89th Congress
2d Session

JOINT COMMITTEE PRINT

STATE AND LOCAL PUBLIC FACILITY NEEDS AND FINANCING

STUDY PREPARED FOR THE

SUBCOMMITTEE ON ECONOMIC PROGRESS

OF THE

JOINT ECONOMIC COMMITTEE

CONGRESS OF THE UNITED STATES

Volume 1

PUBLIC FACILITY NEEDS

DECEMBER 1966

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LETTERS OF TRANSMITTAL

DECEMBER 14, 1966.

To Members of the Joint Economic Committee:

Transmitted herewith for the use of the Joint Economic Committee and other Members of Congress is a study of State and local public facility needs and financing over the next 10 years. It is a staff study prepared for the Subcommittee on Economic Progress with the assistance of a number of experts.

The study projects estimated capital requirements over the next decade for such essential public facilities as water and sewer installations, electric and gas supply, transportation, schools, hospital and health facilities, and other public buildings. These structures represent an investment that is fundamental to our growth and which must increase substantially in the years ahead.

A companion volume which will be available very shortly will analyze sources of credit funds to finance construction of these facilities. Together it is expected that the two studies will prove valuable to public administrators, policymakers and urban planners, as well as economists.

The committee is grateful to the many experts who gave generously of their time to help us in this important work, and, in particular, to Dr. Arnold H. Diamond, Assistant Director, Office of Economic and Market Analysis, Department of Housing and Urban Development, who, as consulting economist to the committee, undertook the major responsibility for preparing and assembling this study. We are also grateful to the Department of Housing and Urban Development for making him available to the committee.

The views expressed in these materials are those of the contributors and do not necessarily represent the views of the committee, or individual members thereof.

WRIGHT PATMAN,
Chairman, Joint Economic Committee.

DECEMBER 12, 1966.

Hon. WRIGHT PATMAN,
Chairman, Joint Economic Committee,
Congress of the United States,
Washington, D.C.

DEAR MR. PATMAN: Transmitted herewith is a projection of public facility needs in the United States over the next decade. Public services have grown rapidly in the past 20 years with attendant increase in the facilities supplying them. This has been an important factor in raising expenditures at all levels of government, and, from time to time, has given rise to proposals for reallocating fiscal resources among the three levels of government to reflect burdens for these services. These estimates of future requirements, it is hoped, will

offer valuable aid to public administrators, fiscal officials, program planners, economists, and financial analysts.

The study examines the provision of State and local public facilities and the availability of credit resources to help finance them. This study is concerned with existing capital plant and the expected growth in requirements over the next 10 years. The second volume, which will be released shortly, will deal with the credit financing of State and local facilities, with particular reference to the municipal bond market.

The estimates are based on the separate assessment of each important category of public facilities, e.g., roads, schools, sewers, airports, etc., prepared by a number of specialists. While the estimates represent their best judgment of the facilities needed to provide adequately for the growing needs of our society, on the basis of a general economic projection for the period covered, it can be expected that some were more moderate than others in projecting increases.

One mildly surprising aspect of the results is that they are closely in line with three other recent studies, each based on a completely different methodology. One is a projection of capital outlays, presented in chapter I of this study, based on extrapolation from past trends and correlations—in short, "a mathematical projection"—derived from past relationships. The second is based on a recent survey of the 50 States and derived from an economic model prepared by the Federal interagency study of economic growth and employment opportunities. A third study was prepared by the Center for Priority Analysis of the National Planning Association.

It might normally be expected that the projection presented herewith, reflecting the so-called "aspiration standards," might indicate greater expenditures than those based on projections of previous relationships or expectations of public officials. But the fact that it is not higher does not necessarily reveal a downward bias. In the recent past, our rate of growth in the public facility sector has been brisk; and it may be that a continuation of this pace would bring us closer to realistic aspiration standards than one might expect. In any case, comparison of our study with the others will in itself offer a stimulating and productive undertaking for the people who are looking ahead in this field of economic activity.

The professional experts who prepared this study in response to the committee's request have given generously of their time and energy. The committee is grateful to them and to their organizations for so graciously making available their time and talents. The participating experts are identified at the beginning of each chapter and in the table of contents.

The committee is particularly grateful to Dr. Arnold H. Diamond, Assistant Director, Office of Economic and Market Analysis, Department of Housing and Urban Development, who, as consulting economist to the committee, undertook the major responsibility for planning the scope of research, editing and coordinating this study. Eleanor Aeschliman assisted with the editing. The study was under the general supervision of John R. Stark, Deputy Director.

JAMES W. KNOWLES.

STATE AND LOCAL PUBLIC FACILITY NEEDS AND FINANCING

Volume 1. Public Facility Needs

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STATE AND LOCAL PUBLIC FACILITY NEEDS AND FINANCING

Volume 1. PUBLIC FACILITY NEEDS

Introduction and Summary*

INTRODUCTION

In our highly developed economy, we in the United States tend to take for granted that the public services ordinarily provided by State and local agencies will in some way continue to be furnished in increasing amounts that keep pace with population growth. By and large, these public services are furnished by State and local public agencies, but significant portions are supplied by (*a*) private, nonprofit organizations, (*b*) proprietary or profitmaking companies, and (*c*) sometimes the Federal Government.

A large part of these public services involve utilization of buildings, structures, and other public facilities, which may be characterized as the Nation's public facilities capital plant. Financing of this capital plant, or what may be termed "capital outlays," will depend upon the type of institution involved, e.g., the financial resources available to public bodies and to private organizations.

As part of its inquiry into the basic economic aspects of human resource investment, the Subcommittee on Economic Progress of the Joint Economic Committee has undertaken an examination of the provision of State and local public facilities by public and private agencies and the availability of credit and other resources to help finance them. The study comprises 2 volumes: The first volume, which is presented herein, is concerned with the existing public facilities capital plant and the growth in requirements that can be expected over the next decade. The second part, presented in a volume to be issued shortly, is concerned with the credit financing of State and local public facilities, with particular reference to the municipal bond market. It will undertake to show prospective increases in such borrowing requirements and probable sources of credit to finance them.

STATE AND LOCAL PUBLIC FACILITY NEEDS

A. NEED FOR AND USES OF STUDY

1. *Need for the Study*

During the past two decades there has been increasing concern regarding the adequacy of the Nation's public facility capital plant. The Congress has authorized a number of Federal assistance programs to help finance the development of basic community facilities (water supply, sewage disposal, power supply), transportation facilities, educational facilities, health facilities, recreational facilities, and other public facilities. In each instance the legislative committees having

*By Dr. Arnold H. Diamond, consulting economist, Joint Economic Committee.

jurisdiction over the functional area have held hearings or conducted studies, which in time were followed by legislation to authorize a particular Federal assistance program.

The assistance is usually in the form of a grant-in-aid, but at times it has been in the form of direct loans or advances, and sometimes in the form of a loan guarantee.[1] Inasmuch as most of our public facilities are owned and operated by State or local public bodies, the bulk of the Federal assistance has gone to these public agencies, but a substantial amount is made to private, nonprofit organizations. With the passage of years, new unmet public facility needs are delineated, or existing needs are expanded, and the volume of Federal financial assistance has grown. Federal expenditures for public works grants to State and local governments rose from $1,735 million in fiscal year 1958 to an estimated $4,854 million in fiscal year 1967.[2] In fiscal year 1967, Federal expenditures for construction by cooperative and other nonprofit groups is estimated at $390 million.[3]

By definition, the Federal assistance programs are designed to *aid* in the provision of needed public facilities, which means that the Federal assistance under each program is but a partial source of financing for the particular facility. It is of interest therefore to examine the other sources; and to ascertain what proportion of the total financing is accounted for by the Federal assistance. Equally important in terms of understanding a Federal assistance program would be the knowledge of how many of the facilities, to be aided by a particular program, are already in existence—as well as their value, location, and age. It is obviously important to have some notion as to what these facilities now cost to construct and to operate and what charges, if any, are collected for their use. Finally, evaluation of public facility assistance programs could be materially enhanced by periodic assessment of the capital requirements flowing from anticipated needs, which could be compared with the volume being constructed.

One might expect that each of the Federal departments or agencies responsible for the administration of a particular Federal assistance program would have reasonably good information regarding the relative importance of the Federal aid to the financing otherwise available for the type of facility for which the Federal aid is provided. Unfortunately, heretofore, this has not been the case, as evidenced by the Federal agency replies to a questionnaire sent out in 1963 by the House Banking and Currency Committee. Relatively few of the Federal agencies were able to answer the question: "To what extent is the type of facility or applicant aided by the program being financed by private credit without involvement of Federal credit assistance?" [4]

Thus, there is a need to develop quantitative information regarding the "universes" in which the Federal assistance programs operate in terms of inventories of existing capital plant, recent trends of capital outlays, and future capital requirements for the facility. If such data could be developed for each category of public facilities, it would then be possible to array them in comprehensive tables that would

[1] Soil and water loans insured by the Farmers Home Administration.
[2] "Special Analyses of the Budget of the United States for Fiscal Year 1967," p. 67.
[3] Ibid., p. 75.
[4] Replies of the Federal credit agencies administering the 74 credit programs in existence at June 30, 1963, are published in vol. II of *A Study of Federal Credit Programs* (issued by the Subcommittee on Domestic Finance, House Banking and Currency Committee, 88th Cong., Feb. 28, 1964).

permit comparisons to be made among the major groups of public facilities and among the component categories.

In essence, the chapters contained in this volume represent an effort to provide in a systematic way information on the infrastructure of State and local public facilities in the Nation. It answers such questions as: What are public facilities? What services do they render? How many are there and where are they located? What has been the trend of capital outlays and indicated sources of financing? How many more are needed? To some extent, one can obtain part of this information from the statistical compilations prepared by the Bureau of the Census.[5] Similarly, one can obtain some of the information from reports and studies issued by individual Federal agencies on their program accomplishments or by some of the trade associations.

But up to now there is no single source to which one can turn in order to obtain a comprehensive picture of the Nation's public facilities ordinarily provided by State and local public bodies and to some extent by private, nonprofit organizations. The study contained in this volume endeavors to fill this void by presenting a series of chapters on the significant categories of public facilities, each prepared uniformly in accordance with a standard chapter outline.

2. *Uses of the Study*

The vast array of information presented in this volume, much of it available for the first time, is adaptable to many uses, depending upon the needs of the reader. However, several intended uses were envisaged when the study project was inaugurated such as (*a*) providing a quantification of the Great Society capital requirements insofar as they relate to public facilities, (*b*) measuring the apparent gap between these requirements and prospective private credit resources, (*c*) providing basic "universe" data inputs to be used in connection with the planning-programing-budgeting system established by the executive branch, and (*d*) providing new dimensions for the "shelf" of unmet public facility needs. These uses are amplified as follows:

(a) *Great Society Capital Requirements.* In his Message on the "Problems and Future of the Central City and Its Suburbs," [6] the President declared:

> The city is not an assembly of shops and buildings. It is not a collection of goods and services. It is a community for the enrichment of the life of man. It is a place for the satisfaction of man's most urgent wants and his highest aspirations. It is an instrument for the advance of civilization.

In prescribing some of the blueprints for the Great Society, the President further declared:

> By 1975 we will need over 2 million new homes a year. We will need schools for 10 million additional children, welfare and health facilities for 5 million more people over the age of 60, transportation facilities for the daily movement of 200 million people * * *. Among the most vital needs of our metropolitan areas is the requirement for basic community facilities—for water and sewerage. Many existing systems are obsolete or need major rehabilitation. And population growth will require a vastly increased effort in years ahead * * *. A community must offer added dimensions to the possibilities of daily life. It must meet the individual's most pressing needs and provide places for recreation and for meeting with neighbors.

[5] Cf. *Governmental Finances* (issued annually by the Governments Division, Bureau of the Census) and *Construction Review* (issued monthly by the Business and Defense Services Administration and which includes data on permits issued for public and private construction, as compiled by the Construction Statistics Division, Bureau of the Census).

[6] H. Doc. No. 99, 89th Cong., 1st sess. (Mar. 2, 1965).

While the public services flowing from the public facilities described in this volume are not the sum total of the goals and objectives of the Great Society, they form an important component. Consequently, these projections of future capital requirements for the different categories of public facilities provide a reasonable approximation of our public service needs for specified levels of service.

(b) *Capital Requirements and Available Resources.* Enumeration of a series of capital requirements for different categories of public facilities carries no assurance that these facilities will, in fact, actually be provided. Whether such facilities will be produced depends upon (1) an assessment by appropriate authorities of the prospective needs for such facilities, (2) a comparison of the relative urgency of such needs with the needs stemming from alternative public and private objectives, and (3) the availability of financial and "real" resources.

A statement of needs for public services represents a series of qualitative judgments as to what would be "needed," if certain standards of performance are to be met for a given population, with due allowance for the existing capital plant. Generally such judgments are rendered by experts or professionals in the particular field who necessarily regard their sphere of interest as more important than others. Assessment of these "needs" by like-minded experts or professionals can result in considerable refinements and reevaluation of the needs; but the winnowing out process (translating "needs" into actual undertakings) does not become very effective until the "needs" for one purpose are compared to equally meritorious needs for other purposes.

Within the constraints of available labor and material resources, the final arbiter is, of course, the availability of financial resources, be they tax receipts, intergovernmental revenues, borrowing, fees, gifts, or donations. All such resources are limited and must be employed for current operations of the spending units as well as for capital outlays. Conceivably a gap could exist between the capital requirements reflecting prospective needs and the financial resources available to meet them.

The size of this gap could only be determined by first ascertaining what our public facility needs are and then comparing the aggregate of such needs with anticipated financial resources. To bridge such a gap, it would be necessary to make more financial resources available or reduce the dimensions of the purported needs by modification of the standards of performance. A necessary first step in this allocation—budgetary process—would be to find out what our public facility needs are and what criteria were used to estimate these needs.

(c) *Planning-Programing-Budgeting System.* On August 24, 1965, the President announced to members of his Cabinet and heads of major agencies his intention to establish a new planning-programing-budgeting system in the executive branch of the Federal Government. This new system—which had been developing in broad outline in the Department of Defense for several preceding years—was formally established within the executive branch by Bureau of the Budget Bulletin No. 66-3 of October 12, 1965. It has since been adopted by all Federal agencies as one of the more important tools of management.[7]

[7] See 1958 recommendations of Joint Economic Committee study on *Federal Policy for Economic Growth and Stability*, pp. 6-14. See also, 1963 Joint Economic Committee report, *The Federal Budget as an Economic Document*, pp. 8-11.

Essential to the new system are: (1) an output oriented program structure which presents data on all of the operations and activities of the agency in categories which reflect the agency's attainment of end purposes or objectives, and (2) analysis of possible alternative objectives of the agency and of alternative programs for meeting these objectives. Such analyses would include comparison of these alternative programs with respect to costs and benefits. As noted in the Budget Bureau Bulletin, the program objectives and planned accomplishments are to be expressed, wherever possible, in quantitative nonfinancial terms. Where relevant, the physical description of the Federal programs is to be related to the entire universe to be served.

In other words, under this new system Federal agencies are required to ascertain the dimensions of the universe in which a particular Federal program operates and to determine the relative proportion accounted for by the Federal aid program. To do so, they will need, in the case of the programs aiding the provision of public facilities, data showing (1) the existing capital plant of the public facility category, for which the aid is provided, (2) the recent trend of capital outlays, and (3) estimated capital requirements for specified levels of performance.

In analyzing alternative programs to meet indicated objectives, the Federal agencies will eventually have to determine (1) whether the program "needs" can be financed by loans or whether they require some form of grant subsidy; (2) the extent to which funds are being, are likely to be, or could be provided from non-Federal sources; (3) the range of capital and operating costs of the public facility; and (4) the extent to which the prospective users can afford to pay these costs.[8] By and large, such information has not been assembled in any systematic manner heretofore. Yet without these "universe" data and related cost and financing information, the comparative analyses and program memoranda called for by the new system may prove to be difficult to prepare.

(d) *Shelf of Public Facility Needs.* Since the 1930's the view has been expressed by certain analysts [9] that there is a need for a shelf or reserve of planned public works, the construction of which can be started promptly when economic conditions make such action desirable. They look to the employment and income generative effects of public works construction as one of the means of counteracting recession tendencies within the economy. Before such a shelf of public works can be developed, the respective "public works" needs have to be identified and quantified.

While one may question the economic merits of the public works reserve thesis, given the problems associated with the timing of stepped-up public works expenditures, there is no doubt that "public facility" expenditures (by private as well as public agencies) contribute importantly to a growing economy. In fact, a slowdown or curtailment of such expenditures could help initiate a general economic

[8] Much of these remarks is based on the writer's conclusions set forth in vol. I of *A Study of Federal Credit Programs* (issued by the Subcommittee on Domestic Finance of the House Committee on Banking and Currency, 88th Cong., Feb. 28, 1964), especially pp. 179–180.

[9] Cf. National Resources Planning Board, *Economic Effects of Federal Public Works Expenditures*, 1933–38 (Washington: Government Printing Office, 1940); Special Assistant to the President for Public Works Planning, *Planning for Public Works* (July 1957); Economic Report of the President (January 1955), p. 57; Robinson Newcomb "Public Works and Economic Stabilization" in *Problems in Anti-Recession Policy* (issued by the Committee for Economic Development, September 1954); and more recently, "America's Need: Social Services and Jobs," AFL-CIO *American Federationist* (August 1963). See also, *Report of the Joint Committee on the Economic Report on the January 1954 Economic Report of the President.* Pp. 13–15.

downturn. Before public facilities can be constructed, they must first be planned, and this planning should be related to some assessment of needs. A periodic assessment of aggregate public facility needs provides, then, a comprehensive picture of the growth potential of an important sector of the U.S. economy, useful to those who have to chart the future course of the economy.

B. PLAN OF THE STUDY

1. *General Considerations*

Initially, assembling the requisite mass of data on the public facilities capital plant in the Nation appeared a formidable, if not impossible, assignment, considering the diversity of ownership patterns and the variety of public facility categories. To confine the study of public facilities to those owned and operated by State and local public bodies would overlook the facilities owned by private, nonprofit organizations, including most of the Nation's hospitals, colleges, and neighborhood centers, and significant amounts of recreational or cultural facilities. On the other hand, the major alternative to State or local public ownership for such public facilities as electric power, gas distribution, airports, marine ports, or parking facilities is ownership and operation by a private, investor-owned company.

To obtain a comprehensive picture of all public facilities, irrespective of ownership, it seemed advisable to develop the study along functional lines; that is, to assemble a series of chapters, each dealing with a specific category of public facilities. Within the chapter appropriate delineations could be made regarding the ownership distribution of the existing capital plant, trend of capital outlays, and prospective capital requirements. The component data by ownership patterns, as well as the totals for each category of public facilities, could then be aggregated, such as is done in the next section of this chapter, or they could be cross-tabulated according to other needs of the user.

The decision to base the study on a series of chapters, each dealing with a specific category of public facilities, materially eased the problem of data assembly. For each public facility category there are groups, generally a Federal agency or a private trade association, that can avail themselves of a substantial amount of knowledge regarding the services rendered, the existing capital plant, costs and user charges, trends of capital outlays, and they are likely to be the most informed as to prospective needs and capital requirements. As evidenced by the chapters in this volume, such materials can be developed by these groups from reports already published, unpublished data in their files, from special surveys, or by informed estimates.

2. *Procedure*

Accordingly, arrangements were made with private associations or Federal agencies, which were believed to be best qualified, to prepare authoritative chapters on designated public facility categories. To assure uniform coverage, and to permit the tabulation of comparative data, each chapter writer was requested to follow a standard outline, set forth in questionnaire form, that was enclosed with the letter of request transmitted by the Chairman of the Joint Economic Committee. (See Supplementary data, pp. 20–21.)

The chapter writers were advised to add such qualifying information and remarks as might be necessary to provide a comprehensive picture of the subject matter. They were given a list of economic assumptions for the years 1966–75 (See Supplementary data, p. 22) as a guide for any projections that may be made for these years. The committee's letter of request prescribed that the requested chapter "should be limited to a factual account of the prevailing or historical situation, supplemented by appropriate estimates and projections. It should omit recommendations, suggestions for changes, or comments on existing or prospective legislation."

The chapters prepared under these instructions were then reviewed and edited by committee staff to delete extraneous materials. Also deleted were recommendations for new or enlarged Federal assistance programs or for other Federal legislation, statements that reflected unfavorably upon other public facility industries and reproductions of Federal statutes or agency regulations.

This editing was deemed necessary to assure that the intended factual presentation did not become a vehicle for promoting the interests of special groups, be they trade associations or Federal agencies. Aside from these changes, the materials presented in the various chapters represent the viewpoints of the respective chapter writers, identified on the first page of the chapter. Because of their expertise in the specialized areas in which they are active, it is presumed that the materials they present fully reflect the information available on the subject.

3. *Identification of Public Facilities*

In setting the ground rules for the individual chapters, it became necessary to clarify what was intended by the term "public facilities." It is recognized that the term *public works* ordinarily applies to undertakings by public agencies [10] and therefore could not be used to describe the physical facilities owned by groups other than public agencies. On the other hand, the term *public facilities* can be interpreted to mean facilities from which *public services* can be rendered, irrespective of ownership of the facilities. Accordingly, the scope of the study has been defined in terms of *public facilities*.[11]

It is further intended the study be confined to *State and local public facilities*, that is, (*a*) public facilities ordinarily provided by State or local public agencies, or (*b*) public facilities that are to a significant extent provided by State and local public agencies or by private, nonprofit organizations. In this way, full recognition would be accorded to the public facilities owned and operated by private, nonprofit organizations, which account for a significant portion of the Nation's public services. Under this definition, facilities entirely owned by the Federal Government (defense installations, post offices, other Federal buildings, space and atomic energy facilities or multipurpose dams) would be excluded from the purview of the study. Similarly excluded would be the capital plant of investor owned private business.

[10] Publicly owned housing is not construed as part of the "public facilities" sector in the economy. Instead, it is regarded as part of the "housing" sector, a sector that also includes housing owned by private, or nonprofit organizations. In a sense, "public facilities" are "nonresidential" structures. However, group housing, such as college dormitories and nursing homes, are regarded by the Census Bureau as "nonresidential," and they are, therefore, construed as part of the Nation's "public facilities."

[11] Urban renewal expenditures to acquire and clear properties are not regarded as *public facilities* expenditures. Cleared land, in itself, does not yield a *public service*.

However, it is recognized that there are categories of "State and local public facilities" where a large part of the facilities are owned and operated by the Federal Government (national parks, regional and river basin water supply systems) or by private investor owned companies (electric power, gas distribution, urban mass transit, airports, parking facilities, nursing homes). These categories of public facilities are included in the study in order to provide a perspective for the facilities within these categories that are owned by State and local public agencies or by private, nonprofit organizations. Moreover, inasmuch as ownership patterns are not immutable, it seems more meaningful to provide the capital requirements over the next decade for, say, the entire electric power industry, rather than the requirements of the small segment of the industry accounted for by State and local public agencies, plus private, nonprofit organizations.

With these definitions in mind, arrangements were made for the preparation of 42 chapters, each covering a designated public facility category. By and large, the public facility categories are those that reflect commonly used identifications; but at times, owing to the nature of the industry or to the availability of data, it became advisable to split an industry into several parts, each with a separate chapter, or sometimes to combine in a single chapter similarly constituted activities.

Under the grouping *Basic Community Facilities* there are three chapters dealing with water supply facilities—regional and river basin water supply systems (including watersheds), public water systems (mainly urban) and rural-agricultural water supply systems (essentially irrigation systems). There are four chapters dealing with sewage collection and disposal—sanitary sewer collection systems, storm sewer systems, water waste treatment plants, and solid wastes collection and disposal facilities. There is one chapter on electric power systems and one on gas distribution systems.[12]

Under the grouping *Transportation Facilities* there are separate chapters on highways, roads and streets (covering rural and urban highways, roads and streets), toll bridges, tunnels and turnpikes, urban mass transit facilities, parking facilities, airports, and marine port facilities.[13] Under the grouping *Education Facilities* there are chapters covering public elementary and secondary schools, nonpublic (private) elementary and secondary schools, area vocational schools, academic facilities for higher education institutions (including community and junior colleges), college housing and related service facilities and educational television.

Under the grouping *Health Facilities* there are separate chapters on hospitals (mainly general hospitals), clinics, and other outpatient facilities (hospital outpatient departments, hospital adjunct services, and freestanding specialized facilities), long-term care facilities (nursing homes, chronic disease hospitals), community mental health centers,[14] facilities for the mentally retarded (community facilities

[12] The possibility of a separate chapter on telephone facilities was explored with the National Telephone Cooperative Association and it was concluded that the negligible amount of publicly owned telephone service did not warrant a separate chapter. In the case of street lighting, it was found that information on the subject was virtually nonexistent, perhaps due to the fact that street lighting is considered in many localities as part of the highway or street capital plant.

[13] The possibility of a chapter on terminal facilities for trucks, buses, and trains operating on interurban routes, was explored with the Department of Commerce and the respective trade associations. All concluded that the prospects of obtaining information for such publicly owned facilities, outside of New York, were slim, and hence no chapter seemed advisable.

[14] As detailed in ch. 25, community mental health centers are expected to be the new type of facility for the mentally ill, and, in time, are expected to displace the traditional State mental institution.

and university affiliated facilities), health research facilities (usually located at universities or hospitals), and medical and other health schools (schools for dentistry, nursing, optometry, osteopathy, pharmacy, podiatry, and public health).

Under the heading *Recreational and Cultural Facilities* there are three chapters on outdoor recreational facilities, one dealing with State and Federal facilities, one with urban local outdoor facilities, and one with rural outdoor facilities. There is a chapter on neighborhood centers for recreation, health and social services (covering the activities of such groups as the Boy Scouts, Boys Clubs, Girl Scouts, "Y's," and other privately operated settlements and neighborhood centers). Other chapters deal with stadiums, arenas, and exhibition halls, theaters and community art centers (cultural centers), museums (including planetariums, zoos, botanical gardens) and public libraries.

Under the heading *Other Public Buildings* are such chapters as residential group care for children (detention homes, institutions for delinquent children, other child welfare facilities), armories, jails and prisons, fire stations,[15] public office and court buildings, and industrial plants financed and owned by local governments.[16]

Owing to the programatic viewpoint of some of the Federal agencies that prepared several of the chapters and the limited detail available on certain of the data, there are several chapters where the information presented overlaps, in part, material contained in other chapters. Thus, there is some overlap between the chapters on (*a*) highways, roads, and streets on the one hand and toll bridges, tunnels, and turnpikes on the other; (*b*) area vocational school facilities, on the one hand, and public elementary and secondary schools and academic facilities for higher education, on the other; (*c*) health research facilities, on the one hand, and hospitals and academic facilities for higher education, on the other; and (*d*) medical and other health schools and academic facilities for higher education. For the first two where the overlap is reported to be near 100 percent, appropriate adjustments are made in the summary compilations. For the latter two, the respective chapter writers advise that the overlap is minimal, and therefore the summary compilations have not been adjusted.

4. *Chapter Content*

Each of the chapters presented in the second part of this volume consists of four sections: (A) nature and composition of public work or facility (B) costs and user charges (C) trend of capital outlays, and (D) needs and prospective capital outlays. The first section is designed to describe the particular public facility in terms of physical characteristics, services rendered and standards of performance. It also provides an inventory of the existing capital plant in terms of number of facilities, location by State and size of city, age distribution, ownership pattern and estimated current value.

The second section is intended to show the current range of construction and operating costs for the particular facility. It also indicates the extent to which user charges are employed to pay for the use of the facilities and the relationship of user charges to capital and operating costs. Section (C) depicts the postwar trend of capital

[15] A parallel chapter on police stations was envisaged, but the International Association of Chiefs of Police found that the available data did not permit the preparation of a useful chapter.

[16] One may question whether a municipally owned industrial plant that is leased for private use is a "public facility." Because of the controversy on this subject, data are presented on municipally owned industrial plants, but excluded from the summary tabulations.

outlays, delineating the ownership patterns for these outlays and their sources of financing. Section (D) presents projections of capital requirements for the facilities over the next decade, with appropriate explanation of the "need" considerations taken into account. To the extent possible, expected ownership patterns and sources of financing for the anticipated capital requirements are also shown. (The standard chapter outline used by the chapter writers is reprinted in the section "Supplementary data," pp. 20–21.)

The purpose of each chapter is to present a factual description of the particular public facility to the extent data are available. In a number of instances such data are sufficient to permit the authors to comply fully with the prescribed chapter outline. In other cases, as evidenced in various chapters, there is a paucity of information available and the authors had to condense accordingly.

Public service needs reflect a series of subjective judgments regarding quantitative and qualitative standards of performance, which may not be acceptable to all. Hence, each author was requested to state explicitly the standards of performance deemed appropriate for the particular facility. Moreover, in projecting capital requirements to reflect future needs, the author was requested to describe the factors taken into account in making the projections. In most chapters these subjective judgments are clearly delineated so that users of the study may make adjustments, if they deem it desirable, in the underlying assumptions. In other chapters, however, the authors presented their considered opinions, without identifying the assumptions and judgments.

5. *General Chapters*

Three general chapters are presented in the first section of this volume to provide a frame of reference for the specific public facility category chapters that follow. The first chapter describes the relative importance of State and local public works expenditures to gross national product during the years 1946–65 and provides "best judgment" projections of the volume of such expenditures that may be expected during 1966–75.

The second and third chapters describe, respectively, the material and labor requirements for State and local public works during the years 1946–75. These two chapters, at least with respect to the projections for 1966–75, are tied to the projections contained in the first chapter.[17] In addition, the chapters examine the importance of State and local public works construction to the material supply, industries and construction employment, trace for the years 1946–65 changes in the capacity of the building materials and construction industries and in the volume of construction employment, automation trends in these industries, cost-price developments, and the adequacy of technically skilled labor to administer the intended public services so as to avoid underutilization of the public facilities capital plant.

[17] These three chapters have been interrelated to assure consistency as to projection assumptions. However, since the writers of these three chapters did not have access to the "capital requirements" projections that were being prepared simultaneously by those writing the chapters on the specific public facility categories, they could not take them into account. The reader, having all these materials at hand, can determine, as appropriate, whether the future supply of construction labor or materials might constrain meeting the various needs, assuming financial resources are available.

C. SUMMARY OF FINDINGS

1. *General Forces*

As explained above, three general chapters are presented in the first part of this volume to provide an overview of the State and local "public works"[18] sector of the economy. The first analyzes and projects State and local public works expenditures in relation to GNP; the second examines the material requirements for such expenditures, and the third examines their labor requirements.

Since 1958 the ratio of real State and local government expenditures for structures and equipment to real GNP has fluctuated within a relatively narrow range—between 2.8 and a little over 2.9 percent. Assuming an average annual growth rate in real GNP of a little over 4 percent from 1965 to 1975, a 4 percent unemployment rate and a 1.5 percent increase per year in the GNP price deflator, coupled with various other factors detailed in chapter 1, GNP is projected (in current prices) to rise from $676 billion in 1965 to $905 billion in 1970, and to $1,180 billion in 1975 (assumption B). If one assumes the average annual growth rate in real GNP at nearly 4½ percent from 1965 to 1975, the unemployment rate at 3 percent, and a 2-percent increase per year in the GNP price deflator, and taking into account account other described factors, GNP is projected at $940 billion in 1970 and at $1,275 billion in 1975 (assumption A).

From these GNP projections, it is further projected that State and local government purchases of structures and equipment (net of residential buildings), which amounted to $19.5 billion in 1965, would rise to $28.5 billion in 1970 and to $39.1 billion in 1975 under assumption B. Under assumption A, such purchases would rise to $29.9 billion in 1970 and to $44.2 billion in 1975.[19]

After surveying the components of the construction and building materials industries, the authors of chapter 2 conclude that—

> To meet future increases in construction demand in both the private and public sectors it is expected that the construction and building materials industries will increase their productive capacities. Prefabrication and prefinishing have been and will continue to be important sources of promoting innovation and labor-saving devices on construction sites * * *. When one considers all the factors, it is difficult to avoid the conclusion that the construction materials industries should be able to meet the needs of future construction—as they have in the past—through innovation, product development, and increased productive capacity.

After reviewing labor market prospects, the authors of chapter 3 conclude that—

> Employment in the building trades is expected to increase moderately through the mid-1970's, assuming relatively full employment nationally and the high levels of economic activity needed to achieve this goal.

Turning to the OBE projections for 1975, the authors estimate that, allowing for increased productivity, 2,802,000 full-time workers will be needed in 1975 for the $41.7 billion of construction projected under

[18] Owing to the definitions and concepts employed in national income accounting, the three chapters necessarily deal only with State and local government "public works," as distinguished from the "public facilities" concept used throughout this volume. The latter includes expenditures by other owners. Moreover, under national income and product accounting, public works expenditures relate only to construction (or equipment purchase) expenditures, but omit expenditures for land. In contrast, "capital outlays" (or "capital requirements") embrace expenditures for land as well as for construction or equipment purchase.

[19] In July 1966, subsequent to the time when these calculations were made, the estimates in the national income and product accounts were revised for the years 1963–65. The Office of Business Economics advises that the effect of these changes on the above projections is relatively small; the projections of State and local capital expenditures would be raised by about $.5 billion in 1970 and 1975.

assumption A and 2,744,000 for the $36.6 billion [20] of construction projected under assumption B—

Thirty-eight percent of these (1,070,000 and 1,048,000, respectively) would be needed in the construction industry and the balance in sectors supplying the necessary materials and service.

2. *Capital Requirements 1966–75*

Each of the chapter writers in the second part of this volume [21] was requested to present, in part D of the chapter, estimates of capital requirements for the particular public facility category for each of the years during the period 1966–75. The projections were to take into account the current backlog of unmet needs, accommodations of expected population growth, replacement of obsolete facilities, quantitative and qualitative standards of performance. As will be noted, some of the chapter writers distinguished between the current backlog of unmet needs and future requirements, while others combined the two elements. Some of the chapter writers provided projections for each year, as requested; others provided only an estimate for the entire 10-year period.

Table 1 compares the estimated capital requirements for all public facility categories by all spending units during 1966–75 with actual outlays for such facilities in 1965 (to the extent data are available). To facilitate comparisons on an annual basis, estimates are also provided for the capital requirements in 1970 and in 1975.[22] The estimates are grouped under six headings: A. Basic Community Facilities (water and sewer, electric and gas); B. Transportation; C. Education; D. Health; E. Recreational and Cultural; and F. Other Public Buildings.

Estimated capital requirements for public facilities by all spending units during 1966–75 total $499 billion. For 1970 the estimated requirements total $49 billion and for 1975 they aggregate $62 billion, or double the volume estimated for 1965. The largest capital needs are for basic community facilities and for transportation facilities. The following table provides a summary comparison of the estimated requirements with actual 1965 capital outlays, broken down by major groups of facilities.

[20] Projected construction figures include $0.5 billion of residential construction. They differ further from the figures cited above ($44.2 billion or $39.1 billion) by the amounts projected for purchases of equipment.

[21] With the exception of chapter 42 dealing with publicly owned industrial plants.

[22] To assure uniformity in the estimates, the following procedures have been employed: (*a*) the figures for 1966–75 are (1) as provided, or (2) the sum of the unmet backlog plus future requirements, or (3) the sum of annual estimates with interpolations for intervening years; (*b*) the estimates for 1970 and 1975 are (1) as provided, or (2) 9.6 percent and 12.6 percent of the 1966–75 projection, the percentages reflecting an annual rate of increase in requirements of 5.5 percent; and (*c*) all estimates are rounded to the nearest $10 million (except when they are under $10 million). Further explanations are shown in the footnotes to the table.

Summary comparison of total capital outlays for public facilities in 1965 with estimated capital requirements during 1966–75, all spending units

[Dollars in billions]

Group of facilities	Actual 1965 [1]	Estimated		
		1970	1975	1966–75
Water and sewer	$3.9	$7.3	$9.2	$76.2
Electric and gas	6.5	8.8	10.2	84.9
Transportation	9.2	14.6	19.0	151.7
Education	5.9	7.8	10.2	82.2
Health	2.5	4.2	5.5	43.5
Recreational and cultural	2.5	5.2	6.6	53.1
Other public buildings	[2] 5	[3] 7	[3] 9	[3] 7.5
Total	31.0	48.6	61.6	499.1

[1] Adjusted to reflect facility categories where data are not available.
[2] Excludes publicly owned industrial plants.
[3] Includes police stations with estimated capital requirements assumed to be $1,000,000,000 during 1966–75.

As will be noted, these capital requirements relate to all spending units—State and local public agencies, private, nonprofit organizations, private investor-owned companies, and, where appropriate, the Federal Government. Since each of these ownership groups finance their activities in different sectors of the capital market, it is useful to provide estimated capital requirements for each of these ownership classifications. Accordingly, table 2 compares the estimated capital requirements for public facilities during 1966–75 with actual capital outlays in 1965 for State and local public agencies. Table 3 provides a similar comparison for private nonprofit organizations and table 4 presents the information for private, investor-owned companies.[23]

State and local public agency capital requirements for public facilities are estimated at $328 billion for the decade 1966–75. For 1970 these capital requirements are estimated at $32 billion and for 1975 they are estimated at $41 billion, which compares to the $20 billion of capital outlays expended by State and local public bodies in 1965. As shown in the following table, over 40 percent of the anticipated capital requirements are for transportation facilities and nearly 20 percent each are accounted for by education and water and sewer facilities.

[23] Each of the requirement estimates for the organizational sectors is related to the estimates presented in table 1 for all spending units. The distribution patterns are either denoted in the respective chapter in absolute amounts or in percentages of total requirements. Where the distribution is not clearly discernible from the respective chapter, the distribution percentages employed for the estimates are described in the footnotes to the respective tables. Where the chapter does not provide data on the distribution pattern of the estimated capital requirements, the patterns are "assumed," on the basis of such information as seemed appropriate (identified in the footnotes). No separate table has been prepared on federally owned facilities.

Summary comparison of public facility capital outlays of State and local public agencies in 1965 with estimated capital requirements during 1966–75

[Dollars in billions]

Group of facilities	Actual 1965 [1]	Estimated		
		1970	1975	1966–75
Water and sewer	$2.7	$5.5	$6.8	$56.5
Electric and gas	.8	1.3	1.4	12.8
Transportation	8.9	13.5	17.7	141.1
Education	4.9	5.9	7.8	62.0
Health	.8	1.3	1.7	13.1
Recreational and cultural	1.5	3.4	4.4	35.0
Other public buildings	[2] 5	[3] 7	[3] 9	[3] 7.3
Total	20.1	31.6	40.7	327.8

[1] Adjusted to reflect facility categories where data are not available.
[2] Excludes publicly owned industrial plants.
[3] Includes police stations with estimated capital requirements assumed to be $1,000,000,000 during 1966–75.

Public facility capital requirements of private, nonprofit organizations for the decade 1966–75 total $54 billion, or over 10 percent of the total capital requirements of all spending units. Capital requirements for these organizations total $5 billion in 1970 and almost $7 billion in 1975, which compare with capital outlays of somewhat over $2 billion in 1965. As detailed in table 3, the largest segments of these private, nonprofit capital requirements are for college facilities (academic and housing) and for hospitals.

For private, proprietary or investor owned companies the capital requirements for public facilities during 1966–75 are estimated at $105 billion, or over 20 percent of the estimated total requirements. These capital requirements are estimated at $10 billion in 1970 and $12 billion in 1975, as compared to capital outlays of some $6 to $8 billion in 1965. As shown in table 4, over half of the estimated capital requirements of the proprietary companies are for electric power facilities, with sizable amounts for gas distribution systems and storm sewer systems. For Federal agencies the capital requirements for public facilities during 1966–75 are estimated at about $13 billion, mainly for outdoor recreation and electric power facilities.

3. *Existing Capital Plant*

Underlying most projections of prospective needs and capital requirements are assumptions, generally unstated, regarding the existing capital plant for the particular category of public facilities. Such assumptions relate to the existing number of facilities, their age or physical condition, and their degree of utilization. Some of these assumptions can be quantified; others involve qualitative judgments or are susceptible of flexibility.

As evidenced by the data presented in table 5, there is usually very good information as to the number of facilities (or where more meaningful, the volume of public service output) for each of the public facility categories. Moreover, as shown in the table, in most instances the number or volume, according to type of ownership, is also ascertainable. In a majority of the chapters, data are presented regarding the distribution of these facilities by States and by population size of city.

Unlike the situation for many of our durable consumer goods, where style changes, built-in obsolescence, and annual improvements

stemming from technological advances make periodic replacement necessary, most of the Nation's public facility capital plant is constructed with long-time use in mind. To a surprising degree, many public facilities or structures built 25 to 30 years ago are still very usable today, especially if there have been proper repairs and maintenance. On the other hand, when the age of a structure reaches 45 to 50 years or more, it is frequently no longer suitable for use and needs to be replaced.

Significant portions of the Nation's public facility capital plant are still being used, even though they were constructed before 1920. For example, 14 percent of the elementary and secondary schools, and 21 percent of the private elementary and secondary schools, were built before 1920. About 15 percent of the public libraries, and 20 percent of State prisons were built before 1900. Given the limited fiscal resources and the higher priorities for other public expenditures of the communities in which they are located, many of these aged facilities may be expected to continue in use for a number of additional years.

Not only is there use of public facilities for time periods beyond their anticipated lifespan, but in many instances facilities are utilized more intensively than was originally contemplated. Additional schoolchildren are frequently handled by installing more desks in classrooms; hospital overflows are accommodated by placing additional beds in rooms, or even in corridors; and college facilities are more intensively used by afternoon or evening classes and through trimester and four semester school years. Crowded highways are manifested by slow moving, bumper-to-bumper traffic; overtaxed bridges and tunnels are evidenced by long waiting lines for use; overcrowded airports are mirrored by the stacking of airplanes waiting to land; and during rush hours subway passengers are "packed like sardines."

Continued use of over-aged facilities and more intensive use than originally contemplated, are sometimes the practical alternatives to increased capital outlays for public facilities to meet expanding needs. Staggered use of commuter mass transit facilities may help to relieve overcrowding as will double sessions of schools. Popular museums, libraries, or parks are likely to attract large attendances, even though they may be overcrowded; and sports or theatrical events frequently play in "packed" arenas or theaters.

Any assessment of future capital requirements for the various public facility categories, as detailed in the previous section, must in some way take into account existing facilities and the extent and duration of their possible use.

The last column of table 5 shows the current estimated value of the existing capital plant for each of the public facility categories. Allowing for the categories where estimated current values are not available, the estimated value of the existing capital plant of all State and local public facilities is in excess of $450 billion, perhaps as much as $500 billion. This sum is the approximate size of the estimated capital requirements for such public facilities during the decade 1966–75.

4. *Costs and User Charges*

To the extent that data are available, each of the chapters present statistics on capital and operating costs for the respective categories

of public facilities and information on user charges. The cost data provide some basis for judging relative construction costs or, to put it another way, an indication of what $1 million of capital outlay is likely to purchase for different categories of public facilities.

Table 6 analyzes the extent to which user charges are employed for each of the public facility categories. As will be noted, of the 42 public facility categories listed, user charges are employed either substantially or moderately in 33. For this purpose, "substantial" means that user charges are employed in all or most instances or, where they are employed, cover all or a substantial part (over 50 percent) of capital and operating costs. "Moderate" means that user charges are infrequently employed or that they cover only a small part (under 50 percent) of capital and operating costs.

User charges are employed for all categories of public facilities classified as basic community facilities and transportation facilities and for all but one of the categories within the groups classified as health facilities and recreational or cultural facilities. On the other hand, there are no user charges for public elementary and secondary schools, health research facilities, public libraries, and the facilities relating to public safety and administration [armories, jails and prisons, fire (and police) stations, residential group care for children, and public office and court buildings].

Inasmuch as most of the public facilities described in this volume have user charges that cover all or part of capital and operating costs, they are amenable to financing through long-term borrowing, so that the capital costs of the facilities can be prorated over several generations of users, each of which can pay all or part of the apportioned capital costs.[24] Financing through borrowing against future revenues, of course, enlarges the volume of capital outlays that can be accomplished during any specified period, as compared to capital outlays financed entirely out of current receipts.

D. EVALUATION OF DATA

1. *Data Quality*

Essentially, this volume is a data source book, full of facts, figures, and expert projections. Many of the chapters contain a wealth of information, sufficient to satisfy most users. However, in some chapters the information is scanty; and upon reading them, one might be inclined to question whether they reflect the ultimate possibility in conveying information about the subject.

Checking with other sources, one finds that in a number of instances the contents of these chapters are just about all we do know with respect to the kinds of data called for in the committee questionnaire. The paucity of information on capital outlays in the various chapters on health facilities, to cite one area, may be attributed to (*a*) the "programmatic" viewpoint of the Federal agencies concerned with such matters as health, which results in minimal interest in related activities carried on outside Federal assistance programs, (*b*) a lack of detail in the construction statistics compiled by the Bureau of the Census, and (*c*) limited efforts by the executive branch to take the

[24] The increasing concern regarding the adequacy of hospital charges paid by public welfare agencies on behalf of indigent patients and by private group medical plans on behalf of their members suggests that future hospital user charges may cover a larger proportion of hospital capital and operating costs.

necessary steps to see that such data are compiled so that the budget presentations would be more meaningful.

To overcome these data deficiencies, it would be helpful to analysts and policymakers to strengthen the data collection resources of such basic fact gathering agencies as the Bureau of the Census, especially the Construction Statistics Division. This Division is currently responsible for compiling statistics on permits authorized and construction put in place for various groups of public and private construction. If these data are to be useful in delineating the "universes" in which Federal assistance programs operate, they must be broken down in sufficient detail and supplemented by statistics for outlays on land and equipment to permit appropriate comparisons to be made.

2. *Other Projections*

It should be noted that several other studies have been made in recent years dealing in part with public facility needs. One is a study on national goals prepared by the Center for Priority Analysis of the National Planning Association. Based on a series of research memoranda, the study presents a number of projected expenditures (including capital outlays) in 1970 and 1975, taking into account certain "aspiration standards." [25] As detailed in table 7 (which lists the public facility categories in line with the classifications employed in this volume), public and private capital outlays for public facilities are projected to rise from $29.0 billion in 1962 to $51.5 billion in 1970, and to $60.8 billion in 1975. These figures compare with the estimates presented above for all spending units of actual capital outlays of $31.0 billion in 1965 and estimated requirements of $48.6 billion in 1970 and $61.5 billion in 1975.

The second, known as "Project '70", is a study of the State and local government sector involving projections of expenditures and revenues in 1970 of State and local governments for each of the 50 States and the District of Columbia. The projections were made on the basis of a set of economic and demographic assumptions generated by a macroeconomic growth model, chosen from several developed for the Federal Interagency Study of Economic Growth and Employment Opportunities. For 1970, this study projects State and local government capital outlays at $30 billion.[26] This compares with the $31.6 billion of public facility capital requirements for 1970 estimated in this volume for State and local public agencies.

3. *Appraisal*

A priori, one might expect that estimates of public facility capital requirements based on separate assessment of over 50 [27] different categories of need would result in figures considerably larger than projections of past trends. As noted above, the aggregate of the separate estimates by functional category of public facilities (that

[25] Leonard A. Lecht, *Goals, Priorities and Dollars* (New York: The Free Press, 1966.)

[26] S. Mushkin and G. Lupo, *State and Local Government Capital Outlays: Projections to 1970* (note, dated August 1966). Detailed projections are presented in S. Mushkin and E. McLoone, *Public Spending for Higher Education in 1970* (The Council of State Governments, Research Memorandum 374); S. Mushkin and R. Harris, *Transportation Outlays of States and Cities: 1970 Projections* (RM 375); S. Mushkin and E. McLoone, *Local School Expenditures: 1970 Projections* (RM 382); R. Rafuse, Jr., *Water-Supply and Sanitation Expenditures of State and Local Governments: Projections to 1970* (RM 389); and S. Mushkin, *Health and Hospital Expenditures in State and Local Governments: 1970 Projections* (RM 390).

[27] In some of the chapters there were several parts, each of which contained a separate estimate of capital requirements.

are presented in the chapters in this volume) are in line with projected capital outlays reflecting certain "aspiration standards"; and the public agency component of public facility capital requirements in 1970 are close to those projected on the basis of a survey of 50 States.

Moreover, the aggregate 1970 and 1975 estimates for public agencies are in line with the capital outlays projected in the growth models of GNP on the basis of past trends. (The latter are presented in the first chapter.) The GNP growth models project corresponding rises in State and local taxes from Federal financial assistance and from other resources. Consequently, it would appear that the State and local government portion of estimated public facility needs would not require any major alteration of State and local government fiscal resources.

Such a conclusion would appear to be at odds with predictions that growing demands on State and local governments for public services will require some reallocation of fiscal resources. Consequently, one must consider the possibility that (*a*) our estimates of public facility requirements are too conservative or (*b*) that the availability of future fiscal resources of State and local governments may be underestimated by those who suggest reallocation of resources, or (*c*) that public facility capital expenditures is only one element in a growing pattern of required public services, and that services, rather than facilities, will make the biggest demands in the future.

(*a*) It is conceivable that many of the chapter authors preferred to employ conservative judgments, especially since they were asked to state their underlying assumptions. Moreover, while backlogs of current unmet needs can be reasonably described, future needs may be more difficult to perceive, since the economic horizon of many analysts tends to be appreciably shorter than the 10-year period called for in the study. These factors, coupled with the arbitrary allocations among ownership patterns made in this study (when they were not provided in the particular chapters) may have contributed to a downward bias in the capital requirements estimates. But if this is so, it would have to be assumed that there were similar "downward biases" in the estimates made in the aforementioned NPA and "Project 70" studies, which would be a striking coincidence.

(*b*) Recent experience with Federal tax revenues has found that actual receipts exceed estimated revenues by considerable amounts. To some extent this underestimation may be due to lack of familiarity with the fiscal aspects of the "New Economics"; and to some extent it may be due to conservative methods of tax revenue estimation. The GNP growth model projections assume a continuation of the accelerated growth of the economy experienced during the past 5½ years, which suggests that our State and local tax resources will grow faster than the rate our "conventional wisdom" would cause us to expect.

(*c*) The present study is concerned with the Nation's public facility capital plant and its prospective growth. Hitherto, capital outlays have accounted for about one-fourth of State and local government expenditures. Most of the remaining State and local government expenditures represent outlays for public services. While a large part of these public services involve utilization of public facilities, it does not necessarily follow that future capital requirements for public facilities fully measure public service needs and possible expenditures.

It may be that an increasing proportion of public funds should be spent on health and educational services, welfare payments, public safety, transportation, recreational and cultural services, manpower training, and the entire range of other activities that have been, or are likely to be, supported by Federal aid under the Economic Opportunity Act or the model cities legislation. Many more nurses, hospital attendants, health, transportation, and utility technicians and operating staff, or park and recreation supervisors, may be needed than the additional personnel called for by the expansion of the public facilities capital plant. Or it may be that public expenditures for such purposes should not be proportionately increased, but rather the additional fiscal resources required at the Federal, State, and local government levels should instead be decreased through tax reductions (if there are fiscal surpluses) or deferment of tax increases (if there are to be fiscal deficits).

It remains to be seen which of the foregoing explanations, or the estimates themselves, accurately describe what is likely to occur during the next decade. Be that as it may, it is hoped that the study presented in this volume provides sufficient data on an often neglected sector to aid those who are responsible for making the economic decisions that will largely shape the future course of the American economy.

Supplementary and supporting data are set forth on the following pages.

SUPPLEMENTARY DATA

PUBLIC FACILITY NEEDS

CHAPTER OUTLINE*

A. NATURE AND COMPOSITION OF PUBLIC WORK OR FACILITY

1. Describe the particular public work or facility in terms of:
   (*a*) General physical characteristics—structures and equipment.
   (*b*) Services rendered—to residential areas, commercial areas, industrial areas, agricultural areas.
   (*c*) Standards of performance—capacity or quantity of output per capita or equivalent concept, e.g., per capita water consumption, schoolroom facilities per capita, hospital space or library space per capita.
   (*d*) Qualitative standards of performance, e.g., primary, secondary, tertiary treatment of sewage, levels of quality of road surfacing, traffic densities, and speed, durability of structures and equipment, frequency of repairs, ordinary replacement cycle.
2. Existing capital plant in the United States:
   (*a*) As of mid-1965, how many of these facilities or structures were in existence or operation?
   (*b*) What was the distribution of such facilities or structures by States?
   (*c*) What was the distribution of such facilities or structures by population size of city—500,000 or more; 100,000 to 499,999; 50,000 to 99,999; 10,000 to 49,999; 2,500 to 9,999; and under 2,500?
   (*d*) What is the age distribution of such facilities or structures, i.e., built (1) before 1900, (2) during 1901–20, (3) 1921–40, (4) 1941–60, (5) since 1961?
   (*e*) Of these facilities and structures now in operation, what proportion is owned by:
      (1) State governments or State agencies;
      (2) Cities, counties, towns, special districts, public authorities, or other local public bodies;
      (3) Private, nonprofit organizations, and cooperatives;
      (4) Proprietary or profitmaking organizations;
      (5) Federal Government, if appropriate.
   (*f*) What is the estimated current value (as of end of 1965) of these facilities and structures?

B. COSTS AND USER CHARGES

1. Construction costs and operating costs:
   (*a*) On the basis of some standard unit of measure (cost per square foot, cost per mile, cost per connection, etc.), indicate the current (as of 1965) range of typical construction costs for different size facilities or structures of longtime durability;
   (*b*) On the same basis, indicate the current range of typical annual maintenance and operation expenses (includes repairs and replacements) for different size facilities or structures.
2. User Charges:
   (*a*) To what extent are user charges (utility charges, tolls, fees, admissions, lease payments, rentals, assessments, or specific taxes) employed to pay for all or part of the services, occupancy or use of the facilities or structures?
   (*b*) To what extent are such user charges sufficient to cover annual maintenance and operation expenses plus annual debt service payments on the indebtedness incurred to finance the capital costs of the facilities or structures? Are there situations where user charges exceed the sum of prorated operating and capital costs?

*To be followed to the extent feasible.

(c) To what extent are the costs of such facilities and structures met out of the general tax resources and general obligation borrowings of State and local government units?

C. TREND OF CAPITAL OUTLAYS

1. What has been the trend of annual capital outlays (expenditures, construction put in place, or contract awards) for these facilities or structures during the 20-year period 1946–65 in terms of number of units and dollar value (in millions of dollars)? Explain the trend.

2. Of these annual capital outlays, how much or what proportions were accounted for by (A) State governments or State agencies, (B) cities, counties, towns, special districts, public authorities, or other local public bodies, (C) private, nonprofit organizations and cooperatives, (D) proprietary or profitmaking organizations, and (E) Federal Government, if appropriate?

3. What have been the sources of financing for these capital outlays (show dollar amounts or percentage distribution)? From:

(a) Appropriations from tax resources;
(b) Gifts, bequests, donations, fund-raising drives;
(c) Federal Government grant assistance (identify programs);
(d) State grants-in-aid (in how many States);
(e) Tax exempt municipal bond market (for public bodies);
(f) Capital flotations in other security markets (for private corporations and private, nonprofit organizations);
(g) Borrowing from the Federal Government.

D. NEEDS AND PROSPECTIVE CAPITAL OUTLAYS

1. In terms of the Great Society, what are the capital requirements (in millions of dollars) for these facilities or structures during the decade 1966–75?

(a) Describe the factors taken into account in making this projection (current backlog of unmet needs, accommodating expected population growth, replacing obsolete facilities, quantitative and qualitative standards of performance).

(b) If possible, show these estimated capital needs on a per year basis.

(c) To the extent feasible, indicate the proportions of these estimated needs that you would ascribe to (1) cities with populations of 50,000 or more, (2) cities and towns with populations of 2,500 to 50,000, and (3) agricultural-rural areas, cities and towns with populations under 2,500.

(d) To the extent feasible, indicate the proportions of these estimated capital outlays that you would expect to be expended by:

1. State governments or State agencies;
2. Cities, counties, towns, special districts, public authorities, or other local public bodies;
3. Private, nonprofit organizations and cooperatives;
4. Proprietary or profitmaking organizations;
5. Federal Government, if appropriate.

2. On the basis of past experiences, projected trends and emerging developments, what are the expected sources of financing for these prospective capital outlays (in millions of dollars or percentage distribution)? From:

(a) Borrowing in the tax-exempt municipal bond market (for public bodies);
(b) Capital flotations in other security markets (for private corporations and nonprofit organizations);
(c) Borrowing from the Federal Government;
(d) Federal Government grant assistance (existing or new programs);
(e) State grants-in-aid (existing or new programs);
(f) Appropriations from tax resources;
(g) Gifts, bequests, donations, fund-raising drives.

3. If your estimated capital requirements exceed the amounts you estimate will be supplied by the above identified sources of funds, how would you bridge the gap?

Basic assumptions for State and local public facility needs and financing study

Factor	Actual 1961–65 (percent)	Assumed 1966–75 (percent)
A. Annual rates of increase:		
1. Population	1.5	1.5
2. Gross national product	5.9	5.5
3. Personal income	5.6	5.2
4. Gross private domestic fixed investment	4.9	4.5
5. Employed civilian labor force	1.6	1.9
6. Gross national product deflator	1.5	1.5
7. Wholesale price index	.8	—.5
8. Boeckh construction cost index	2.5	2.0
9. Index of industrial production	5.6	5.0
10. Money supply	3.3	3.0
11. Selected liquid assets held by public	7.2	6.5
B. Annual rates of:		
12. Civilian unemployment	5.6	4.0
13. Savings as a percent of disposable income	5.6	5.5
C. Other parameters:		
14. Capacity utilization of industry	85.6	90.0
15. Average Federal budgetary deficit:		
National income budget (billion)	—$2.4	0
Cash budget (billion)	—$4.1	0

TABLE 1.—*Comparisons of total capital outlays for public facilities in 1965 with estimated capital requirements during 1966–75, all spending units*

[Dollars in millions]

Chapter number and type of facility	Actual 1965	Estimated		
		1970	1975	1966–75
A. BASIC COMMUNITY FACILITIES				
1. Regional and river basin water supply systems [1]	$67	$100	$110	$1,060
2. Public water supply systems	1,300	2,380	2,810	24,300
3. Rural-agriculture water supply systems	(2)	[3] 260	[3] 350	2,750
4. Sanitary sewer collection systems	513	930	1,450	10,340
5. Storm sewer systems	1,140	2,450	2,850	25,000
6. Water waste treatment plants	625	[3] 940	[3] 1,240	9,830
7. Solid wastes collection and disposal facilities	170	[3] 280	[3] 360	[4] 2,890
Subtotal, water and sewer facilities	3,815	7,340	9,170	76,170
8. Electric power	5,700	7,800	9,000	75,000
9. Gas distribution systems	809	990	1,200	[5] 9,930
Subtotal, other utilities	6,509	8,790	10,200	84,930
B. TRANSPORTATION FACILITIES				
10. Highways, roads, and streets	8,170	[3] 12,060	[3] 15,830	[3] 125,650
11. Toll bridges, tunnels and turnpikes [7]	[3] 388	[3] 380	[3] 500	[6] 4,000
12. Offstreet parking facilities	(2)	[3] 760	[3] 1,000	7,900
13. Urban mass transit facilities	(2)	1,050	1,370	10,900
14. Airport facilities [10]	313	580	630	5,970
15. Marine port facilities	[11] 160	130	150	1,280
Subtotal, transportation	8,643	14,580	18,980	151,00
C. EDUCATIONAL FACILITIES				
16. Public elementary and secondary schools	[12] 3,650	[3] 4,010	[3] 5,270	41,800
17. Nonpublic elementary and secondary schools	[13] 260	[3] 570	[3] 750	[14] 5,960
18. Area vocational school facilities [15]	(2)	[3] 600	[3] 790	[15] 6,300
19. Academic facilities for higher education	[12] 1,525	[3] 2,250	[3] 2,960	23,500
20. College housing and related service facilities	[16] 483	930	1,220	10,820
21. Educational television	[17] 8	30	40	350
Subtotal, educational facilities	5,926	7,790	10,240	82,380
D. HEALTH FACILITIES				
22. General hospital facilities	[18] 1,926	[3] 1,510	[3] 1,980	15,710
23. Clinics and other outpatient facilities		[3] 310	[3] 410	3,240
24. Long-term care facilities		[3] 600	[3] 780	6,230
25. Community mental health centers		280	450	2,930
26. Facilities for the mentally retarded [19]	(2)	330	400	3,340
27. Health research facilities [20]	(2)	[3] 460	[3] 600	4,800
28. Medical and other health schools	(2)	[3] 690	[3] 910	[21] 7,210
Subtotal, health facilities	(2)	4,180	5,530	43,460
E. RECREATION AND CULTURAL FACILITIES				
29. State and Federal outdoor recreation facilities	743	1,190	1,420	11,800
30. Urban local outdoor recreation facilities	[22] 360	[3] 1,700	[3] 2,200	17,600
31. Rural outdoor recreational facilities	(2)	[3] 460	[3] 600	[23] 4,800
32. Neighborhood centers for recreation, etc	43	[3] 80	[3] 100	780
33. Arenas, auditoriums, exhibition halls	667	[3] 770	[3] 1,010	8,000
34. Theaters and community art centers [24]	(2)	700	910	7,230
35. Museums	25	[3] 90	[3] 120	950
36. Public libraries	103	190	240	1,910
Subtotal, recreation and cultural	1,941	5,180	6,600	53,070
F. OTHER PUBLIC BUILDINGS				
37. Residential group care facilities for children [25]	(2)	[3] 80	[3] 110	840
38. Armories	1	15	15	145
39. Jails and prisons	(2)	[3] 90	[3] 120	920
40. Fire stations	[26] 191	[3] 130	[3] 170	1,370
41. Public office and court buildings	[27] 218	320	400	3,250
42. Publicly owned industrial plants	214			
Subtotal, other public buildings	410	635	815	6,525

[1] Combined figures for water supply capital outlays by Corps of Engineers, Bureau of Reclamation, and Soil Conservation Service.
[2] Not available.
[3] Annual figures derived from 10-year estimated capital requirements.
[4] $2,420,000,000 in constant prices, adjusted to current prices at assumed price increase at rate of 2 percent per year.
[5] Annual rate of increase interpolated during 1971–73 at 3.8 percent per year.
[6] Capital requirements, rather than capital outlays, per chapter table G.
[7] Shown separately, although included in "Highways, roads and streets"; however, excluded from subtotal for "Transportation."
[8] Annual average for years 1946–65.
[9] $2,282,000,000 reported in survey; expanded to $4,000,000,000 on the basis of other materials in the chapter.
[10] All figures estimated at 120 percent of figures for publicly owned facilities.
[11] Average during 1960–62.
[12] Average of estimates for fiscal years 1965 and 1966.
[13] Average 1960–66.
[14] 149,000 classrooms at $40,000 per classroom.
[15] Shown separately, although included in "Public elementary and secondary schools and academic facilities for higher education"; however, excluded from subtotal for "Education."
[16] For 1963–64.
[17] 15 stations at $540,000 each.
[18] Includes general and mental hospitals, clinics, nursing homes, related facilities.
[19] Combination of community facilities and university affiliated facilities for the mentally retarded.
[20] Some of these capital requirements are probably included within the figures shown for "Academic facilities for higher education and hospitals"; but degree of overlap is not ascertainable.
[21] Broken down as follows (in millions of dollars): (a) medical schools, $4,259; (b) dental schools, $590; (c) schools of nursing, $1,641; (d) optometry schools, $58; (e) osteopathic schools, $191; (f) pharmacy schools, $307; (g) podiatry schools, $48; and (h) public health schools, $112. To some extent, these capital requirements overlap with the capital requirements for higher education academic facilities, but the proportion is unknown.
[22] For fiscal year 1964–65.
[23] Average of high-level estimate of $5,300,000,000 and low-level estimate of $4,200,000,000.
[24] Based on discussion with informed sources.
[25] Data on detention homes and institutions for delinquent children in the chapter. Data on other child welfare institutions obtained from Children's Bureau, as follows: Maternity homes, $17,000,000, homes for neglected and disburbed children, $264,000,000.
[26] For 1966.
[27] For 1964. May include in part "police stations."

TABLE 2.—*Comparison of public facility capital outlays of State and local public agencies in 1965 with estimated capital requirements during 1966–75*

[Dollars in millions]

Chapter number and type of facility	Actual 1965 [1]	Estimated		
		1970	1975	1966–75
A. BASIC COMMUNITY FACILITIES				
1. Regional and river basin water supply systems [2]	$2	$20	$30	$170
2. Public water supply systems [3]	1,040	1,900	2,250	19,440
3. Rural-agriculture water supply systems [4]	([5])	110	140	1,100
4. Sanitary sewer collection systems	385	[4] 700	[4] 1,090	[4] 7,750
5. Storm sewer systems	417	[6] 1,570	[6] 1,820	[6] 16,000
6. Water waste treatment plants	625	940	1,240	9,830
7. Solid wastes collection and disposal facilities [7]	130	210	270	2,170
Subtotal, water and sewer facilities	2,599	5,450	6,840	56,460
8. Electric power [8]	[1] 766	1,200	1,350	12,250
9. Gas distribution systems [9]	44	60	70	550
Subtotal, other utilities	810	1,260	1,420	12,800
B. TRANSPORTATION FACILITIES				
10. Highways, roads, and streets	8,170	12,060	15,830	125,650
11. Toll bridges, tunnels, and turnpikes [10]	388	380	500	4,000
12. Offstreet parking facilities	[11] 102	230	300	2,400
13. Urban mass transit facilities	[1] 242	730	960	[12] 7,600
14. Airport facilities	261	480	530	4,980
15. Marine port facilities	[1] 159	[13] 40	[13] 50	430
Subtotal, transportation	8,934	13,540	17,670	141,060
C. EDUCATION FACILITIES				
16. Public elementary and secondary schools	3,650	4,010	5,270	41,800
17. Nonpublic elementary and secondary schools				
18. Area vocational school facilities [14]	([5])	600	790	6,300
19. Academic facilities for higher education	915	1,330	1,750	13,870
20. College housing and related service facilities	[15] 301	520	720	6,080
21. Educational television [16]	5	20	30	230
Subtotal, education facilities	4,871	5,880	7,770	61,980

See footnotes at end of table, p. 25.

TABLE 2.—*Comparison of public facility capital outlays of State and local public agencies in 1965 with estimated capital requirements during 1966–75*—Con.

Chapter number and type of facility	Actual 1965	Estimated		
		1970	1975	1966–75
D. HEALTH FACILITIES				
22. Hospitals	[1] $494	[17] $380	[17] $480	[17] $3,930
23. Clinics and other outpatient facilities [18]		[18] 80	[18] 100	[18] 810
24. Long-term care facilities [19]		[19] 100	[19] 130	[19] 1,060
25. Community mental health centers [20]		140	220	1,470
26. Facilities for the mentally retarded	34	[21] 110	[21] 130	[21] 1,070
27. Health research facilities [22]	([5])	180	240	1,920
28. Medical and other health schools [23]	([5])	280	360	2,880
Subtotal, health facilities	528	1,270	1,660	13,140
E. RECREATIONAL AND CULTURAL FACILITIES				
29. State and Federal outdoor recreation facilities	313	430	530	4,400
30. Urban local outdoor recreation facilities	360	1,700	2,200	17,600
31. Rural outdoor recreational facilities				
32. Neighborhood centers for recreation, etc.				
33. Arenas, auditoriums, exhibition halls [24]	600	690	910	7,200
34. Theaters and community art centers [25]	([5])	350	460	3,620
35. Museums	14	[26] 30	[26] 40	[26] 270
36. Public libraries	103	190	240	1,910
Subtotal, recreation and cultural	1,390	3,390	4,380	35,000
F. OTHER PUBLIC BUILDINGS				
37. Residential group care facilities for children [27]	([5])	[28] 50	[28] 70	560
38. Armories	1	15	15	150
39. Jails and prisons	([5])	90	120	920
40. Fire stations	191	130	170	1,370
41. Public office and court buildings	218	320	400	3,250
42. Publicly owned industrial plants	214	([5])	([5])	([5])
Subtotal, other public buildings	410	605	775	6,250

[1] Where data supplied in chapter seemed unrealistic, capital outlay figures for 1964–65, as reported by the Bureau of the Census, have been used.
[2] For capital outlays financed by Soil Conservation Service; in the case of the Corps of Engineers and Bureau of Reclamation projects, the capital outlays are made by the Federal Government.
[3] 80 percent of estimated capital requirements, per chapter.
[4] Assumed to be 40 percent of estimated total capital requirements, per 1959 Census of Agriculture.
[5] Not available.
[6] 64 percent of estimated total capital requirements, per chapter.
[7] 75 percent of estimated total capital requirements, per 1965 experience.
[8] Municipal plus one-half of "State, cooperative and other."
[9] 5.5 percent of estimated total capital requirements (or 1965 outlays).
[10] Shown separately, although included in "Highways, roads and streets;" however, excluded from "Subtotal for transportation."
[11] Capital outlay in 1964.
[12] Assumed to be 70 percent of estimated total capital requirements, based on informed judgment.
[13] Calculated at 33.6 percent of estimated total capital requirements, per chapter.
[14] Shown separately, although included in "Public elementary and secondary schools" and "Academic facilities for higher education"; however, excluded from "Subtotal for education."
[15] Capital outlay in 1964.
[16] Calculated at 66 percent of estimated total capital requirements, per chapter.
[17] Assumed to be 25 percent of estimated total capital requirements, per 1965 distribution of construction put in place, net of direct Federal construction.
[18] Assumed to be 25 percent of estimated total capital requirements, based on 1964 distribution of ownership of organized outpatient departments, emergency departments and rehabilitation facilities (last, 1963 data).
[19] Assumed to be 17 percent of estimated total capital requirements, based on distribution of ownership of nursing home beds in 1964.
[20] Calculated at 50 percent of estimated total capital requirements, per chapter.
[21] Assumed to be 30 percent of estimated total capital requirements for community centers, based on distribution of ownership of existing mental retardation facilities according to State plans of 46 States; assumed to be 50 percent of total requirements for university affiliated facilities.
[22] Calculated at 40 percent of estimated total capital requirements, per chapter.
[23] Assumed to be 40 percent of estimated total capital requirements, "best judgment."
[24] Calculated at 90 percent of estimated total capital requirements, per chapter.
[25] Assumed to be 50 percent of estimated total capital requirements, "best judgment."
[26] Calculated at 28 percent of estimated total capital requirements, per chapter.
[27] In addition to data in chapter, Children's Bureau estimates—homes for neglected and disturbed children—$40,000,000.
[28] Calculated at 9.6 and 12.6 percent of $520,000,000.

TABLE 3.—*Comparison of public facility capital outlays of private, nonprofit organizations in 1965 with estimated capital requirements during 1966–75*

[Dollars in millions]

Chapter number and type of facility	Actual 1965	Estimated		
		1970	1975	1966–75
3. Rural-agricultural water supply systems [1]	(2)	$130	$170	$1,370
8. Electric power [3]	$300	300	350	3,150
17. Nonpublic elementary and secondary schools	260	570	750	5,960
19. Academic facilities for higher education [4]	625	930	1,210	9,630
20. College housing and related service facilities	[5] 182	400	500	4,540
21. Educational television [6]	3	10	20	120
22. Hospitals [7]	[8] 410	1,070	1,360	11,190
23. Clinics and other outpatient facilities [9]		190	250	1,940
24. Long-term care facilities [10]		80	110	870
25. Community mental health centers [11]		140	220	1,470
26. Facilities for the mentally retarded [12]	(2)	170	200	1,670
27. Health research facilities [13]	(2)	230	300	2,400
28. Medical and other health schools [14]	(2)	420	550	4,330
31. Rural outdoor recreational facilities [15]	(2)	90	120	960
32. Neighborhood centers for recreation	43	80	100	780
33. Arenas, auditoriums, exhibition halls [16]	(2)	10	10	80
34. Theaters and community art centers [17]	(2)	210	280	2,160
35. Museums	10	[15] 60	[18] 80	[15] 620
37. Residential group care facilities for children	(2)	30	40	[19] 280
Subtotal	(2)	5,120	6,620	53,520

[1] 50 percent of estimated capital requirements, per 1959 Census of Agriculture.
[2] Not available.
[3] One-half of "States, cooperatives and other."
[4] Calculated at 41 percent of estimated total capital requirements.
[5] In 1963–64.
[6] Calculated at 34 percent of estimated total capital requirements.
[7] Assumed to be 95 percent of estimated capital requirements for privately owned hospitals, per ownership of hospital beds in 1964.
[8] Includes general and mental hospitals, clinics, nursing homes, related facilities; construction put in place data.
[9] Assumed to be 60 percent of estimated total capital requirements, based on 1964 distribution of ownership of organized outpatient departments, emergency departments and rehabilitation facilities (last, 1963 data).
[10] Assumed to be 14 percent of estimated total capital requirements, based on distribution of nursing home beds in 1964.
[11] Calculated at 50 percent of estimated total capital requirements, per chapter.
[12] Assumed to be 50 percent of estimated total capital requirements, based on distribution of ownership of existing mental retardation facilities.
[13] Calculated at 50 percent of estimated total capital requirements, per chapter.
[14] Assumed to be 60 percent of estimated total capital requirements, "best judgment."
[15] Calculated at 20 percent of estimated total capital requirements, per ownership distribution in chapter.
[16] Calculated at 1 percent of estimated total capital requirements, per chapter.
[17] Assumed to be 60 percent of estimated capital requirements for privately owned facilities (theaters and community art centers).
[18] Calculated at 65 percent of estimated capital requirements for museums, per chapter.
[19] Includes $17 million for maternity homes and $224 million for homes for neglected and disturbed children.

TABLE 4.—*Comparison of public facility capital outlays of private investor-owned companies in 1965 with estimated capital requirements during 1966–75*

[Dollars in millions]

Chapter number and type of facility	Actual 1965	Estimated		
		1970	1975	1966–75
2. Public water supply systems [1]	$260	$480	$560	$4,860
3. Rural-agricultural water supply systems [2]	([3])	6	10	80
4. Sanitary sewer collection systems [4]	128	230	360	2,580
5. Storm sewer systems [5]	720	880	1,030	9,000
7. Solid wastes collection and disposal facilities [6]	40	70	90	720
8. Electric power	4,100	5,500	6,300	[7] 56,000
9. Gas distribution systems [8]	770	940	1,130	9,380
12. Offstreet parking facilities	([3])	[9] 530	[9] 690	5,500
13. Urban mass transit facilities [10]	([3])	320	410	3,300
14. Airport facilities [11]	50	100	110	990
15. Marine port facilities [12]	100	80	90	820
22. Hospitals [13]	([3])	60	70	590
23. Clinics andjother outpatient facilities [14]	([3])	30	40	320
24. Long-term care facilities [15]	([3])	410	540	4,300
26. Facilities for the mentally retarded [16]	([3])	60	70	600
31. Rural outdoor recreational facilities [17]	([3])	370	480	3,840
33. Arenas, auditoriums, exhibition halls [18]	50	70	90	720
34. Theaters and community art centers [19]	([3])	140	180	1,450
35. Museums [20]	([3])	5	6	50
Total	([3])	10,281	12,256	105,100

[1] Calculated at 20 percent of estimated total capital requirements, per chapter.
[2] Assumed to be 3 percent of estimated total capital requirements, per 1959 Census of Agriculture.
[3] Not available.
[4] Assumed to be 25 percent of estimated total capital requirements, per 1965 experience.
[5] Calculated at 36 percent of estimated total capital requirements, per chapter.
[6] Calculated at 25 percent of estimated total capital requirements, per chapter.
[7] Estimated on basis of data furnished for 1966, 1970, and 1975.
[8] Calculated at 94.5 percent of estimated total capital requirements, per chapter.
[9] Calculated at 9.6 and 12.6 percent, respectively, of estimated requirements for 1966–75.
[10] Assumed to be 30 percent of estimated total capital requirements, based on informed judgment.
[11] Calculated at 20 percent of estimated capital requirements for State and local public agencies, per chapter.
[12] Calculated at 64 percent of estimated total capital requirements, per chapter.
[13] Assumed to be 5 percent of estimated capital requirements for private institutions, per 1964 distribution of hospital beds in 1964.
[14] Assumed to be 10 percent of estimated total capital requirements, based on 1964 distribution of ownership of organized outpatient departments, emergency departments and rehabilitation facilities (last, 1963 data).
[15] Assumed to be 69 percent of estimated total capital requirements, based on distribution of ownership of nursing home beds in 1964.
[16] Assumed to be 20 percent of estimated total capital requirements for community centers, based on ownership distribution of existing facilities.
[17] Assumed to be 80 percent of estimated total capital requirements, per ownership distribution of existing facilities.
[18] Calculated at 9 percent of estimated total capital requirements, per chapter.
[19] Assumed to be 40 percent of estimated capital requirements for privately owned facilities.
[20] Calculated at 5 percent of estimated total capital requirements, per chapter.

TABLE 5.—*Existing capital plant of State and local public facilities as of 1965*

Chapter number and type of facility	Unit of measure (number of)	Number of units				Total estimated value (billions)
		Total (all owners)	State and local public agencies	Nonprofit organizations	Private investor owned	
A. BASIC COMMUNITY FACILITIES						
1. Regional and river basin water supply systems	Projects	129				$0.3
2. Public water supply systems [1]	Systems	19,236	13,468		5,501	47.0
3. Rural-agricultural water supply systems [2]	Acreage	17,701	7,038	8,800	573	(11)
4. Sanitary sewer collection systems [3]	Systems	11,655	11,655			8.5
5. Storm sewer systems	Square miles [4]	14,000	14,000			22.0
6. Water waste treatment plants [1]	Plants	9,378	9,378			3.6
7. Solid wastes collection and disposal facilities [5]	Incinerators	[6] 314	311		3	[6] .8
8. Electric power	Billions kilowatt-hours	1,055	75	25	810	[7] 82.0
9. Gas distribution systems [8]	Systems	1,501	773		728	[9] 15.8
B. TRANSPORTATION FACILITIES						
10. Highways, roads, and streets	Millions of miles	3,644	3,644			[9] 63.0
11. Toll bridges, tunnels, and turnpikes	Units	[10] 261	261			9.2
12. Offstreet parking facilities	Lots or structures	(11)	[12] 3,861		[13] 11,269	(11)
13. Urban mass transit facilities	Transit companies	1,152	77		1,075	[9] 4.1
14. Airport facilities	Airports	9,547	3,556		5,988	6.0
15. Marine port facilities	Port facilities	2,121	713	6	1,359	3.4
C. EDUCATION FACILITIES						
16. Public elementary and secondary schools	Classrooms (thousands)	1,550	1,550			58.0
17. Nonpublic elementary and secondary schools	do	227		227		5.7
18. Area vocational school facilities	Institutions	613	613			.3
19. Academic facilities for higher education	Institutions [14]	2,077	744	1,333		11.1
20. College housing and related service facilities	Housing spaces [15]	1,766	977	789		[16] 10.5
21. Educational television	Stations	114	75	39		.1
D. HEALTH FACILITIES						
22. Hospitals (general and T.B.)	Beds (thousands) [16]	936	259	501	62	18.4
23. Clinics and other outpatient facilities	Centers	[17] 12,669	(11 18)	(11 18)	(11 18)	(11)
24. Long-term care facilities	Beds (thousands)	[19] 625	(11 20)	(11 20)	(11 20)	1.5
25. Community mental health centers	do	[21] 550	513	37		(11)
26. Facilities for the mentally retarded	Facilities	2,571	641	1,202	460	(11)
27. Health research facilities	do	760	352	408		.5
28. Medical and other health schools	Institutions	[22] 1,361	468	893		(11)

E. RECREATION AND CULTURAL FACILITIES							
29. State and Federal outdoor recreation facilities	Areas	[23] 20,822	19,076			(11)	
30. Urban local outdoor recreation facilities	Park acres (thousands)	[24] 1,730	1,730				23.6
31. Rural outdoor recreational facilities	Enterprises (thousands)	[25] 132		[26] 25	107	(11)	
32. Neighborhood centers for recreation, etc	Structures	[27] 8,564		8,564		(11)	
33. Arenas, auditoriums, exhibition halls	Buildings	1,200	1,000		200		2.5
34. Theaters and community art centers	Theaters	[28] 440	(11)	(11)	(11)	(11)	
35. Museums	Institutions	4,595	1,424	2,619	230		.5
36. Public libraries	Agencies	[29] 7,257	7,257				1.3
F. OTHER PUBLIC BUILDINGS							
37. Residential group care facilities for children	Institutions	[30] 2,141	627	1,500	14		2.3
38. Armories	Facilities	2,786	2,786			(11)	
39. Jails and prisons	Institutions	[31] 3,369	3,369			(11)	
40. Fire stations	Stations	25,600	24,450	1,150			3.0
41. Public office and court buildings	Structures	24,860	24,860				7.0
42. Publicly owned industrial plants [32]	Plants	526	526				.8

[1] As of 1963.
[2] As of 1959.
[3] As of 1962, municipally owned only.
[4] Square miles of improvement.
[5] In 1965 there were an estimated 280 to 345 public incinerators, 1,000 to 1,250 sanitary land-fills and 17,500 to 21,300 open dumps.
[6] Estimated value of incinerators, land-fills, open dumps, collection vehicles, storage, and maintenance facilities.
[7] According to Federal Power Commission.
[8] Of the 603,410 miles of gas distribution and integrated company pipeline, 564,580 miles, or 94 percent, are operated by investor owned utilities and 38,830 miles by municipal owned utilities.
[9] As of 1964.
[10] Consisting of 58 turnpikes, 193 toll bridges and 10 toll tunnels.
[11] Not available.
[12] City owned parking lots in 1960.
[13] Privately owned parking lots and structures in 1963.
[14] As of 1963; in 1957 the assignable areas of higher education institutions for instruction, research, and general activities totaled 276.8 million square feet, of which 163.8 million were for public institutions and 113 million for were private institutions.
[15] Consisting of 1,689,000 dormitory spaces (917,000 for public institutions and 772,000 for private institutions) and 77,000 married student apartments (60,000 for public institutions and 17,000 for private institutions).
[16] General and tuberculosis hospital beds; located in 7,586 hospitals of which 437 are Federal, 2,033 are State or local government, 3,569 are private, nonprofit, and 1,547 are proprietary.
[17] Data as of 1964–65; includes 2,950 hospitals with organized outpatient departments, 2,244 public health centers, 4,513 diagnostic or treatment centers, 1,339 rehabilitation centers and 1,623 (1959 data) medical groups.
[18] Of 2,950 hospitals with organized outpatient departments, 812 are State or local government, 1,425 nonprofit, 304 proprietary and 409 Federal Government.
[19] Includes about 550,000 beds in skilled nursing homes and 75,000 beds in chronic disease hospitals or units.
[20] A 1964 survey of nursing home beds found 69 percent owned by proprietary groups, 14 percent by nonprofit organizations and 17 percent by public bodies.
[21] Beds in existing mental hospitlas (500,000 in State hospitals, 25,000 in private, nonprofit hospitals and remaining 25,000 in general hospitals distributed equally between public and private hospitals).
[22] Consists of (number of schools): 88 medical, 49 dental, 1,118 nursing, 10 optometry, 5 osteopathic, 75 pharmacy, 5 podiatry, and 13 public health.
[23] 20,822 areas with 312,300,000 acres, of which 19,076 are State areas with 35,400,000 acres, and 1,746 Federal areas with 277,000,000 acres. In Federal or State recreational areas there are 307,810 picnic tables, 18,164 acres of swimming beach, 17,985 acres of boat access, 31,988 acres of ski slopes, 204,310 tent and trailer camping spaces and 34,899 acres of golf courses.
[24] Selected special facilities include 20,932 playgrounds, 4,978 recreation buildings, 4,013 skating rinks, 3,181 swimming pools and 16,616 tennis courts.
[25] Includes swimming, hunting, land based, water based, golf, fishing, playfield, picnicking, cabins, cottages, and related facilities.
[26] 19 percent of total; balance investor owned.
[27] Excluding camps.
[28] Includes 35 Broadway, 35 off-Broadway (but in New York City), 155 used for national tours, 35 resident professional, 150 summer, and 30 musical; excludes community theaters (that may be as many as 40,000), college and university theaters (about 1,500) and community art centers.
[29] As of 1962.
[30] Consists of 281 detention homes, 280 institutions for juvenile delinquents, and 1,580 child welfare institutions.
[31] Consists of 3,050 jails and 279 adult felony institutions.
[32] Measured by number and dollar amount of bond issues during 1956–65.

TABLE 6.—*User charges for State and local public facilities*

Chapter number and type of facility	User charges		
	None	Moderate [1]	Substantial [2]
A. BASIC COMMUNITY FACILITIES			
1. Regional and river basin water supply systems			X
2. Public water supply systems			X
3. Rural-agricultural water supply systems			X
4. Sanitary sewer collection systems			X
5. Storm sewer systems		X	
6. Water waste treatment plants			X
7. Solid wastes collection and disposal facilities		X	
8. Electric power			X
9. Gas distribution systems			X
B. TRANSPORTATION FACILITIES			
10. Highways, roads, and streets			X
11. Toll bridges, tunnels, and turnpikes			X
12. Offstreet parking facilities			X
13. Urban mass transit facilities			X
14. Airport facilities			X
15. Marine port facilities			X
C. EDUCATION FACILITIES			
16. Public elementary and secondary schools	X		
17. Nonpublic elementary and secondary schools			X
18. Area vocational school facilities	X		
19. Academic facilities for higher education		X	
20. College housing and related service facilities			X
21. Educational television		X	
D. HEALTH FACILITIES			
22. Hospitals			X
23. Clinics and other outpatient facilities			X
24. Long-term care facilities			X
25. Community mental health centers		X	
26. Facilities for the mentally retarded			X
27. Health research facilities	X		
28. Medical and other health schools		X	
E. RECREATION AND CULTURAL FACILITIES			
29. State and Federal outdoor recreation facilities		X	
30. Urban local outdoor recreation facilities		X	
31. Rural outdoor recreational facilities		X	
32. Neighborhood centers for recreation, etc		X	
33. Arenas, auditoriums, exhibition halls			X
34. Theaters and community art centers		X	
35. Museums		X	
36. Public libraries	X		
F. OTHER PUBLIC BUILDINGS			
37. Residential group care facilities for children	X		
38. Armories	X		
39. Jails and prisons	X		
40. Fire stations	X		
41. Public office and court buildings	X		
42. Publicly owned industrial plants			X
Total	9	12	21

[1] User charges are infrequently employed or, when employed, they cover only a small part (under 50 percent) of capital and operating costs.

[2] User charges are employed in all or most instances, or where they are employed, they cover all or a substantial part (over 50 percent) of capital and operating costs.

TABLE 7.—*Estimated public and private capital outlays for selected public facilities, 1962, 1970, and 1975*

[Dollars in billions]

Category	Actual 1962	Projected expenditures	
		1970	1975
1. Basic community facilities:			
(a) Sewer and water systems	$1.7	$2.7	$3.1
(b) Public utilities	4.8	7.0	7.7
Subtotal	6.5	9.7	10.8
2. Transportation capital expenditures:			
(a) Highways (excluding urban streets)	8.8	13.9	18.8
(b) Urban streets and highways	2.9	5.8	7.0
(c) Railroad and transit construction	.1	1.1	1.1
(d) Airports	.3	.6	.8
(e) Inland waterways [1]	.3	.4	.5
Subtotal	12.4	21.8	28.2
3. Educational facilities capital outlays:			
(a) Elementary and secondary schools	3.4	4.4	4.0
(b) Colleges and universities	1.2	2.6	2.1
Subtotal	4.6	7.0	6.1
4. Medical facilities construction:			
(a) Private expenditures	.8	1.8	2.8
(b) Public expenditures	.6	4.0	4.8
Subtotal	1.4	5.8	7.6
5. Recreational and cultural:			
(a) Recreational facilities [2]	1.6	2.8	3.3
(b) Public libraries	.3	.8	1.0
Subtotal	1.9	3.6	4.3
6. Other public buildings [2]	2.2	3.6	3.8
Total, all categories	29.0	51.5	60.8

[1] Presumably includes port facilities.
[2] In urban areas only.

Source: Leonard A. Lecht, *Goals, Priorities and Dollars* (New York: The Free Press, 1966), pp. 103, 139, 161, and 185.

PART I. GENERAL FORCES

CHAPTER 1

State and Local Government Capital Expenditures in Relation to National Economic Activity With Projections for 1975*

INTRODUCTION

In this chapter it is proposed to examine the relation of capital goods purchases by State and local governments to the course of national economic activity and other relevant factors. Projections for 1975 of State and local government purchases of structures and equipment are also prepared, making use of alternative assumptions with respect to future rates of national economic growth, rates of unemployment, prices, and other factors provided by the staff of the Joint Economic Committee. No attempt is made to analyze or quantify existing or future Federal programs designed to provide aid to State and local governments in order to meet the needs of their changing economies and of the growing population. Rather, reliance is placed on extrapolating the fairly stable relations which have persisted in the postwar period among the national economic and other variables and those of State and local governments. Therefore, a basic assumption is that these relationships will continue to hold in the future to substantially the same extent as they have in the past. Should any marked departures develop from the historical patterns of these relations, a reexamination of the projections herein set forth would be required.

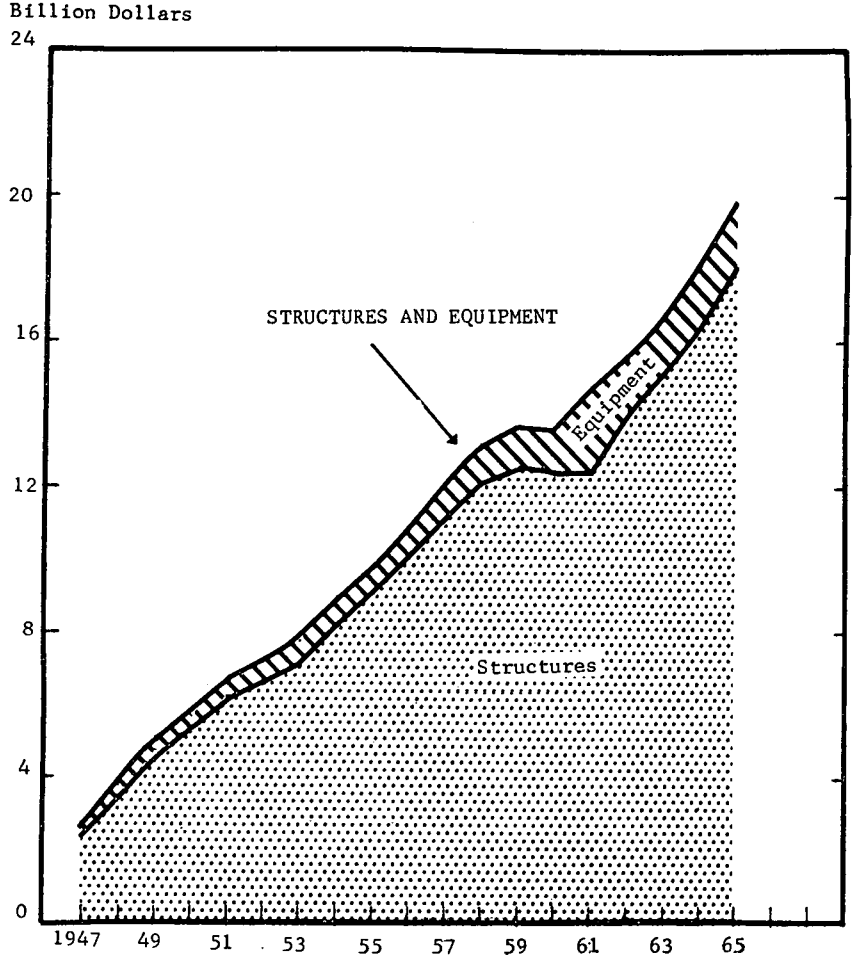
Outlays of State and local governments for structures and equipment;[1] that is, their capital expenditures, have risen sharply over the postwar period in both current and constant dollars. In 1947 such purchases amounted to $2.7 billion, and in 1965 they were about $20 billion—nearly 7½ times as much. (See chart 1.) This expansion compares with a tripling in nonresidential structures and equipment expenditures by private business. Also, in contrast to the private sector where outlays for nonresidential structures in 1965 comprised about one-third of total expenditures for nonresidential structures and equipment, State and local government spending for structures constituted nearly 90 percent of their total capital outlays.[2] This emphasis of State and local governments on structures reflects their efforts to meet the pressing needs of the population for nonresidential buildings, such as schools and hospitals, for highways, sewer and water systems, and for other public facilities.

* By Louis J. Paradiso and Mabel A. Smith, Office of Business Economics, U.S. Department of Commerce, with minor editing by committee staff. Mrs. Irene M. Mattia of the OBE staff assisted in the computations, in developing regressions, and in making charts.

[1] These include State and local new construction plus purchases of existing structures less construction force account compensation, and net purchases of equipment (purchases less sales). The definitions and measurement conform with those used in the national income and product accounts.

[2] State and local government structures include residential buildings which, in 1965, amounted to $500,000,000. Nonresidential structures in 1965 would also comprise 90 percent of capital outlays excluding residential building.

CHART 1.—STATE AND LOCAL GOVERNMENT EXPENDITURES FOR STRUCTURES AND EQUIPMENT



U.S. Department of Commerce, Office of Business Economics

In the early postwar years, 1947 to 1949, State and local government capital outlays nearly doubled, reflecting a surge in demand arising from the deficits in capital acquisitions incurred during World War II. After 1949, however, while the capital expansion programs still continued strong, the increases were considerably more moderate than in the earlier period. Also, it may be noted that capital outlays rose at a faster pace than did total expenditures of State and local governments up to 1956. From 1957 to 1960 the relative increase was less, and since then the rise has about matched the growth of total expenditures.

The following table shows for selected years a breakdown of total State and local government expenditures on a national income and product accounts basis and the relative proportions:

	Expenditures (billions of dollars)				Percent distribution			
	Structures and equipment	Other purchases of goods and services	Other expenditures	Total expenditures	Structures and equipment	Other purchases of goods and services	Other expenditures	Total expenditures
1950	5.6	13.8	2.8	22.3	25	62	13	100
1955	9.8	20.3	2.6	32.7	30	62	8	100
1960	13.6	32.5	3.5	49.6	27	66	7	100
1965	19.9	48.3	4.4	72.6	27	67	6	100

Source: U.S. Department of Commerce.

Purchases of goods and services other than structures and equipment consist mostly of compensation of employees and spending for nondurable goods. The "other" expenditures consist of transfer payments plus net interest less the current surplus of government enterprises; the ratio of these to total expenditures has been declining since 1950, due to the large expansion in the operations of government enterprises resulting in a sharp increase in their current surplus.

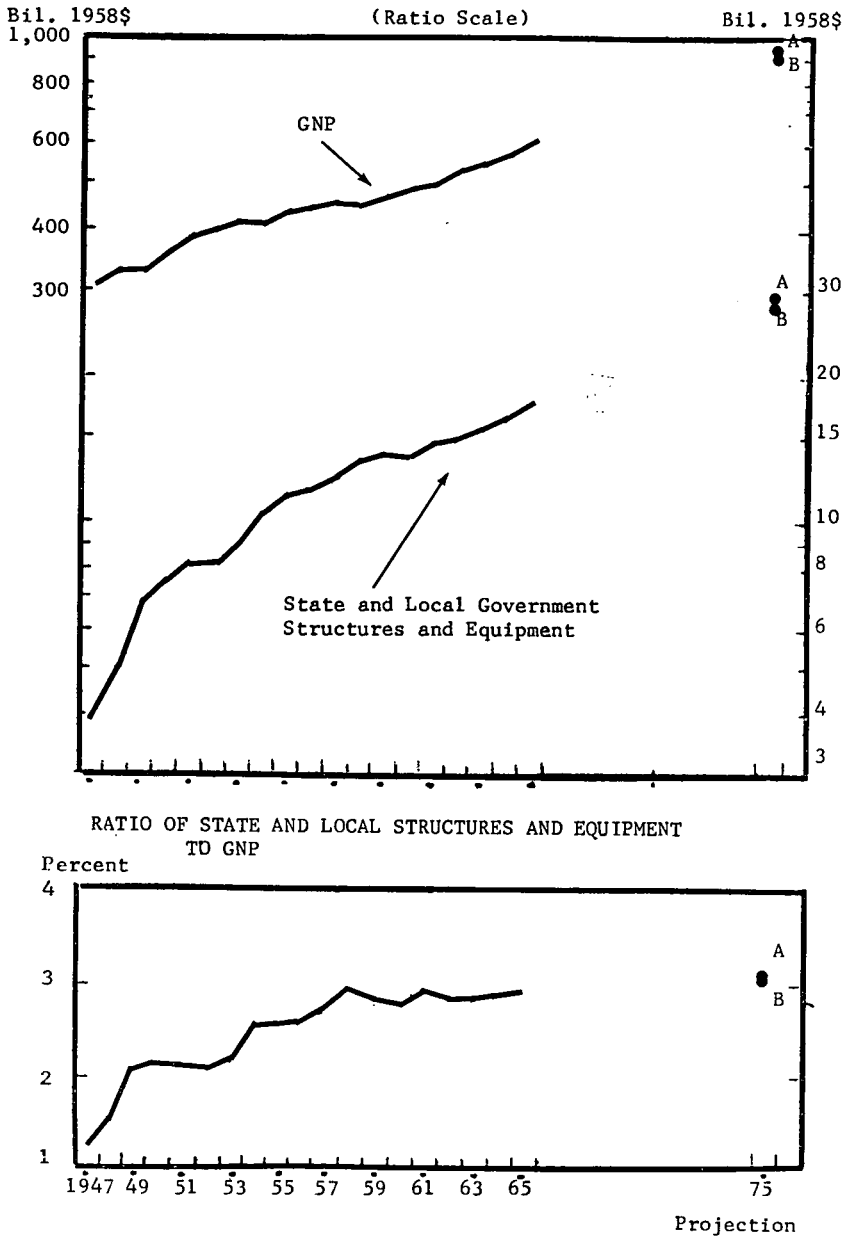
State and local government expenditures for structures and equipment have differed substantially from GNP, both with respect to trend and to general contour, whether compared in current or constant dollars. Since differential price movements affect dollar values, a comparison in constant dollars may be more useful. Chart 2 shows the movements of the two series, State and local government capital purchases and real GNP over the postwar period.

Appropriate price indexes have been compiled for a number of detail groups of structures and equipment purchases, and overall implicit prices derived for the two major aggregates of these outlays. For each of these major groups—structures and equipment—the the implicit price has moved about in line with that for the respective group in the private sector. In the more recent years, however, the implicit price for structures purchased by State and local governments has increased at a somewhat faster pace than that for the corresponding group in the private sector, mainly due to a different composition and relative importance of the subgroups within the major category.

As previously indicated, real capital purchases by State and local governments moved sharply upward in the early postwar years. However, after 1950, the rate of increase moderated considerably, averaging 5.9 percent per year through 1965—still considerably larger than the average growth rate of real GNP of 3.2 percent per year over the same period. The growth rates show further disparities when the period is split into parts. From 1950 to 1957 real purchases of structures and equipment rose at a rate of 7.2 percent per year, but after 1957 the rate was reduced to 4.7 percent per year. In contrast, real GNP increased at 3.3 percent per year in the 1950–57 period but has expanded at an average rate of 4 percent per year since 1957. In both periods the growth rates of State and local government capital purchases exceeded those of real GNP.

CHART 2.—STATE AND LOCAL GOVERNMENT PURCHASES OF STRUCTURES AND EQUIPMENT COMPARED WITH GNP

[In constant prices]



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Another important dissimilarity between the two series is their movement in recession periods. In contrast to the downturn in real GNP in each of the four postwar recessions—the decline in 1961 is not evident in the annual data—State and local government public works continued to rise by as much as, or more than, in the immediately preceding years. It appears that in recessionary periods, total revenues of State and local governments move contracyclically, and their public works outlays also expand. Continuous vigorous State and local government capital programs, financed by increasing tax revenues and borrowing and by rising Federal grants-in-aid, have thus helped in cushioning recessions and have contributed to the growth of the economy. In contrast, investment in structures and equipment by private business has fluctuated widely and has been an important factor in shaping the patterns of the postwar business cycles.

It may be noted that business expenditures for plant and equipment is a lagging indicator, turning down at about the time or shortly after general business activity begins to decline and rising about 6 months after the turnaround in general business. State and local government expenditures for plant and equipment, on the other hand, cannot be considered an indicator in relation to the general economy since it has tended to show a continual growth throughout the postwar period.

The lower panel of chart 2 shows the ratio of real State and local government expenditures for structures and equipment to real GNP. The ratio rose sharply, from 1¼ percent of real GNP in 1947 to nearly 3 percent in 1958. Since then the proportion has fluctuated within a relatively narrow range—between 2.8 and a little over 2.9 percent.

Nonresidential buildings, which include the important categories of public schools and hospitals, and highway construction account for roughly two-thirds of total capital outlays. Most of the major categories of public works grew rapidly in the early fifties, but since then the advances have been more moderate; even so, the expansions have continued at relatively high rates—certainly larger than the rate of growth of the economy as a whole.

The following table shows State and local government expenditures for the major categories of structures and equipment for selected years:

	Structures and equipment [1]	New construction [2] (billions of current dollars)					Purchases of existing structures	Net purchases of equipment
		Total	Nonresidential buildings	Highways	Sewer and water	All other construction [3]		
1950	5.65	5.24	1.89	2.09	0.66	0.61	0.14	0.39
1955	9.82	8.95	3.39	3.78	1.08	.68	.33	.76
1960	13.61	12.24	4.06	5.30	1.49	1.39	.41	1.26
1965	19.91	17.83	5.74	7.23	2.42	2.44	.68	1.78

[1] Includes new construction and purchases of existing structures less construction force account compensation, and net purchases of equipment.
[2] Includes construction force account compensation.
[3] Includes residential buildings, public service enterprises, conservation and development, and other construction not elsewhere shown.

Source: U.S. Department of Commerce.

Much of the impetus to the State and local government construction programs has come from the channeling of Federal funds through grants-in-aid to these governments. These grants have increased steadily throughout the postwar period—from $1¾ billion in 1947 to about $11½ billion in 1965. Considered by function, Federal grants-in-aid allocated to highways are by far the largest, with public assistance and relief, second. In 1964 these two functions absorbed two-thirds of the total grants-in-aid. However, allocations to other functions may be expected to expand rapidly in the coming years as programs such as Federal assistance for health, and the modernization of existing hospitals and construction of new ones get fully underway. Also, the large needs for new educational facilities plus expanding community redevelopment programs and housing development and improvement in urban areas will result in rising Federal assistance for these purposes.

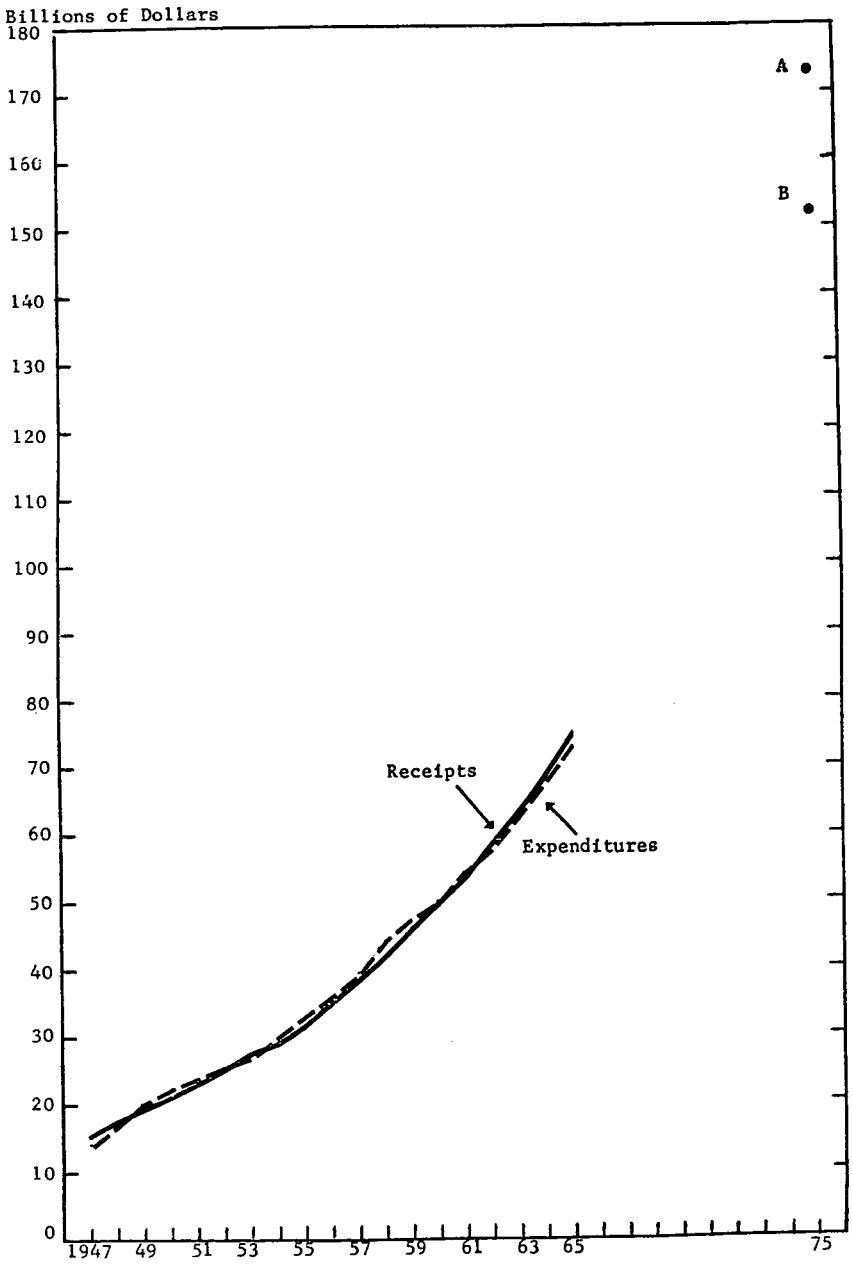
EXPENDITURES OF STATE AND LOCAL GOVERNMENTS

With the rising tempo of economic activity, State and local government receipts have correspondingly expanded and have thus permitted constantly rising expenditures for capital goods and for other purposes. Chart 3 shows that, on a national income basis, expenditures and receipts in the postwar period have been fairly close together with the resulting surpluses and deficits relatively small. The largest deficit—$2.3 billion—occurred in 1958, and the largest surplus—$1.7 billion—in 1965. In the past 9 years, the aggregate deficit has been just about equal to the aggregate surplus on the national income account basis. However, the deficit or surplus in these accounts does not indicate the change in the outstanding debt of these governments, mainly because their receipts and expenditures do not include changes in financial assets and land transactions. Also, because the accounts are on a consolidated basis, they include the operations of the pension trust funds, which have been running a surplus in recent years. Moreover, these governments need a larger volume of funds in liquid form to support their expanding obligations.

Throughout the postwar period State and local authorities have been borrowing sizable sums with the result that there has been a steady increase in the net debt. In the past 3 years this increase has averaged over $6 billion a year, bringing the outstanding debt as of mid-1965 to $92.8 billion. This represents a ratio to their total 1965 expenditures of 1.28. While this ratio has been maintained over the past 3 years, it is higher than in 1955, when it was 1.17, and much higher than in 1950, when it was only 0.93.

If we assume that pension trust fund transactions, net borrowing, and holdings of liquid assets will continue to bear about the same relationship to economic growth as in recent past years, then we may use for purposes of longer-term projection total State and local government receipts as a "proxy" measure of their expenditures.

CHART 3.—STATE AND LOCAL GOVERNMENT RECEIPTS AND EXPENDITURES (ON NATIONAL INCOME ACCOUNTS BASIS)



U.S. Department of Commerce, Office of Business Economics

Projection of State and Local Government Capital Outlays in 1975

State and local government purchases of structures and equipment are dependent principally on their tax receipts, borrowing, Federal aid received, and the needs of the growing population. Apart from the Federal grants, the expenditures of these governments are primarily dependent upon receipts from their own sources, and these receipts are basically a function of the level of economic activity and, particularly, personal income. Thus, the first requirement in projecting State and local government expenditures is to develop projections of these two overall measures of the national economy on the basis of certain specific assumptions.

1. Projection of GNP

The pattern of economic activity and, more specifically, the requirements of State and local governments are influenced by the growth and mobility of the population, and, of course, by many other factors. Shifts in population—from agriculture to industry and from central cities to suburbs—have greatly affected the rates of growth and the types of needs of different industries and regions.

Following the end of World War II, the rate of population growth accelerated markedly to 1.7 percent per year, compared with 1.2 percent during the war period and a much lower rate during the great depression years. The Bureau of the Census has projected the 1975 population [3] at nearly 223 million persons (series B). This implies an average annual growth rate from 1965 to 1975 of 1.4 percent—somewhat less than that in the years since the end of World War II; in absolute terms, however, the average increase is 2.8 million per year in the next 10 years, only slightly less than the average in the postwar period.

The age composition of the population in 1975 is expected to differ from that in 1965, primarily due to a decline in the number of 5- to 9-year-olds. In 1965 the school-age group, 5 to 21 years old, comprised 31.9 percent of the total population; in 1975 the ratio is expected to be somewhat smaller—31.2 percent. While the school-age group will continue to increase in the period ahead, the rate of advance is projected to be considerably less than that of the past decade. This has important implications on the expansion required for new school buildings, teachers, and other requirements for education resulting from the pressure of increases in the school-age group.

The population rise is eventually reflected in the growth of the labor force, and this, in turn, is one of the basic factors in the expansion of our potential production and economic activity. In the decade prior to 1963, the labor force increased at an annual rate of 1.2 percent. Since that year, the increase has accelerated to 1.7 percent per year, reflecting, in large part, the relatively high birth rate in the early postwar years. According to projections of the Department of Labor, the labor force will expand to 93.6 million by 1975 [4]—indicating an

[3] U.S. Department of Commerce, Bureau of the Census, "Population Estimates," series P-25, No. 329, Mar. 10, 1966.

[4] Department of Labor, Bureau of Labor Statistics, "Projections of the Labor Force," 1970-80, Special Labor Force Report, No. 49. The expansion of the labor force is to some extent a function of the rate of economic growth. The 1975 labor force estimate assumes high levels of employment and might be conservative under the assumption of a prolonged high rate of economic activity.

average annual rate of growth of 1.8 percent from the 1965 total of 78.4 million.

It appears that the economy would have to provide about 1½ million new jobs per year over the next 10 years if a low rate of unemployment is to be maintained. In 1965, the rate of unemployment improved considerably, averaging 4.6 percent for the year as a whole, and in early 1966, the rate was reduced to below 4 percent. As the economy continues to grow, as more of our people become better educated and more highly skilled, and as workers are trained to fit the jobs which become available, unemployment may well be reduced below present rates. For projection purposes, an unemployment rate of 3 percent in 1975 is assumed—this with the other associated factors discussed below is designated as assumption A. However, in order to gage the differences if a 3-percent rate should not be achieved, an alternative set of projections has been made on the assumption of a 4-percent rate of unemployment in 1975—this is designated as assumption B.

Another ingredient of production is the number of hours worked per week. Average factory hours reached a postwar low of 39.1 hours in 1949 and a high of 41.1 hours in 1965. Although hours worked tend to rise in a cyclical upswing, a modest decline in the work-year is assumed over the next decade.

The final major component of output is productivity, commonly measured as production per man-hour. Productivity changes have varied considerably year by year in the postwar period. Productivity rises sharply in a year following a recession, and subsequently tends to fall back to the longer term average. In the past decade, the average annual rate of increase in productivity for the total private economy has been 2.8 percent (on the labor force basis).

With continued large expenditures by business on new plant and equipment, much of which is for the purpose of increasing efficiency, the gain in private productivity in the next 10 years is assumed to average 3.2 percent per year, somewhat higher than the average of the past 10 years. This productivity increase is used in conjunction with the 3-percent rate of unemployment (assumption A). A somewhat smaller gain in productivity is used with the assumed 4-percent unemployment rate (assumption B) since investment in more efficient productive facilities may be somewhat less than under assumption A.

Based on the foregoing assumptions and consistent with the 3-percent rate of unemployment (assumption A), the 1975 projection of the GNP would be $940 billion in 1958 prices. This is equivalent to an average growth rate in real GNP of nearly 4½ percent per year from 1965 to 1975. If we assume a relatively stable price movement—a 2-percent increase per year in the GNP price deflator—associated with the foregoing growth in real GNP, then the GNP in 1975, in the prices of that year, would be $1,275 billion, an increase of more than seven-eighths over the 1965 total of $676 billion.

The alternative projection of GNP in 1975 (assumption B) would be $910 billion in 1958 prices, implying an average growth rate of a little more than 4 percent per year from 1965 to 1975. Using a somewhat smaller price increase—1.5 percent per year—associated with the lower growth rate for GNP, would result in a projected GNP of $1,180 billion in prices of 1975.

2. Projection of Personal Income

As already indicated, personal income is another major determinant of receipts of State and local governments. Since 1953 the ratio of personal income to GNP has varied from a low of 78.1 percent in 1955 to a high of 80.8 percent in 1958. The ratio rises sharply in a recession period and declines abruptly in the first year of recovery; thereafter, the changes tend to be relatively small. Fluctuations in this ratio are to a large extent a reflection of changes in corporate retained earnings (these are excluded from personal income but are included in GNP), which fall sharply during a recession and thereafter rebound, particularly in the early phase of the recovery. In 1965 the ratio of personal income to GNP was 78.5 percent—a moderate decline from the 79 percent in the first year following the 1961 recession.

The 1975 projection of personal income is derived by utilizing a regression relating personal income to GNP in current dollars for the period 1953–65, excluding the recession years 1954, 1958, and 1961. The regression equation expressed in billions of current dollars is:

(1) Personal income $=3.752+.7827$ GNP $\frac{2}{r}=.999$.

Using the projected 1975 GNP of $1,275 billion, this relation yields a corresponding personal income of $1,000 billion in 1975 under assumption A. The ratio of personal income to GNP in 1975 is 78.4 percent, only fractionally lower than the 1965 ratio. On the alternative GNP projection of $1,180 billion in 1975 (assumption B), personal income, as set forth by the staff of the Joint Economic Committee, is $895 billion. This implies a significantly lower ratio to GNP than for assumption A.

3. Projection of State and Local Government Receipts

Having projected the GNP and personal income, we are now in a position to estimate State and local government receipts. The major sources of these receipts and their amounts in 1965 are given below.

[Billions of dollars]

Personal tax and nontax receipts	11.5
Property taxes	23.0
All other taxes [1]	28.4
Federal grants-in-aid	11.4
Total receipts	74.3

[1] Includes corporate profits taxes, contributions to social insurance, and all indirect business taxes other than property taxes.

a. *Personal tax and nontax receipts.* Over the postwar period an increasing number of States have inaugurated taxing of personal incomes or have increased their existing rates as a means of obtaining additional revenues. As a result, the ratio of State and local government personal taxes to national personal income has risen steadily over the past decade, from 1.3 percent in 1955 to 2.2 percent in 1965, with the rise in the ratio slowing somewhat since 1960. The share of personal income taken by State and local governments is likely to continue to increase in the years ahead.

A closer relationship between State and local personal taxes and personal income is given by the following regression (in billions of dollars) derived from the more recent period 1960 to 1965:

(2) log (State and local personal taxes) $= -3.507 + 1.679$ log (personal income) $\frac{2}{r} = .992$.

This equation yields a more conservative projection of personal tax receipts over the next decade than that based on the period 1955–65. The relationship indicates that on the basis of the experience of the past 6 years a 10-percent rise in personal income, for example, would yield on the average a 16.8 percent increase in these personal taxes. The equation provides a 1975 estimate of State and local personal tax and nontax receipts of $33.9 billion under assumption A. This projection is equivalent to 3.4 percent of the projected personal income in that year. Under assumption B, the projected personal tax receipts in 1975 would be $28.2 billion.

b. *Property taxes.* State and local governments, particularly local governments, have used property taxes, for the most part, to finance current public school requirements. In response to the rapidly increasing school enrollment throughout the postwar period, these taxes have risen sharply—from $5.3 billion in 1947 to $23.0 billion in 1965, or an average rate of growth of 8.5 percent per year. Despite this large rise, however, the ratio of property taxes to total receipts of State and local governments has been drifting downward over the postwar period. In 1947 the ratio was 35 percent and in 1965 it was down to 31 percent.

Property taxes follow very closely the movement of State and local government wages and salaries for public education as chart 4 shows. The following equation describes the relationship for the period 1950–65, in billions of dollars:

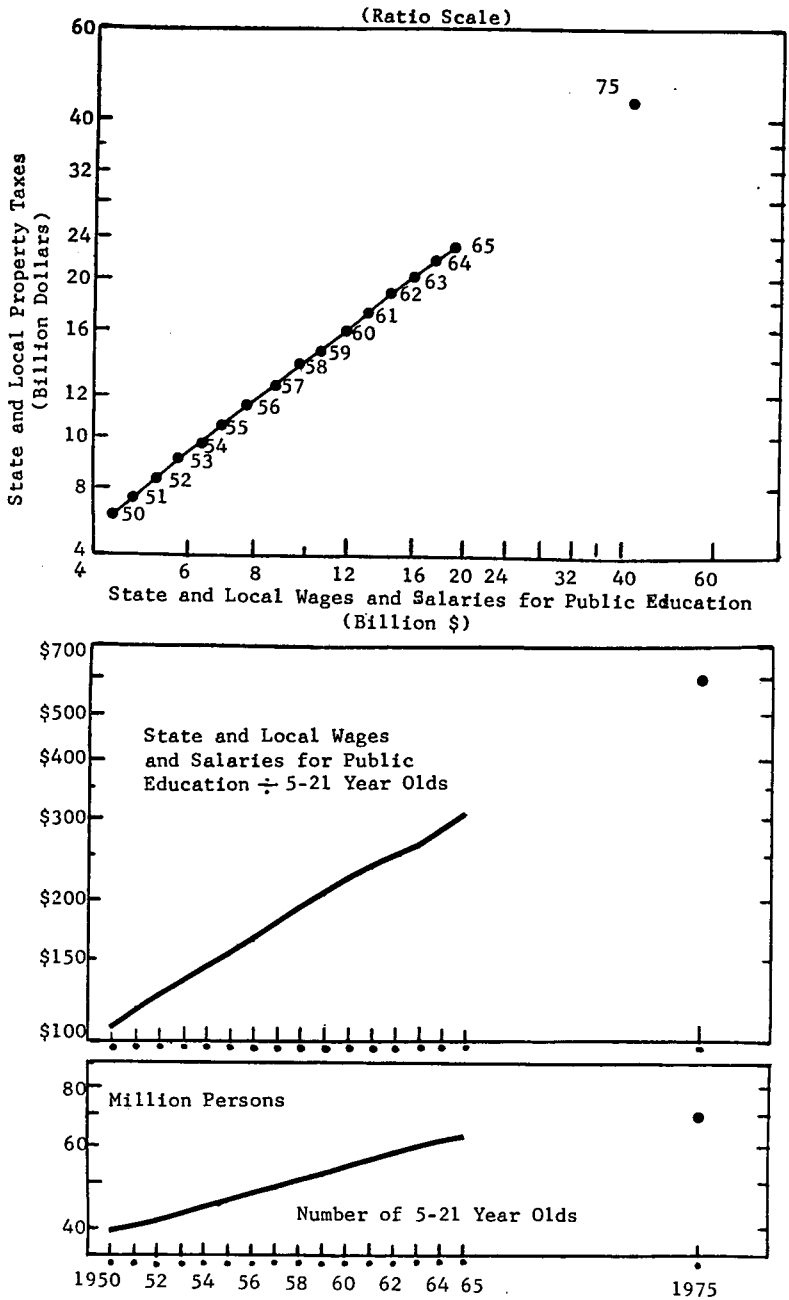
(3) log (Property taxes) $= .353 + .793$ log (State and local wages and salaries for education) $\frac{2}{r} = .9995$.

This relation implies that, over the past 15 years, an increase of 10 percent in these wages and salaries, for example, has been associated on the average with an increase of nearly 8 percent in property tax receipts.

Property tax collections in 1975 may be obtained from equation (3) and a projection of wages and salaries for education. The latter has shown a remarkably steady rate of growth over the past 15 years when expressed as a ratio per person in the school-age group 5 to 21 years old. In 1950 the average wage and salary for education per school-age person was $108; in 1965 it rose to $306. The average rate of increase over this period was 7.2 percent per year; however, it should be noted that the rate of increase in the number in this age group has been decreasing in recent years.

The most recent projections of the Bureau of the Census show that the number of 5 to 21 years olds would total 69.5 million in 1975 compared with 62.1 million in 1965, an average rate of growth of 1.1 percent per year—much lower than the 3.2 percent annual growth rate of the past 10 years. Wages and salaries for public

CHART 4.—STATE AND LOCAL PROPERTY TAXES RELATED TO STATE AND LOCAL WAGES AND SALARIES FOR PUBLIC EDUCATION



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education per 5 to 21 year olds for 1975 are obtained by extrapolating the 1956–65 trend (in terms of logarithms). The 1975 projection averages $600 per person in the school-age group. This average is then multiplied by the projection of the school-age group, 69.5 million persons, to yield a 1975 projection of wages and salaries of $41.7 billion. This total implies a lesser rate of increase in the next 10 years than in the past decade.

The projection of wages and salaries for education, when applied in equation (4), yields an estimated property tax for 1975 of $43.5 billion compared with $23.0 billion in 1965—or a rate of increase of 6.6 percent per year, a considerable reduction from the average rate of gain of 8.2 percent per year in the past 10 years. This projection is the same for both the A and B assumptions.

c. *Tax receipts other than property and personal.* These include State and local sales taxes, corporate profits tax accruals, contributions for social insurance, and other taxes not considered above. In 1965 these taxes amounted to $28.4 billion; they have risen steadily over the postwar period from the total of $6.4 billion in 1947. In the aggregate, changes in these "other" taxes are dependent on long-term developments in economic activity. With the exception of corporate tax accurals, which comprise a relatively small proportion of these taxes, they are not strongly affected by recessionary influences; indeed, in every postwar recession, when the GNP dropped or halted its advance, they have risen in the aggregate. However, the overall relationship of these taxes to GNP since 1951 has been quite close with the only marked deviation from a linear regression occurring in 1961. The regression, in billions of dollars, for the period 1951–65 is:

(4) Taxes other than personal and property $= -7.18 + .0533$ GNP
$r^2 = .996$.

This relation indicates that increases in these taxes have on the average conformed with about 5.3 percent of the increase in GNP over the period 1951–65. Assuming that this relation will hold over the next 10 years, the projection of these taxes in 1975 is $60.8 billion, corresponding to the GNP of $1,275 billion projected in that year under assumption A. This reflects an average growth rate of 7.9 percent per year over the next 10 years—a rate somewhat higher than that of the past decade. For assumption B these taxes are projected at $55.7 billion in 1975.

d. *Federal grants-in-aid.* The role of the Federal Government in relation to the needs of State and local governments is changing rapidly. Not only are the public works needs of our population expanding, but also the costs of the projects are rising—for both labor and materials. State and local bodies are constantly striving to raise their revenues by imposing new taxes or upping existing tax rates, but even so the additional revenues fall short of the necessary required funds. The Federal Government has assumed a larger share of the burden of financing many of the requirements of State and local bodies, and through its new or expanded programs for improving health and education, and through a host of other measures designed to better the standard of all Americans, it will provide increasing aid to State and local governments.

No definitive projections of Federal grants-in-aid to State and local governments can be made at this time because the Federal programs

are in a state of flux. The expanded operations in Vietnam are now a factor in limiting the Federal funds allotted to State and local bodies. When the activity there quiesces or stops entirely, the Government will proceed to implement fully its domestic programs.

Private sources [5] estimate that existing programs would call for a rise in Federal grants-in-aid to $30 billion or more in 1975. Relative to assumption A, a large expansion in Federal receipts is indicated, since GNP and income would grow at a faster pace than during the average of the postwar period. This would permit the implementing of existing Federal aid programs for State and local governments and also would provide for some additional future Federal aids to these bodies. Thus, a large growth in Federal grants-in-aid may be envisaged under this assumption, but the amount of increase can only be surmised at this time. For the purpose of calculations associated with assumption A, the Federal grants total in 1975 is placed at $35 billion—derived by applying the same average percentage rate of increase per year over the next 10 years as that which occurred over the period 1960–65; i.e., 12 percent per year.

In conjunction with assumption B (the 4-percent rate of unemployment) it is assumed that the average annual absolute increase in Federal grants would be somewhat larger than the average absolute increase of $1.1 billion per year experienced since 1962, when annual increases were larger than the average in the earlier postwar years. The assumed total grants for 1975 is $25 billion compared with $11.4 billion in 1965.

The above estimates yield the total State and local government receipts from all sources under assumptions A and B. These are summarized in the accompanying table which includes the projections of the major national variables and of State and local government receipts.

	1965 actual	Projection, 1970		Projection, 1975	
		A [1]	B [2]	A [1]	B [2]
GNP (billion current dollars)	676.0	940.0	905.0	1,275.0	1,180.0
GNP (billion 1958 dollars)	610.0	760.0	750.0	940.0	910.0
Implicit GNP price (1958=100)	111.0	123.0	121.0	136.0	130.0
Personal income (billion dollars)	531.0	740.0	700.0	1,000.0	895.0
Population (millions)	194.6	207.0	207.0	223.0	223.0
School-age population, 5 to 21 years of age (millions)	62.1	67.4	67.4	69.5	69.5
State and local government receipts—total (billion dollars)	74.3	115.8	109.7	173.2	152.4
Personal tax and nontax receipts	11.5	20.4	18.6	33.9	28.2
Property taxes	23.0	32.5	32.5	43.5	43.5
All other taxes	28.4	42.9	41.1	60.8	55.7
Federal grants-in-aid	11.4	20.0	17.5	35.0	25.0

[1] Based on assumption of 3-percent rate of unemployment.
[2] Based on assumption of 4-percent rate of unemployment.

NOTE.—See text for sources and methods and assumptions used in deriving the projections.

Source: U.S. Department of Commerce.

Assuming that State and local government expenditures would equal receipts in 1975, on the national income and product basis, the projected expenditures under assumptions A and B would be about

[5] The National Planning Association has estimated a range in Federal grants-in-aid of between $31 and $43 billion in 1975 in their national-regional economic projections series, Report No. 66-J-1.

$173 billion and $152 billion, respectively. In 1965 total expenditures were $72½ billion, so that these projections represent an average annual rate of increase over the next 10 years of 9.1 percent and 7.7 percent, respectively; these rates compare with 8.1 percent per year from 1955 to 1965.

4. Projection of Structures and Equipment Expenditures

To project State and local government capital outlays realistically would involve an examination of the various types of construction programs and other needs for the period ahead, an appraisal of regional and local requirements, and of the ability of State and local authorities to finance the projects. Also, the scope and nature of Federal Government aids to State and local governments would need to be considered. But even projections based on such thorough considerations would still involve making conjectures and judgments at many points. No long-term programs or plans are available for the major categories of capital outlays by State and local governments. In addition to many other unknowns, there is the question as to how fully existing programs and legislation of the Federal Government affecting State and local government public works will be implemented over the coming years and what new programs and legislation might be forthcoming.[6]

In view of the aforementioned uncertainties, the only other approach to projecting over the longer term is by developing meaningful relations which portray the historical experience, particularly if they have proved to be stable under varying political and economic conditions. Future events can alter the past pattern, but this is the risk involved in any attempt to look ahead, whether short run or long run. This approach, which has been used in making the foregoing projections, is also utilized to project capital outlays.

As already indicated, State and local government expenditures for structures and equipment comprise a fairly large part of their total expenditures. Since the latter are largely dependent upon the receipts of these bodies, the volume of capital outlays, together with the borrowing required to finance them, tend to move with receipts or expenditures. Chart 5 shows that real capital outlays moved up rather sharply relative to real total expenditures[7] up to 1954. Since then the relative movement has been more moderate. A linear regression for the period 1954–65, in billions of 1958 dollars, is:

$$\text{(5)}\quad \text{Capital outlays} = .414 + .287\ (\text{total expenditures}) \quad \frac{2}{r} = .994.$$

The relationship is very close over this period and implies that the change in real capital outlays has on the average reflected nearly 30 percent of the change in real total expenditures.

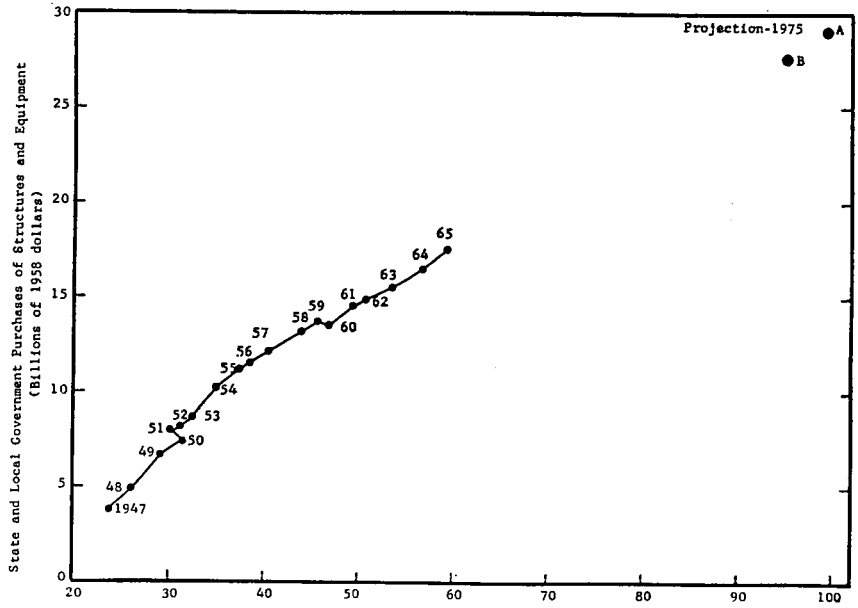
To project real capital outlays it is necessary to estimate real State and local government expenditures; this requires a projection of their implicit price. These prices have moved in a close relation

[6] A detailed analysis for the year 1970 using the foregoing considerations is available in an unpublished manuscript, "State and Local Finances, Project 1970," prepared for the Federal Interagency Committee on Economic Growth by the Council of State Governments.

[7] Since purchases of goods and services comprise the bulk of total State and local expenditures, the latter were converted to real terms by the use of the implicit prices for goods and services—see table 1 in the appendix.

CHART 5.—STATE AND LOCAL GOVERNMENT CAPITAL OUTLAYS RELATED TO TOTAL EXPENDITURES

[In constant prices]



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with the total GNP implicit prices over the past 15 years—a 1-percent increase in the latter prices have been accompanied on the average by a 1.7-percent increase in those for State and local government expenditures. This larger relative advance is attributable to the way prices of services (measured by wages and salaries) are treated in the government sector of the GNP; i.e., no productivity gain is imputed in measuring real government GNP. In the government sector real GNP moves proportionately to the man-hours, whereas in the private economy real GNP reflects the productivity times man-hours. Thus, the implicit price movements in the private sector reflect the effects of productivity changes whereas in the government sector they do not.

The relationship of State and local government expenditures implicit prices with those for GNP for the period 1950–65, with each price index on a 1958 base, is as follows:

(6) $\log$ (State and local government expenditures implicit price) $=$

$$-1.419+1.714 \log \text{ (GNP implicit price) } \frac{2}{r}=.985.$$

Equation (6) produces an implicit price index for 1975 of State and local government expenditures of 174 (1958=100) for assumption A (which involves an average rate of increase in the GNP implicit price of 2 percent per year), and an index of 160 (1958=100) for assumption B (which involves a rate of increase in the GNP implicit price of 1.5 percent per year). Using these deflators gives a 1975 projection of real State and local government expenditures of $99.5 billion under

assumption A and $95.2 billion under assumption B, both in 1958 dollars.

Thus, applying these estimates of real total expenditures in equation (5) results in projections of real purchases of structures and equipment by State and local governments in 1975 of $29.0 billion (1958 dollars) under assumption A and $27.7 billion (1958 dollars) under assumption B; these projected real capital outlays imply an expansion over the next 10 years of 65 percent and 57 percent under assumptions A and B, respectively. The increase over the decade 1955–65 was 58 percent.

Of especial interest is the projection of real new construction expenditures by State and local governments which, except for construction force account compensation, are included in expenditures for structures. As indicated earlier, these expenditures in 1965 represented 90 percent of total purchases of structures and equipment. The projection of new construction is derived by subtracting from the projection of structures and equipment those of equipment and "other" structures.

Equipment purchases in constant dollars have risen along a well-defined upward trend since 1958, averaging $110 million per year. An extrapolation of this trend results in a 1975 projection of equipment purchases of $2.8 billion (in 1958 dollars); in 1965 such purchases amounted to $1.7 billion. Subtracting the projections of equipment from those of structures and equipment combined, results in projections of structures of $26.2 billion and $24.9 billion (in 1958 prices) under assumptions A and B, respectively.

Expenditures for structures excluding new construction [8] (in constant dollars) have risen moderately since 1955. On the basis of an extrapolation of the 10-year trend, these purchases are projected at $0.4 billion (in 1958 dollars) for both the A and B assumptions; the 1965 figure was $0.3 billion.

As a result, new construction of State and local governments is projected in 1975 at $25.8 billion for the A assumption and $24.5 billion for the B assumption, in terms of 1958 dollars. These projections imply a growth over 1965 of 65 percent and 57 percent, respectively, for the A and B assumptions.

For certain purposes total capital outlays, excluding residential building construction, are desired, since the latter is affected by special factors. State and local government residential building construction has shown erratic movements over the past 15 years, with no discernible trend either in constant or current dollars. With this pattern in mind and in the absence of a detailed analysis of the factors underlying the movements of residential building construction, the 1975 projection was placed at $0.5 billion in both current and constant dollars—equal to the average of each series for the years 1950–65. This yields projections of new construction excluding residential building of $25.3 billion and $24.0 billion (1958 dollars) for assumptions A and B, respectively.

The foregoing projections have been derived in constant dollars. The current dollar projections are derived from these by the use of the assumed GNP implicit prices and derived relations of the implicit prices of structures and of equipment to the GNP implicit prices in recent years. Since 1959 the implicit prices of State and local govern-

[8] Consists of net purchases of existing structures less construction force account compensation.

ment structures have risen sharply relative to the implicit GNP prices—a 1-percent rise in the implicit GNP price has on the average been accompanied by a 1.6-percent rise in the implicit price of structures—mainly reflecting the relatively faster pace of construction prices generally. On the other hand, in this same period the implicit prices of equipment purchases by State and local governments have shown only a slight rise relative to the movement of the implicit GNP prices. Applying these price adjustments to the constant dollar State and local government capital outlays converts the projections to current dollars. The following table summarizes the 1975 projections in both constant and current dollars:

Projections of structures and equipment purchases of State and local government, 1970 and 1975

	Actual, 1965	Projection, 1970		Projection, 1975	
		Assumption A	Assumption B	Assumption A	Assumption B
Structures and equipment (billion 1958 dollars)	17.6	23.2	22.6	29.0	27.7
Structures	15.9	20.9	20.3	26.2	24.9
New construction	15.6	20.6	20.0	25.8	24.5
Addendum: Residential building	.3	.5	.5	.5	.5
Other [1]	.3	.3	.3	.4	.4
Equipment	1.7	2.3	2.3	2.8	2.8
Structures and equipment (billion current dollars)	19.9	30.4	29.0	44.7	39.6
Structures	18.1	28.0	26.6	41.7	36.6
New construction	17.8	27.6	26.2	41.2	36.1
Addendum: Residential building	.4	.5	.5	.5	.5
Other [1]	.3	.4	.4	.5	.5
Equipment	1.8	2.4	2.4	3.0	3.0

[1] Includes net purchases of existing structures less construction force account compensation. The latter item is deducted here because it is included in compensation of employees of State and local governments in the national income and product accounts.

NOTE.—In July 1966—subsequent to the time when the calculations above were made—the estimates in the national income and product accounts were revised for the years 1963–65. While the upward revisions of GNP and personal income in 1965 amounted to $5,000,000,000 and $4,000,000,000, respectively, the effect of these changes on the above projections is relatively small; for example, projections of State and local capital expenditures would be raised by about $500,000,000 in 1970 and 1975.

Source: U.S. Department of Commerce.

APPENDIX

Regression Equations and Basic Data Used in Deriving the 1975 Projections of State and Local Government Expenditures for Structures and Equipment

The following model was used as the basis for the projections, with all data on a national income and product accounts basis:

		R^2	Period
(1)	$E=R+U$		
(2)	$R=PT+PrT+OT+FG$		
(3)	$\log PT=-3.507+1.679 \log PI$	0.992	60–65
(4)	$\log PrT=.353+.793 \log WS_S$	.9995	50–65
(5)	$WS_S=WS_{SP}\times P$		
(6)	$\log WS_{SP}=2.341+.029t$ (t=0 for 1960)	.998	56–65
(7)	$OT=-7.18+.0533\ GNP$	.996	51–65
(8)	$\log FG=.911+.0499t$ (t=0 for 1962) for Assumption A	.997	60–65
	$FG=9.15+1.15t$ (t=0 for 1963) for Assumption B	.995	62–65
(9)	$SEQ_C=S_C+EQ_C$		
(10)	$SEQ_C=.414+.287Ec$	.994	54–65
(11)	$Ec=E\div I_S$		
(12)	$\log I_S=-1.419+1.714 \log I_{GNP}$	.985	53–65
(13)	$EQ_C=1.458+.115t$ (t=0 for 1961)	.991	58–65
(14)	$S_C=SE_C-EQ_C$		
(15)	$NC_C=S_C-O_C$		
(16)	$O_C=.168+.018t$ (t=0 for 1960)	.611	55–65
(17)	$\log I_S=-1.267+1.624 \log I_{GNP}$	.947	59–65
(18)	$\log I_{EQ}=1.632+.185 \log I_{GNP}$	.728	58–65
(19)	$S=S_C\times I_S$		
(20)	$EQ=EQ_C\times I_{EQ}$		
(21)	$SE=S+EQ$		
(22)	$NC=S-O$		
(23)	$O=.165+.019t$ (t=0 for 1960)	.626	56–65

The notations used in the above equations follow:

(1) E State and local government expenditures, in billions of current dollars.
R State and local government receipts, in billions of current dollars.
U State and local government surplus or deficit, in billions of current dollars.
(2) PT State and local government personal taxes, in billions of dollars.
PrT State and local government property taxes, in billions of dollars.
OT State and local government taxes other than personal and property, in billions of dollars.
FG Federal grants-in-aid to State and local governments, in billions of dollars.
(3) PI National personal income, in billions of dollars.
(4) WS_S State and local government wages and salaries for education, in billions of dollars.
(5) WS_{SP} State and local government wages and salaries for education per schoolage person (ages 5–21, inclusive).
P Schoolage population (ages 5–21, inclusive).
(7) GNP Gross national product, in billions of dollars.
(9) SEQ_C State and local government purchases of structures and equipment, in billions of 1958 dollars
S_C State and local government purchases of structures, in billions of 1958 dollars.
EQ_C State and local government purchases of equipment, in billions of 1958 dollars.
(11) I_S Implicit price deflator for State and local government expenditures, represented by the implicit price deflator for goods and services purchased by these governments (1958=100).
(12) I_{GNP} Implicit GNP price deflator (1958=100).
(15) NC_C State and local government purchases of new construction, in billions of 1958 dollars.
O_C State and local government purchases of "other" structures than new construction, in billions of 1958 dollars.
(17) I_S Implicit price deflator for State and local government expenditures for structures (1958=100).
(18) I_{EQ} Implicit price deflator for State and local government expenditures for equipment (1958=100).
(19) S State and local government expenditures for structures, in billions of current dollars.
(20) EQ State and local government expenditures for equipment, in billions of current dollars.
(21) SE State and local government expenditures for structures and equipment, in billions of current dollars.
(22) NC State and local government expenditures for new construction, in billions of current dollars.
(23) O State and local government expenditures for "other" structures than new construction, in billions of current dollars.

TABLE 1.—*GNP and State and local government expenditures, 1947–65 and projected 1975*

	GNP			State and local government expenditures		
	Billions of current dollars	Implicit price[1] (1958=100)	Billions of 1958 dollars	Billions of current dollars	Implicit price[1] (1958=100)	Billions of 1958 dollars
1947	231.3	74.6	309.9	14.3	60.4	23.7
1948	257.6	79.6	323.7	17.4	66.4	26.3
1949	256.5	79.1	324.1	20.0	68.9	29.1
1950	284.8	80.2	355.3	22.3	70.8	31.6
1951	328.4	85.6	383.4	23.7	76.9	30.8
1952	345.5	87.5	395.1	25.3	80.6	37.3
1953	364.6	88.3	412.8	27.0	82.8	32.6
1954	364.8	89.6	407.0	29.7	85.3	35.0
1955	388.0	90.9	438.0	32.7	87.5	37.3
1956	419.2	94.0	446.1	35.6	92.7	38.4
1957	441.1	97.5	452.5	39.5	97.3	40.6
1958	447.3	100.0	447.3	44.0	100.0	44.0
1959	483.6	101.6	475.9	46.8	102.6	45.6
1960	503.8	103.3	487.8	49.6	105.9	46.9
1961	520.1	104.6	497.3	54.1	109.4	49.5
1962	560.3	105.7	530.0	57.6	113.2	50.9
1963	589.2	107.1	550.0	62.2	116.5	53.4
1964	628.7	108.9	577.6	67.2	119.3	56.4
1965	676.3	110.9	609.6	72.6	122.8	59.1
1975 projected:[2]						
Assumption A	1,275	135.9	940	173.2	174	98.5
Assumption B	1,182	130.0	910	152.4	160	95.2

[1] Implicit price for State and local government purchases of goods and services.
[2] See foregoing text for details of these assumptions.

Source: U.S. Department of Commerce.

TABLE 2.—*State and local government expenditures for structures and equipment, 1947–65 and projected 1975*

	Billions of current dollars				Billions of 1958 dollars			
	Structures and equipment	Structures[1]	New construction	Equipment	Structures and equipment	Structures	New construction	Equipment
1947	2.7	2.5	2.5	0.3	3.8	3.5	3.5	0.4
1948	3.8	3.5	3.5	.3	5.0	4.5	4.6	.4
1949	5.1	4.8	4.8	.3	6.7	6.2	6.4	.5
1950	5.6	5.3	5.2	.4	7.5	7.0	7.0	.5
1951	6.8	6.3	6.3	.5	8.0	7.4	7.5	.6
1952	7.2	6.5	6.6	.6	8.2	7.4	7.6	.8
1953	7.8	7.1	7.1	.7	8.8	8.0	8.1	.8
1954	9.0	8.3	8.3	.7	10.3	9.4	9.5	.9
1955	9.8	9.1	8.9	.8	11.2	10.3	10.2	.9
1956	11.0	10.1	10.0	.9	11.5	10.6	10.5	.9
1957	12.2	11.2	11.1	1.0	12.2	11.2	11.2	1.0
1958	13.2	12.2	12.1	1.0	13.2	12.2	12.1	1.0
1959	13.7	12.6	12.3	1.1	13.7	12.6	12.4	1.1
1960	13.6	12.4	12.2	1.3	13.6	12.3	12.2	1.2
1961	14.7	13.4	13.3	1.3	14.5	13.2	13.1	1.3
1962	15.5	14.1	14.0	1.4	14.9	13.5	13.3	1.4
1963	16.7	15.1	14.9	1.6	15.6	14.1	13.9	1.5
1964	18.1	16.4	16.1	1.7	16.6	14.9	14.6	1.7
1965	19.9	18.1	17.8	1.8	17.6	15.9	15.6	1.7
1975 projected:[2]								
Assumption A	44.7	41.7	41.2	3.0	29.0	26.2	25.8	2.8
Assumption B	39.6	36.6	36.1	3.0	27.7	24.9	24.5	2.8

[1] Includes new construction less force account compensation, plus net purchase of existing structures.
[2] See foregoing text for details of these assumptions.

Source: U.S. Department of Commerce.

CHAPTER 2

Material Requirements for State and Local Public Works, 1946–75*

I. NEW CONSTRUCTION AND MATERIALS REQUIREMENTS

The value of building materials consumed in State and local construction rose ninefold between 1946 and 1965. Over this period, the value of new State and local construction increased only sixfold.[1] But, the significant factor in the upsurge of total consumption was the physical volume (constant dollar) increase in State and local construction of 300 percent.

Viewed in terms of the proportion of total State and local construction expenditures involved, building materials usage rose from 35 to 50 percent in these years. This increase in the relative importance of materials expenditures reflects advances in laborsaving technology, reductions in onsite labor requirements due to the increased use of prefabricated materials, and the faster growth of the more material intensive types of construction. It is not merely a reflection of price changes.

The backlog of postponed construction projects in the immediate post-World War II period set the stage for an upsurge in both private and publicly owned construction. During the war, new construction had almost come to a standstill, but maintenance and repair work of necessity continued to be strong. This work, however, while providing a limited market for building materials products, at the same time provided a base for maintaining capacity which was instrumental in fulfilling the materials requirements for new construction immediately after the war. Full capacity production levels were reached very quickly in the postwar period in most building materials industries. Significant price increases for many products were the inevitable result, especially for materials which were heavily dependent upon the booming residential market. Capacity-price pressures prevailed for some industries until the end of the Korean conflict in 1953, but since that time materials production has generally not been pressing capacity and price movements have not been primarily associated with this factor.

A. COMPONENTS OF NEW CONSTRUCTION GROWTH

In the first post-World War II year, 1946, the physical volume of new construction, both private and public, was more than double that of each of the preceeding 2 war years. Federal, State, and local con-

*Prepared in the Business and Defense Services Administration, U.S. Department of Commerce under the direction of Aaron Sabghir, Chief Economist, Building Materials and Construction Industries Division, by John R. Cambern and Phyllis A. Scott, staff economists, with minor editing by committee staff.

[1] For purposes of this study, State and local construction does not include public housing, which, because of many special factors, lends itself to separate analysis. The State and local construction discussed in this chapter includes, however, federally aided as well as nonfederally aided work.

struction constant dollar outlays in 1946 were about 15 percent of total new construction. Federal Government construction, however, dropped off somewhat with demobilization, but State and local outlays followed the pattern of private construction and many categories showed an enormous spurt between 1945 and 1946. For example, the value of public educational construction activity in constant dollars jumped by almost 50 percent, highways by 75 percent, and sewer and water by more than 75 percent, in only 1 year's time. All of these are primarily owned by State and local governments. One category which not only failed to show a construction spurt but actually dropped in real activity was hospitals where many projects appear to have encountered difficulties.

By 1953, the first post-Korean year, the public sector had grown to almost 30 percent of total new construction. Although dropping slightly in the next few years, since 1958 the public sector proportion remained relatively steady at 30 percent. The physical volume of all new public construction by 1965, was about 250 percent above that of 1947. State and local construction activity, up by about 300 percent was mainly responsible. In general, in the first few years after World War II, the most rapid period of growth for most types of State and local construction expenditures reflected a large backlog of unmet public works needs. This was an inheritance from the prewar depression years as well as from the restrictions of World War II. The stimulus due to the introduction of new programs of Federal aid was taking effect while State and local governments were showing major improvements in their financial condition. Between 1946 and 1949 Federal aid about doubled. Thus, Hill-Burton hospital construction assistance funds, which became available beginning in 1947, stimulated hospital construction to become one of the fastest growing categories of State and local public facilities. State and local hospitals showed an estimated fivefold increase between 1947 and 1949.

Educational construction, even without a comparable stimulus from Federal aid, increased fourfold between 1947 and 1949 and then began to slow down as the wartime backlog was partially eliminated. However, the growing school population as well as a high rate of population mobility, and housing development in suburban areas continued to stimulate school building. By the midfifties expenditures reached a physical volume peak (not surpassed until 1965) which was more than double the 1949 rate of outlays. Average annual growth over the 20-year period for new public educational facilities was the highest among all State and local construction categories (table 1).

TABLE 1.—*State and local construction activity, 1947–65* [1]

	Activity (millions of 1957–59 dollars)		Average annual rate of increase (percent)
	1947	1965	
Total State and local	$3,279	$13,396	8.2
Nonresidential building	635	4,351	11.3
Educational	363	3,042	12.5
Hospital and institutional	75	397	9.6
Administrative and service	57	414	11.6
Other nonresidential	140	498	7.3
Nonbuilding construction	2,644	9,106	7.1
Sewer	329	954	6.1
Water	286	699	5.1
Highways	1,631	6,543	8.0
All other	398	910	4.7

[1] The statistics for 1947 and 1965 are prepared by Business and Defense Services Administration on a comparable basis by using the "old" Bureau of the Census series which terminated with 1965.

The growth of highway construction, traditionally a large expenditure item for State and local governments, was stimulated in the first decade after the war by the ABC Federal-aid program under which the Federal Government contributed 50 percent of funds. But, this growth tapered off by the midfifties, setting the stage for the new Federal Interstate Highway program under which the Federal Government provided 90 percent of funds. The influence of the new 41,000 mile program was not clearly evident until 1958, when constant dollar expenditures for highways rose 15 percent above 1957.

For other types of State and local construction there was also substantial growth from 1946 to 1949 as immediate postwar needs were dealt with. Dips in physical activity took place in the early 1950's, when State and local governments were facing difficulties getting voter approval for financing many projects. In the early 1960's, a new Federal-aid program to aid waste treatment plant construction resulted in a resurgence of growth for this category. The relative affluence of State and local governments as compared to pre-World War II years had a favorable influence on the growth rate for administrative and service buildings.[2]

B. CHANGING MATERIAL REQUIREMENTS OVER TWO DECADES

Between 1947 and 1965 the proportion of total State and local construction expenditures spent for materials increased from 35 to 50 percent (table 2). Seven of the eight major State and local construction categories showed a rising proportion of materials outlays. The eighth category, administrative and service buildings, for reasons not entirely clear, showed a slight decline.[3]

[2] This category includes general office buildings, courthouses, State capitals and city halls, jails and penitentiaries, police stations and firehouses.

[3] The information on materials usage for this State and local category is based on Federal office building construction which may not be typical.

TABLE 2.—*Relationship of selected materials to State and local construction in 1947 and 1965*

	Percent of State and local construction outlays [1]	
	1947	1965
Total materials [2]	35.0	50.0
Metal products [2]	10.0	17.0
Fabricated structural steel	1.8	3.2
Plumbing	.7	1.3
Heating and cooling	1.0	1.9
Metal doors, windows and trim	.3	.9
Reinforcing steel	2.3	3.3
Lumber products	2.7	2.0
Millwork	.7	.9
Stone, clay, and glass products	14.0	17.0
Cement	3.7	2.1
Concrete products	2.8	6.4
Structural clay products	1.4	1.3
Aggregates (rock products)	5.3	5.1
Bitumen (in highways)	2.2	.9
Asphalt (ready-mix)	.9	2.0
Paint	.1	.2
Roofing	.3	.3
Electrical equipment, fixtures, and wiring devices	.7	2.5
Pipe [2 3]	4.0	5.4
Iron	1.5	1.3
Steel	.7	1.1
Concrete	1.0	1.8
Asbestos cement	.4	.4
Clay	.3	.6

[1] Based on the value of construction materials consumed in all State and local construction measured in current dollar values.
[2] Also includes materials not listed in this table. Pipe categories are duplicative of other categories.
[3] Total pipe and the component types of pipe listed below are those used in nonbuilding construction only. This usage accounts for the overwhelming majority of pipe in State and local construction.

Source: Prepared by Business and Defense Services Administration.

Highway construction, which accounted for half the volume of all State and local construction in both 1947 and 1965, is the dominant factor in the increasing overall importance of materials in State and local construction expenditures. For highways the materials share increased from 27 percent in 1947 to 47 percent in 1965. This substantial shift reflects primarily a decline in the importance of on-site wages. Significantly, highway construction in the past two decades had very large increases in labor productivity due mainly to the impact of new road building and earth moving equipment. Higher standards in highway design and construction, which call for more overpasses and better quality pavement, have also strongly influenced materials consumption. Steel usage was particularly affected. Thus, over the span of about 20 years, the use of steel products rose from 5 percent of total costs of highway construction to 13 percent. Similarly, the share of stone, clay, and glass products rose from 14 to 20 percent.

A second major factor in the increase from 35 to 50 percent of the materials share in State and local construction is the higher growth rates since 1947 experienced by the more material intensive nonresidential buildings category. The materials share in recent years was about 55 percent of total costs for that category as compared to 48 percent for nonbuilding construction. The more materials intensive

construction had annual growth rates varying from 7 to 13 percent, whereas the nonbuilding categories had growth rates varying from 5 to 8 percent.

A third element boosting the share of material costs for construction in general over the two decades is the increasing use of off-site fabricated materials which in effect shifts labor costs from the construction site to the factory. For example, concrete products rose considerably in importance in State and local construction while its raw materials, cement and rock products, declined in importance. In highway construction specifically, there was a relative increase in the use of ready-mix asphalt, and a decline in the share of bitumens which are mixed on site. Another example involves metal doors, windows and trim, whose share of total State and local construction outlays tripled between 1947 and 1965, as increasing substitution for lumber products took place.

Finally, as in the case of highways, the trend toward higher standards and improved design in other types of construction has also been partly responsible for the increasing relative importance of building materials. Expenditures on electrical equipment, fixtures and wiring devices have been particularly affected. The share of total expenditures for these products has increased more than three times since 1947, rising from 0.7 percent to 2.5 percent. Similarly, the share of plumbing materials almost doubled during the postwar period, reflecting the inclusion of more laboratories and drinking fountains, and the increasing pipe requirements of new buildings resulting from more one-story spreadout designs in such fast growing buildings types as schools and hospitals.

While on an overall basis materials expenditures were increasing their relative importance, some major building materials and products could not maintain their competitive positions during the past 20 years. Thus, in the case of lumber products, usage declined from about 3 to 2 percent of total construction outlays. For education, the largest building category of public construction, lumber usage declined since 1947 from 8 to about 5 percent. This shift was mainly associated with new trends in the design of schools. New designs also explain another important shift, from brick to concrete products in expenditures for schools. Brick usage declined from 5 to 2 percent of school outlays. The greater popularity of concrete products, more than doubling in usage over the years for all types of facilities is associated with the decline in brick and lumber usage. Finally, a slight decline in materials outlays occurred in iron pipe. This reflects a shift to other types of pipe particularly for water facilities construction.

C. FUTURE MATERIAL NEEDS OF PUBLIC WORKS

The projected increase of from 57 to 65 percent in the physical volume of State and local construction in 1975 over 1965 [4] does not involve the same disparity in growth trends between more material and less material intensive types of construction as during the 1947–65 period. The overall materials share in State and local construction of 50 percent will probably not increase by more than a few percentage

[4] This range relates to the alternate projections of constant dollar State and local construction activity presented in ch. 1.

points in the next decade. This relatively small increase will result mainly from design changes and a continuation of the trend toward off-site prefabrication. These developments as well as the change in the mix of the various types of construction involving the somewhat lesser importance of highway construction, will produce varied effects on the consumption pattern of individual materials. Among the various building materials, fabricated structural steel, lumber products, bitumen, and rock products should decline from 1965 proportions (table 2). Metal doors, windows and trim, concrete products, electrical equipment, and pipe (particularly concrete) should rise. Other materials should remain relatively stable.

With regard to changes in the mix of construction, the greatest rate of increase will probably be in hospital and insitutional construction, spurred by the demands of medicare and other health programs. Administrative and service building construction will also have a higher than average growth rate as expenditures continue to expand for office, fire, police, park, and recreational buildings. While the growth rate of new educational facilities is likely to be considerably below that of the 1947–65 period when the backlog of needs was particularly large, it is still expected to exceed the average growth rate for State and local construction as a whole. The growth of these building types of construction will particularly increase the proportion of total construction expenditures devoted to plumbing, heating, electrical equipment, and metal doors and trim since they are heavy users of these materials. The relative share of expenditures for fabricated structural steel products will be particularly influenced by the growth of administrative and service buildings construction which because of the office building component has a considerably higher usage factor for this material than does other construction. Some types of materials, such as cement, concrete products, pipe and aggregates will be unfavorably affected by the higher growth rate in nonresidential building construction since for these meterials they are inherently comparatively low users.

The growth of sewer construction is expected to be second only to hospitals. This growth is related to the increasing concern for the need for greater control of waste disposal and involving the expansion of Federal aid programs to State and localities for sewer construction. The rapid growth of sewer construction will tend to offset the effects of the lower usage of concrete in nonresidential buildings, since such usage in sewer is double that of the average for all State and local construction. Water construction is also expected to show an above average rate of growth, and like the sewer category will benefit from increased Federal aid. The major implication for materials use is in pipe, since sewer and water construction require from four to five times as much pipe per dollar of total expenditures as in all State and local construction.

Highways is the only category of State and local construction which is expected to have a lower than average growth rate. It will constitute a lower proportion of State and local construction expenditures. The average annual rate of increase for highways in the next decade may drop to less than half of the 8-percent average rate of growth for 1947–65. The stimulus of extensive Federal aid for highways will probably continue as in the past decade, but the satisfaction of other public works needs will receive greater priority. Nevertheless,

in 1975, highway construction will still account for the largest single share of State and local construction outlays, about two-fifths of the total in constant dollars. The rapid rise from 27 to 47 percent in the materials portion of highway expenditures experienced in the past two decades is expected to level off. A rapid rise will, therefore, not be a strong factor in shaping the overall material consumption pattern for State and local construction as in the past. In the next decade, increases in construction productivity due to advances in equipment technology are not likely to be as significant as in the past 20 years. The use of reinforcing bars, cement, aggregates, asphalt, and bitumen, those materials heavily used by highways, will reflect the relatively slower growth of highway construction by accounting for lower shares of total costs than at present.

D. THE DEPENDENCE OF BUILDING MATERIALS INDUSTRIES ON STATE AND LOCAL CONSTRUCTION

New construction activity by State and local governments in 1964 [5] accounted for about one-fourth of all new construction activity. However, for some building materials there was considerably more than one-fourth dependence by supplying industries on State and local construction (table 3). Furthermore, during the past 20 years, many industries became increasingly dependent on State and local construction, because of its above average growth rate.

TABLE 3.—*Share of shipments for new State and local construction, 20 selected materials in 1964*

[Percent of total shipments] [1]

50 percent or more	*30 to 49 percent*
Vitrified clay pipe	Bitumens
Concrete pipe	Cast iron pipe and fittings
Steel reinforcing bars	Portland cement
Aggregates (rock products)	
15 to 29 percent	*5 to 14 percent*
Fabricated structural steel	Metal doors, windows, and trim
Heating equipment	Millwork
Concrete products	Iron and steel products
Structural clay products	Steel pipe
Stone, clay, and glass products	*Less than 5 percent*
	Electrical equipment, fixtures and wiring devices
	Lumber products
	Paints

[1] Based on the value of shipments (f.o.b. plant) for new State and local construction, related to the value of total shipments, except for some materials used in highways which are based on physical ratios (cement, reinforcing steel, aggregates, and bitumens).

Source: Prepared by Business and Defense Services Administration.

The four materials for which State and local construction in 1964 consumed more than half of the output, are all primarily related to nonbuilding construction. The needs of highway and sewer construction accounted for more than half of the shipments of concrete pipe, and with water construction accounted for more than three-fifths of all shipments. Sewer construction alone provided the market for about two-thirds of vitrified clay pipe shipments. Nearly half of all aggre-

[5] At the time this analysis was made, 1964 was the latest year for which building materials industries data were available.

gates and reinforcing steel was consumed for pavement, bridges, drainage structures, and pipe in highway construction. In addition, aggregates were also extensively used for highway subbase.

Available statistical data do not make possible the determination of the proportion of shipments consumed in 1947 by State and local construction for most materials. Among the cases where comparisons between 1947 and 1964 could be made, there is only one instance where the proportion of total shipments was lower in 1964—steel pipe. This decline reflects a shift to concrete pipe for State and local use while a greater use of steel pipe materialized in private pipeline construction and in other private uses.

Cement, bitumens, reinforcing and structural steel are products which became increasingly dependent on State and local construction during the past two decades. This trend was particularly influenced by highway construction which has accounted for one-half of the constant dollar value of all nonfederally owned public works, except housing. Whereas highways consumed about 10 percent of all cement shipments in 1947, in more recent years about one-fourth of all shipments went to highways. Reinforcing steel for highway construction represented about one-fifth of all shipments of this product in 1947, but approached one-half of all shipments by the 1960's. Not only has there been a steady trend toward the use of more reinforced concrete in highways but higher standards have called for more use of reinforcing steel per unit of concrete. The use of more bridges and overpasses for highways since 1947 also nearly doubled the 15 percent of total shipments of fabricated structural steel. The dependence of bitumen on new highways is not only due to the influence of higher standards but also reflects a decline in highway maintenance and repair work relative to new construction. Thus, whereas in 1947 new highways accounted for about a fifth of bitumen shipments, by 1964 this proportion almost doubled.

The dependence of materials industries on State and local construction by 1975 is not likely to change markedly from the present. Since the rate of growth in expenditures for State and local construction is expected to be within the range of expectations for all construction, it will continue to account for about one-fourth of total new construction expenditures as it has for the past 8 years. Furthermore, technological and productivity changes in State and local public works will probably be similar to those in the private and Federal sectors so that shifts toward certain materials will be similar in all sectors. One area where the dependence pattern might change because of factors outside the construction industry is iron and steel for which demand depends more on industries other than construction. Assuming no significant shifts in other uses, it is possible that a smaller portion of steel output will be used for construction, particularly in the State and local sector.

II. Building Materials and Construction Costs

A. CAPACITY AND PRICE TRENDS

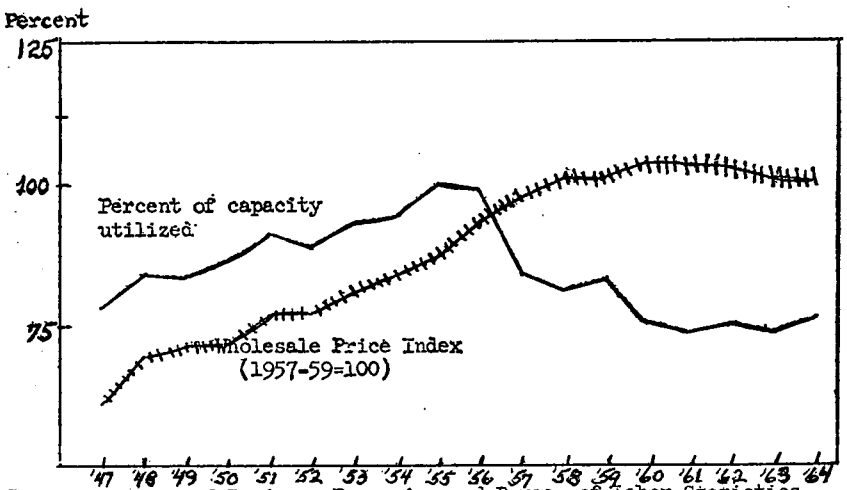
In the immediate postwar period the lifting of price controls and the rush to fill the backlog of unmet construction needs of all types, private and public, sparked a rapid increase in the prices of building materials.

On an overall basis building material prices increased by more than one-third between 1946 and 1947. This was a major factor in the upward spiral of construction costs. Plants producing building materials were operating at or very near capacity. Even these additions to capacity could not keep up with the sizable new construction growth taking place. The Korean conflict of the early 1950's put a temporary damper on capacity expansion and prices of many materials continued to rise even during the period of price controls.

The midfifties saw an upsurge in plant expansion which greatly increased capacity for most building materials industries, still operating at capacity levels. At about the same time some of the newer materials such as aluminum and prestressed concrete began to make inroads into the market of traditional products like lumber and brick. These factors contributed to halting upward price movements.

In the early 1960's many building materials industries were operating well below optimum capacity levels despite the continued growth of new construction. The roofing industry, for example, was operating only a little above half capacity. The cement industry which had tooled up in response to the soaring prospects of the new interstate highway program, expanded very rapidly in the late 1950's and early 1960's. This response seems to have been somewhat greater than was warranted by demand considerations although the need for cost cutting through modernization was an important aspect of plant expansion. Consequently, in recent years cement plants have been generally operating at a level of about three-fourths capacity (chart I). Its price movements effectively depict the imbalance between output and capacity.

CHART I. CAPACITY UTILIZATION AND AVERAGE PRICE OF PORTLAND CEMENT, 1947–1964



Source: Office of Business Economics and Bureau of Labor Statistics.

B. EFFECTS OF PRICE CHANGES ON CONSUMPTION PATTERNS AND CONSTRUCTION COSTS

Price trends for individual building materials, varied greatly during the 20-year period, but because of the dominance of private construc-

tion in affecting total demand, they cannot generally be directly related to changing use patterns in State and local construction. But the substitution of more highly fabricated materials for the purpose of minimizing onsite labor costs and the use of new, inherently less costly materials in all types of construction were factors which influenced price trends.

The average wholesale price rise for all construction materials during 1947–65 was just over 40 percent. However, it should be noted that those materials which are predominantly dependent on the State and local construction sector (table 3) did show above average price changes during the period (table 4), reflecting the more rapid growth of this sector.

Only in the case of structural steel did price rises probably have an impact on its consumption pattern. During the postwar period the prices of structural shapes more than doubled. This contrasts sharply with the price movement of a competitive material, concrete, the price of which increased by only about one-third. Although the value of structural steel increased as a share of State and local construction expenditures (table 2), the steel tonnage consumed per constant dollar of construction activity was less in 1965 than in 1947.

In order to put construction cost developments in the State and local area in perspective it is necessary to sharply distinguish between the divergent cost trends of highways, and those of all other public works.

Because of the precipitous drop-off in unit costs of highway construction between 1948 and 1950, the overall average construction cost for State and local facilities declined. This differed sharply from the cost experience for all new construction in this 2-year period. Cost decreases from 1948 to 1949 reflected the effects of the initial postwar recession. In the 1949 to 1950 recovery period the cost decrease for highways was probably associated with increases in productivity rather than with a decline in the price of materials. Unlike other types of construction, between 1950 and 1959, highway costs were subject to sharp cyclical movements, possible due to the changing mix within highway construction. Since 1960, however, highway cost trends have not differed from overall construction costs (chart II). Prices of materials used for highway construction were stable until 1965, as were the prices of most other types of building materials.

During the early 1960's materials prices going into other than highway construction were not of primary importance in the increase in construction costs which reflected mostly rising wages. The prices of all construction materials from 1961–64 were slightly below the 1957–59 level. This was a period of more than adequate capacity, rising productivity, and strong competition from new products and materials. Actually the prices of some materials such as plywood, aluminum, insulation materials and asphalt roofing dropped markedly and helped to counterbalance the strong forces which were pushing construction costs upward.

The cost of educational and hospital building saw a rapid, almost 90 percent, increase over the 20-year span, but this cannot be primarily ascribed to material price changes. The only cost stable years over this period were 1948–50, during which building materials prices, except for steel and concrete, dropped. These products, which ac-

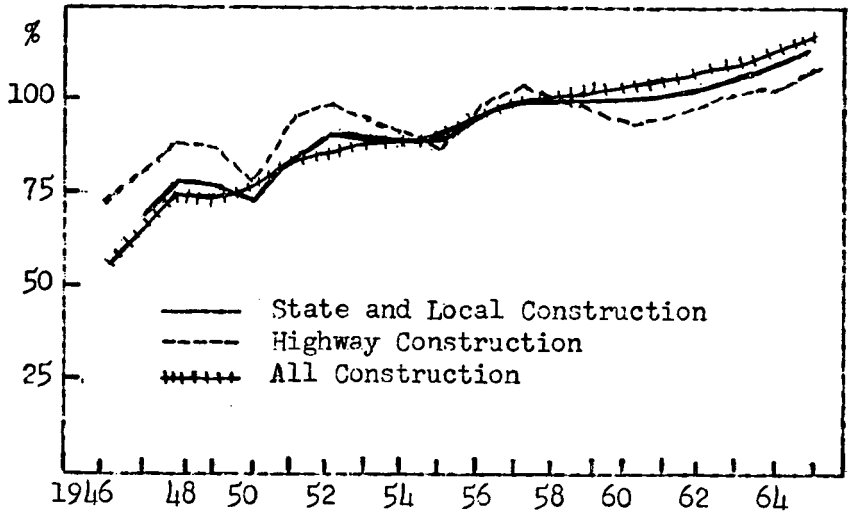
count for about 20 percent of total expenditures for building construction help explain why overall costs did not drop. Another important material in school and hospital construction, lumber, which accounts for 5 to 10 percent of total construction costs had, aside from the early postwar years, relatively stable prices during the whole 20-year period.

TABLE 4.—*Construction material price changes, 1947–65* [1]

	Total percent change 1947–65
RAPIDLY RISING PRICES [2]	
Structural steel shapes	+143
Wire nails	+115
Reinforcing bars	+107
Asbestos cement shingles	+102
Galvanized sheets	+94
Clay sewer pipe	+77
Steam and hot water heating equipment	+75
ABOVE-AVERAGE PRICE INCREASES [3]	
Window glass	+72
Portland cement	+66
Plaster, base coat	+65
Building brick	+62
Brass plumbing fittings	+62
Millwork	+61
Concrete pipe	+60
Building wire [4]	+56
Concrete ingredients	+54
Selected hardwood lumber	+46
Building paper and board	+44
Gypsum products [4]	+44
Sand, gravel, and crushed stone (rock products)	+43
BELOW-AVERAGE PRICE INCREASES [3]	
Plumbing fixtures and brass fittings [4]	+41
Gypsum lath	+41
Clay tile	+40
Gypsum wallboard	+38
Insulation board	+38
Paint	+37
Concrete products [4]	+35
Metal doors, sash and trim	+33
Enameled iron fixtures	+30
Douglas fir lumber	+29
Vitreous china fixtures	+25
Concrete building block	+25
Plate glass [4]	+24
Heating equipment	+17
Prepared asphalt roofing	+16
Southern pine lumber	+15
Warm air furnaces	+11
Asphalt floor tile	+9
DECLINING PRICES	
Plywood [4]	−5
Insulation materials	−6
Softwood plywood	−8
Nonmetallic sheathed cable	−8

[1] Based on Bureau of Labor Statistics, Wholesale Price Indexes.
[2] The prices of these materials advanced more rapidly during the period than average construction costs which were up 73 percent.
[3] The average increase for all construction materials was 42 percent.
[4] This is a group index. Some of the component materials are also given in this table.

CHART II. CONSTRUCTION COST INDEXES, 1946–1965
[1957–59=100]



Source: Bureau of Public Roads, Bureau of the Census, and Business and Defense Services Administration.

Sewer and water facilities showed a similar 90 percent increase in construction. By far the most important materials for this type of construction, produced by the stone, clay, and glass industry groups, are concrete and clay pipe. Their prices soared by 61 percent and 77 percent, respectively. Large increases in the price of steel products, which account for about 8 percent of total expenditures for these facilities, was also an important aspect of rising construction costs.

III. SIGNIFICANT TRENDS IN BUILDING MATERIALS INDUSTRIES

Output of most building materials industries over the past 20 years has been primarily geared to the needs of private construction. However, the major suppliers of rock products and some types of pipe depend mostly on publicly owned nonbuilding types of construction. The overall growth patterns of building products industries have reflected the substitution of new products for traditional materials as well as the growth and mix changes of construction activity. The impact on a large group of materials differs widely, varying from gains of over 10 percent to declines of 10 percent in average annual change in output (table 5). An example of product substitution is the displacement of radiators and convectors in favor of warm air furnaces. In the case of brick, an average growth rate of 1.7 percent a year occurred despite the substitution of other products such as concrete for traditional brick uses, mainly because of the overall increase in construction activity during the 20 years.

Technological change in construction as a whole since World War II may be characterized best as a wave of change which has been dubbed the "industrialization of building." As a craft-based and geographically fragmented industry, changes in construction technology have in general been initiated from scientifically based external industries,

in many cases the construction materials producing industries. In this connection, perhaps the most striking trend is the relative de-emphasis of on-site craft activities in favor of off-site fabrication in industrial plants. Many new factory-based power tools now produce prefabricated building products and components which formerly were made and put in place with the use of hand tools directly at the construction site. Prefinishing has increased markedly. In the case of aluminum alone, prefinishing was estimated to have tripled between 1957 and 1961. Thus major changes in construction productivity both off and on the site have taken place.

TABLE 5.—*Average annual rates of change in production of selected construction materials* [1] *(1948–63)*

Material	Unit of measure	Production		Average annual percent change
		1948	1963	
FAST GROWTH (5 PERCENT OR MORE)				
Douglas fir (softwood) plywood	Millions of square feet	1,871	9,923	+11.8
Air-conditioning systems, commercial (excluding heat pumps).	Thousands	[2] 84	152	[3] +9.7
Sand and gravel	Millions of short tons	319	831	+6.6
Floor and wall tile, glazed and unglazed.	Millions of square feet	102	266	+6.6
Galvanized sheets	Thousands of short tons	1,643	3,922	+6.0
Asphalt	Millions of barrels	51	111	+5.3
MODERATE GROWTH (0–4.9 PERCENT)				
Warm air furnaces	Thousands	777	1,414	+4.1
Concrete reinforcing bars	Thousands of short tons	1,542	2,683	+3.8
Cement	Millions of barrels	205	353	+3.7
Gypsum, wallboard, including lath	Millions of square feet	5,035	8,658	+3.7
Water heaters, gas	Thousands	1,513	2,602	+3.7
Water closets	do	3,408	5,653	+3.4
Insulating board and hardboard	Thousands of short tons	1,270	2,102	+3.4
Lavatories, total	Thousands	3,303	5,111	+3.0
Flushtanks, vitreous china	do	3,082	4,809	+3.0
Fabricated structural steel	Thousands of short tons	2,718	4,097	+2.8
Calcined gypsum	do	6,249	9,182	+3.6
Cast iron soil and pressure pipe and fittings.	do	1,809	2,590	+2.4
Paint, varnish and laquer	Millions of gallons	272	379	+2.2
Construction paper and board	Thousands of short tons	2,592	3,558	+2.1
Bathtubs, total	Thousands	1,948	2,600	+1.9
Asphalt shingles	Thousands of squares	30,026	39,521	+1.8
Brick, common and face	Millions of standard brick	5,707	7,398	+1.7
Glass, sheet (window)	Thousands of boxes of 50 square feet.	[4] 18,947	24,968	+1.7
Clay sewer pipe and fittings, vitrified	Thousands of short tons	1,433	1,750	+1.3
Steel line pipe	do	1,888	2,260	+1.2
Facing tile, glazed and unglazed (hollow).	Millions of brick	322	366	+.9
Oak flooring	Millions of board feet	832	832	+0.0
DECLINE				
Lumber, total	Billions of board feet	37	35	−.4
Water heaters, electric	Thousands	1,040	950	−.6
Asphalt roll roofing	Thousands of squares	29,913	23,610	−1.6
Gas-fired direct heating equipment	Thousands	2,084	1,218	−3.5
Ponderosa pine doors	do	4,091	1,986	−4.7
Insulated sidings, all types	Thousands of squares	2,560	852	−7.1
Structural clay tile	Thousands of short tons	1,271	377	−7.8
Asphalt siding	Thousands of squares	3,280	794	−9.0
Radiators and convectors	Millions of square feet	60	12	−10.2

[1] Source: "Patterns of Output Growth," Survey of Current Business, September 1964. Measured in physical units.
[2] 1953.
[3] 1957–63.
[4] 1947.

Iron and Steel. The basic iron and steel industry is characterized by a high degree of economic concentration. In 1947, 45 percent of the output of the industry was produced by four major companies, and by the midfifties these companies accounted for more than half of the output. But in terms of fabricated products including most building products, only from one-fifth to one-fourth of the industry's output is concentrated in four companies.

In the basic steel industry there is a long leadtime between the planning stage and effective utilization of new capacity, generally more than 5 years, whereas for all manufacturing the period is shorter. Thus, the steel industry has not been able to respond quickly to capacity pressures. The long leadtime was felt in the immediate postwar years. Production from expanded plant capacity which came in the late forties was not really available until the midfifties when there was a significant increase in output.

However, the lag in increasing capacity has diminished somewhat in the last few years with the development of oxygen injection which reduces the time required for individual heats and increases open-hearth capacity by as much as 30 percent. An increase in capacity in existing plants can be obtained from capital outlays of approximately 20 percent of the cost of equivalent capacity in new plant. It has been estimated that by 1970 about two-fifths of the Nation's capacity may be basic oxygen and this may reach one-half by 1975. The implications for steel construction products are quite favorable from a cost standpoint. In addition, new welding techniques which permit production of a wider range of structural shapes also promises to reduce production costs.

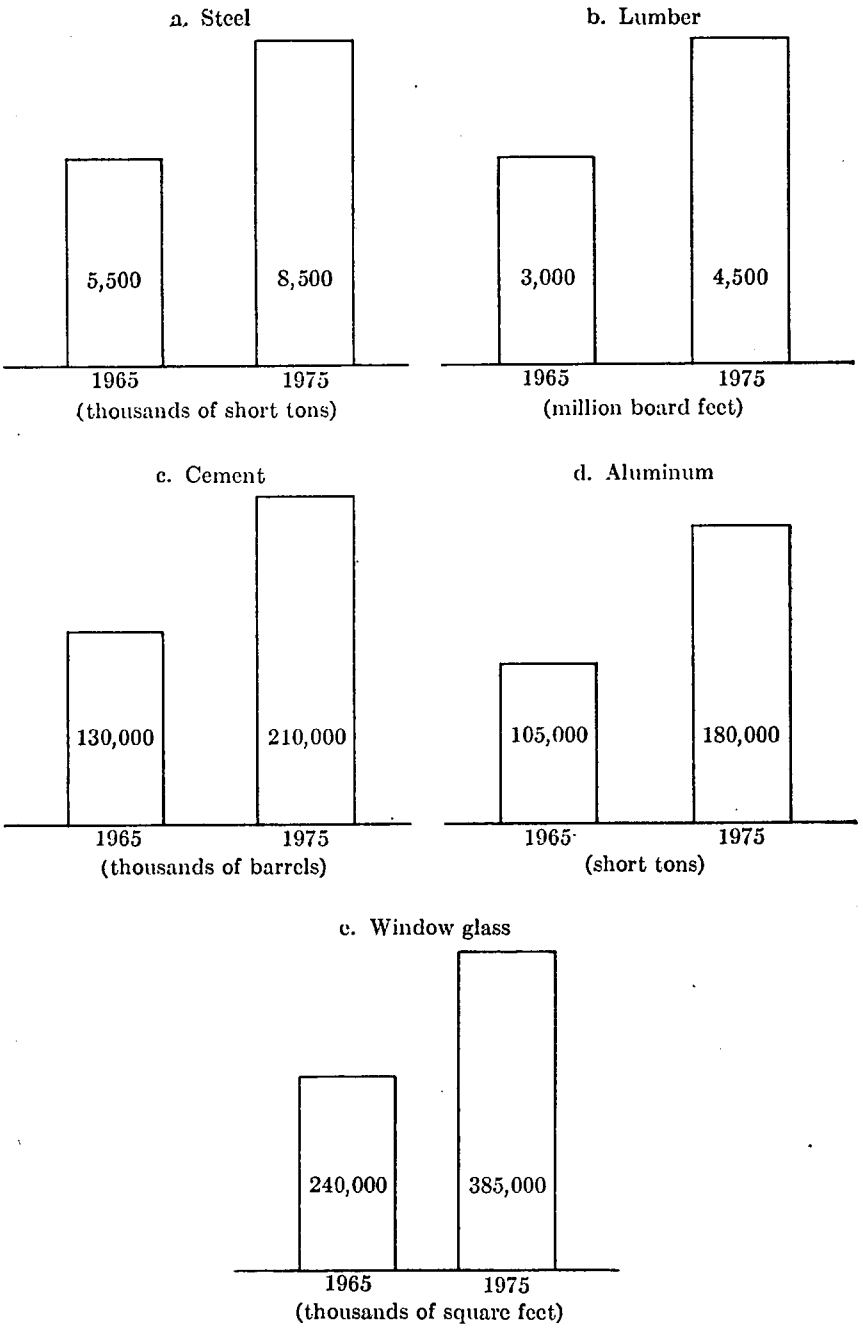
Steel. Iron and steel products will continue to be important in State and local construction although less steel may be used proportionately for structural shapes. The supply of structural steel should be adequate to meet projected construction needs, and domestic production will probably be increasingly supplemented by foreign supply which also may provide considerable price competition for the domestic industry. Another factor pointing toward an increase in steel imports, from the present 10 percent of total supply, is the rising importance of reinforced concrete. The types of steel used in this product are particularly heavy import items.

For State and local construction the growth in aggregate demand for steel will approximate 3 million tons by 1975 (chart IIIa).

Lumber Products. Since the end of World War II substitutions for lumber products have been increasingly made by a variety of other building materials, especially for structural uses (table 2). The production rate of the industry showed an average annual decline of 0.4 percent between 1948 and 1963. In nonresidential buildings the emphasis on fireproof and low-maintenance materials has also resulted in a declining use of many wood products. Although the tendency toward continued substitutions away from lumber will continue, some expansion in the use of wood in nonresidential buildings and the greater use of fire-retardant lumber may reverse this trend. Many building codes and insurance provisions have been revised to allow more use of wood.

While the consumption level of structural lumber used in State and local construction may hold up, it will continue to become a smaller proportion of total lumber used, with concrete particularly gaining more of the market for structurals (chart IIIb).

CHART III.—*Estimated total consumption of five major materials for State and local construction, 1965 and 1975*



Source: Estimated by Business and Defense Services Administration.

Plywood shipments doubled in the 10-year period of 1947–57, and subsequent to 1957 increased at a faster rate than did construction activity. Plywood's growth has been at the expense of less fabricated wood products in applications such as sheathing and subflooring.

Improvements in sawing techniques have resulted in the effective use of much formerly wasted lumber. Leftover material from sawmill operations is used for particleboard, hardboard, and other products. New processes which mold wood by compression into complex forms formerly confined to metals and plastics may also result in some new markets.

Cement. The cement industry, despite a major growth of demand for its products, which forced output to rise 5 percent annually in the postwar period has been encountering serious problems associated with overcapacity. At the end of World II, the industry found that it was somewhat hard pressed to meet the upsurge in demand. Its subsequent major expansion programs, spurred in some measure by highway construction prospects, left the industry by 1960 with much unused capacity which led to falling price levels. Import competition in some areas has also contributed to downward price movements. At the same time, intense competition was developing due partly to the technical changes which took place after the war, and to marketing changes which greatly expanded the geographical scope of the market which could be covered by an individual plant.

The modernization of existing plants and the installation of new, highly efficient equipment in new plants, greatly increased the output capability for a producing unit. Centralized control of instrumentation and the increased use of measurement devices has given the cement iudustry one of the fastest productivity growth rates of all the building materials industries. At the same time, new distribution concepts involving the utilization of low-cost water transportation, along with a system of local distribution facilities made it possible for an individual plant to serve a radius of more than a thousand rather than hundreds of miles.

Expenditures for capital investment are relatively high in the cement industry, but from a technological standpoint, entry has been relatively easy. A very important factor in encouraging entry has been the prospects of high profit to sales ratios.

There is a strong likelihood that cement demand for State and local markets will increase by 1975 by 80 million barrels (chart IIIc).

Concrete Products. The rise in demand for concrete products has grown much more rapidly than construction activity over the past two decades. This rise has been associated with an improvement in the quality of concrete over the years. Improvements have been made in cement, but a major factor has been improved aggregate selection as well as better control of mixing and placement. High strength concrete has been a large factor in high rise buildings in the postwar period. Prior to World War II 16 stories seemed to be the economic and structural limit for the use of concrete but in recent years its use in higher storied buildings is quite feasible. The increased use of concrete products also has been a factor in the average annual growth rate in the production of sand and gravel of almost 7 percent.

An important development in the industry has been the introduction of prestressed concrete. This was used extensively in Europe, but did not make much of an appearance in the United States until

the 1950's. Even by 1959, 78 percent of prestressed concrete producing plants in the United States were less than 5 years old. This growth was generated by a trend toward replacement of steel with concrete, but it is also related to the rise in prefabrication. The rise in demand for concrete products in general seems destined to far outdistance the rise in State and local construction by 1975.

Aluminum. Aluminum construction products have grown quite rapidly during the last few years because of their substitution for wood and other metals. Since 1948 primary aluminum has had an average annual growth rate of over 9 percent a year Its rapidly increasing usage in such items as windows, doors, and trim has been due to its low maintenance requirements, and increasingly important factor in the material demand picture throughout the postwar period.

Growth in aluminum demand stimulated a rapid expansion in plants in the late 1950's. Some new processes, now being developed, promise capital savings of up to 50 percent. The standard reduction process, however, is still expected to produce 90 percent of the primary output in 1975. New metal to metal and metal to nonmetal bonding methods may continue to stimulate new aluminum products for use in construction. An increase in aggregate aluminum consumption of 70,000 tons is in prospect by 1975 (chart IIId).

Other Building Materials and Products. The products of the chemical industry, aside from paints and lacquers, have come into prominent notice as construction materials since World War II. Particularly involved are plastic products. Over most of the postwar period plastics producing industries have grown at an average annual rate of almost 13 percent a year, making them the fastest growing among industries producing building materials. It has been estimated that in recent years about 18 percent of plastics output was for products used in construction. By the mid-1950's about 40 percent of these plastics were in paints, 20 percent in laminates and floor coverings, and another 20 percent in wire coatings and electrical devices. Most of the plastic products are used as substitutes for traditional materials. For example, the use of plastic flooring increased markedly at the expense of oak and maple hardwood flooring, and more recently, plastic pipe and plumbing fixtures have been competing for the markets which have been held by traditional materials.

Advances in insulation have allowed the use of thinner walls in building construction. Foamed materials, especially in glass and plastics for insulation have made possible the rise of curtain wall exteriors and prefabrication.

One of the problems in the expansion of these as well as other new products are the restrictions of local building codes. Current efforts to achieve more unified, flexible and up-to-date codes which put stress on performance rather than enumerating specific materials is a hopeful portent for the next decade.

IV. Future Prospects

The tripling in the volume of new State and local construction over the past 20 years reflects a greater emphasis in the postwar period on satisfying growing public needs rather than viewing construction primarily as an economic stimulus. Public construction volume has been dominated by two types of facilities—highway and educational.

Highway construction alone accounted for about half of State and local construction in the 1947–65 period. The predominance of materials and the development of new laborsaving equipment, which has resulted in higher productivity in this type of construction, has been a dominant factor in the increase of the materials share of public construction outlays from 35 to 50 percent over the past 20 years. In educational construction there have also been new material applications such as increasing use of prestressed concrete in place of brick.

In the next decade it is expected that there will be a further shift in the mix of State and local public works expenditures—with hospital, institutional, sewer, and water construction having the highest growth rates. Highway construction is the only major type which is expected to decrease in relative importance, although in absolute volume it will remain significantly large. These shifts will produce differing growth rates in materials usage. There will be increased emphasis on metal doors, windows, and trim, electrical equipment, pipe, and concrete products with less relative material consumption of fabricated structural steel, lumber products, bitumen, and rock products. Nevertheless, it is expected that the overall materials share of total outlays for construction will remain at about 50 percent.

In the past a steadily growing private market for building materials has been an important factor in stimulating the productive capacity which could also supply the vast volume of public works. Thus, shortages of building materials for State and local construction in the period 1947–65 have not been particularly frequent. Most of the shortages which have taken place have been the result of special factors not directly related to insufficient productive capacity. For example, shortages of structural steel were aggravated by the 1956 steel strike. Shortages of nickel in 1955 contributed to a shortage of stainless steel building sheets. Transportation problems have occasionally caused difficulties for lumbermen in supplying the eastern markets.

During the Korean conflict insufficient productive capacity did finally result in the rationing of such metals as steel and copper. Yet with some product substitution, building materials were available to support a high level of construction activity. In 1955 and 1956 at the height of the economy's investment boom, shortages in a number of building materials occurred. Structural steel and aluminum were in short supply as were gypsum products. From 1954 through early 1957 the cement industry, although expanding rapidly in response to heavy highway construction requirements, was still under pressure to meet demand. Generally, after 1956, few shortages of a serious nature seemed to exist. In 1959, during the extended steel strike, inventories were adequate to supply construction needs throughout the strike period. Construction during the first half of the 1960's seems to have been unhindered by any significant materials shortages.

To meet future increases in construction demand in both the private and public sectors it is expected that the construction and building materials industries will increase their productive capacities. Prefabrication and prefinishing have been and will continue to be important sources of promoting innovation and labor-saving devices on construction sites. This will be particularly true in the lumber and concrete products industries. The trend for prestressed concrete and

softwood plywood to be more heavily used in the place of less fabricated materials will continue. Similarly, aluminum, glass, and plastics should continue to make inroads in the market for traditional materials.

Not to be overlooked is the important role which numerous Federal Government programs will play in stimulating private as well as public construction. Furthermore, actions through appropriate fiscal and monetary policies are likely to avoid sharp swings in the economy. These factors diminish the possibility of shortage or oversupply in the steel industry which requires by its very nature, long leadtimes for the planning and building of new facilities. Since the steel industry must make expansion decisions well in advance of demand itself, it can be expected to respond to a steady growth pattern to which current and future government policy is undoubtedly pointed.

Perhaps one of the big question marks is the effects of inflationary conditions on construction. Prices of building materials have risen about 40 percent over the past 20 years. In the next decade it would not be unreasonable to expect at least a 10–15 percent aggregate rise. Such a rise could, however, reflect mainly general price movements and result from cost-push type of pressures rather than the effects of inadequate capacity.

When one considers all the factors, it is difficult to avoid the conclusion that the construction materials industries should be able to meet the needs of future construction—as they have in the past—through innovation, product development, and increased productive capacity.

APPENDIX

Data for chart I: Capacity and price of portland cement, 1947–64

Year	Capacity	Price 1957–59=100	Year	Capacity	Price 1957–59=100
1947	78	60.9	1956	99	93.2
1948	84	68.7	1957	84	98.0
1949	83	70.6	1958	81	100.5
1950	87	72.1	1959	83	101.5
1951	91	77.7	1960	75	103.5
1952	89	77.7	1961	74	103.3
1953	93	81.5	1962	75	103.1
1954	94	84.4	1963	74	101.5
1955	100	87.7	1964	76	101.0

Source: "Business Statistics, 1965," Office of Business Economics, and Wholesale Price Index, Bureau of Labor Statistics.

Data for chart II: Construction cost indexes for State and local, highway, and all construction, 1946–65

Year	BPR	State and local	Composite	Year	BPR	State and local	Composite
1946	70.7	(1)	56	1956	98.8	95.3	95
1947	80.3	69.8	67	1957	103.1	99.5	99
1948	89.8	77.2	75	1958	100.5	100.2	100
1949	86.7	76.4	74	1959	96.4	99.9	102
1950	78.3	74.6	77	1960	94.1	100.7	103
1951	96.1	83.7	84	1961	95.0	102.2	104
1952	98.9	87.4	86	1962	98.5	104.7	107
1953	95.3	88.6	88	1963	101.0	107.7	109
1954	89.9	87.8	88	1964	102.0	110.9	112
1955	87.3	87.9	90	1965	105.9	114.4	116

[1] Not available.

Source: Bureau of Public Roads, Bureau of the Census, and Business and Defense Services Administration.

Data for chart III: Estimated total consumption of 5 major materials for State and local construction, 1965 and 1975

	1965	1975
A. Steel (thousand short tons)	5,500	8,500
B. Lumber (million board feet)	3,000	4,500
C. Cement (thousands of barrels)	130,000	210,000
D. Aluminum (short tons)	105,000	180,000
E. Window glass (thousands of square feet)	240,000	385,000

Source: Estimated by Business and Defense Services Administration.

CHAPTER 3

Labor Requirements for State and Local Public Works, 1946–75*

This chapter presents estimated construction employment requirements for State and local construction activity. These estimates have been derived in the course of work done in the Bureau of Labor Statistics concerning labor and material requirements for various segments of the construction industry based on contractor's records.

To provide perspective, employment and related data for the total construction industry are also presented in this chapter. It should be noted that employment requirements for State and local government construction activity are estimates for man-years[1] while estimates for the construction industry as a whole are estimates of the number of persons employed (monthly report on the labor force) or number of persons on the payrolls of construction contractors (Bureau of Labor Statistics establishment data).

I. Employment Generating Effects of State and Local Public Works Construction

In 1947, State and local public works construction amounted to a little more than $2.5 billion and resulted in the employment equivalent of 625,000 full-time workers (man-years of employment). Currently nearly $18 billion is being expended, utilizing the equivalent of over 1,800,000 full-time workers (table 1).

TABLE 1.—*Volume of State and local public works construction and estimated man-years of employment, selected years, 1947–65*

Year	Value of construction (in millions of dollars)	Man-years of employment (thousands)				
		Total	Construction			Other[1]
			Total	On site	Off site	
1947	2,598	625	279	(2)	(2)	346
1950	5,494	1,047	451	404	47	596
1955	9,375	1,377	585	518	67	792
1960	12,829	1,570	656	586	70	914
1965	17,864	1,862	752	670	82	1,110

[1] Including workers in architectural and engineering establishments.
[2] Not available.

While dollar volume has increased about 600 percent, employment requirements have risen less than 200 percent. The lower labor requirements per million dollars for the later periods result from two

*Prepared by the Department of Labor, with minor editing by committee staff.

[1] A man-year in the construction trades was considered to be 1,800 man-hours. In other industries, it was considered to be 2,000 hours.

major factors: (1) price increase, which makes the increase in dollar volume overstate the actual increase in physical volume and (2) the increased productivity which has greatly reduced both the on-site and off-site labor requirements.

In 1947 a little less than half (45 percent) of the employment required was in the construction industry. In 1965 the construction industry proportion had dropped to 40 percent, largely reflecting the increased use of prefabrication. It is estimated that a little over half of the employment outside of the construction industry is engaged in making, selling, and transporting the material used to the construction site. The balance of the other employment is utilized in all other sectors of the economy in supplying the raw materials and services required by the construction materials and equipment manufacturing industries. The figures do not include any estimate of resulting government employment or employment generated by the respending of wages and profits which is generally called the "multiplier effect."

In general, the total employment effect of various types of construction do not vary to any great degree. At present, $1 million of almost any type of construction expenditure gives 1 year of employment to approximately 100 men. The only substantial differences in employment effect of various types of construction are in the industries and occupations affected. (See table 2.)

The construction industry gets the majority of the employment only in a few types of construction such as dredging and public housing. In most types of construction the employment created by the manufacture and distribution of the materials is greater, generally by about 25 percent or more.

The principal differences in the employment effect of various types of construction are in the manufacturing industries affected. The lumber industry, for example, is affected twice as much by school construction as for hospital construction. The three manufacturing industry groups most greatly affected by construction are: stone, clay, and glass products; primary metal industries; and fabricated metal products.

Construction trade occupations are also affected in varying degrees by type of construction. For example, three times as many plumbers are used in hospital construction as in an equal amount of home construction.

TABLE 2.—*Estimated 1966 labor requirements for selected types of construction*

Industry and occupation	Man-years per million dollars [1]									
	Private housing (1-family)	College housing	Highways	Land operations	Dredging	Schools	Federal office buildings	Hospitals	Public housing	Sewage projects
Total	99.3	102.9	101.4	92.6	107.3	100.2	102.2	100.8	105.7	103.9
Construction industry	40.4	48.8	44.7	39.3	64.1	42.4	47.2	44.0	55.2	44.2
On-site	34.6	43.7	42.3	37.5	59.1	37.3	42.1	38.6	49.3	40.8
Administrative and supervisory	1.0	1.5	4.3	4.1	3.8	1.4	2.5	1.5	1.9	3.9
Construction trades	25.4	27.8	25.3	18.9	[3] 27.7	23.9	25.4	26.3	31.4	14.7
Bricklayers	1.9	4.4	[2]			3.4	2.2	2.1	3.7	.7
Carpenters	11.9	7.3	[2]	2.4		6.8	5.3	5.1	9.4	3.1
Electricians	.9	2.9	[2]	.1		2.6	3.8	3.4	2.1	.6
Ironworkers		1.7	[2]	1.2		1.0	1.8	1.3	1.0	.8
Operating engineers	.5	.7	[2]	9.0	.7	.7	1.0	.6	1.3	
Painters	3.3	1.6	[2]	.1		1.2	.9	1.1	2.2	.3
Plasterers and lathers	.8	1.5	[2]			1.0	1.7	2.4	3.3	
Plumbers	1.8	4.2	[2]	.1		3.4	3.7	5.5	3.9	1.0
Unskilled	8.2	14.2	12.7	14.3	27.6	11.1	14.2	10.7	15.9	22.0
Off-site	5.8	5.1	2.3	1.8	5.0	5.1	5.1	5.4	5.9	3.4
Other industries	58.9	54.1	56.7	53.3	43.2	57.8	55.0	56.8	50.5	59.7
Manufacturing	27.9	32.4	29.3	22.9	24.4	31.3	30.3	31.9	26.2	33.5
Trade, transportation, and services	19.5	14.2	19.5	20.2	13.6	19.2	18.1	18.4	16.8	18.8
Mining and all other	11.5	7.6	8.0	10.3	5.3	7.4	6.6	6.7	7.6	7.4

[1] Based on 1,800 hours per man-year in construction and 2,000 hours per man-year in other industries.
[2] Data not available.
[3] All skilled workmen, including maritime.

II. Construction Industry Employment and Its Characteristics

EMPLOYMENT TRENDS

Employment in the construction industry [2] increased from 3.6 million workers in 1950 to 4.6 million workers in 1965, an increase of 28 percent. However, most of this gain occurred between 1950 and 1952 when employment rose to 4.2 million persons. Employment fell to 3.8 million in 1955 and, since then, employment has been increasing gradually, except for a few years in the early 1960's. By 1965 employment in the construction industry had reached an all-time high, and indications in early 1966 were that employment would go even higher. Increased State and local public works construction has been an important factor in the 1950–65 increase in construction employment. Construction labor requirements for State and local public works increased from 1950 to 1965 by about 300,000 man-years (table 1). However, the proportion of the total increase in construction employment attributable to State and local construction activity would be even greater than implied by the 300,000 increase in man-year requirements because the average construction worker did not work a full man-year.

The proportion that wage and salary workers make up of all workers in the construction industry between 1950 and 1965 has been relatively constant at about 70 percent. On the other hand, there was some reduction in the proportion of self-employed and unpaid family workers and an increase in the proportion of government workers.

SKILL DISTRIBUTION

Between 1958 and 1965, total blue-collar workers—craftsmen, operatives, and laborers—accounted for about four-fifths of construction industry employment during the period. Construction craftsmen alone maintained a relatively consistent 50 percent of employment in the construction industry.[3] (See table 3.) Operatives increased slightly and construction laborers declined slightly as a proportion of construction employment. In the white-collar group, clerical workers increased their share slightly. Professional, managerial, and sales workers had relatively stable shares up to 1965 when professional workers increased as a percent of construction employment and managerial workers decreased somewhat.

SELECTED SKILLED OCCUPATIONS

Because of the changing mix of construction activity and because of changing construction techniques, some construction craft occupations between 1950 and 1965 grew faster than others and some even declined. Employment of carpenters in the construction industry

[2] The construction industry includes establishments engaged in contract construction and government agencies engaged in construction and related activities such as highway maintenance and land reclamation. The contract construction industry on the other hand includes wage and salary workers in private establishments performing construction activities, including new construction and maintenance and repair, on a contract basis.

[3] The 1950 and 1960 Censuses of Population indicate that the proportion of craftsmen in the construction industry declined somewhat between these years. However, these census data are not directly comparable with the BLS data (Monthly Report on the Labor Force) because the Census of Population data are for April only, a seasonally low month for construction. Also, there are some conceptual differences between the two sources. The census data are also not comparable with data based on establishment surveys. See footnote on table 2.

was significantly lower—by 175,000. Employment of painters, paperhangers, and plasterers was also lower. On the other hand, employment of excavating, grading, and road machinery operators was more than twice as high in 1965 as in 1950. Other significant employment increases were experienced by cement and concrete finishers, electricians, and plumbers.

TABLE 3.—*Employed persons, by major occupation group, in the construction industry, 1958–65* [1]

[Percent distribution]

	Year							
	1965	1964	1963	1962	1961	1960	1959	1958
All occupations	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Professional, technical, and kindred workers	5.1	4.5	4.5	4.4	4.9	4.7	4.4	4.5
Managers, officials, and proprietors, except farm	11.1	12.4	12.9	13.2	12.3	12.2	11.9	12.1
Clerical and kindred	5.3	4.9	4.9	5.3	4.7	4.6	4.5	4.3
Salesworkers	.2	.2	.2	.2	.2	.3	.4	.3
Craftsmen, foremen, and kindred	50.4	50.0	50.8	49.7	51.0	50.4	50.3	49.8
Operatives and kindred	9.9	9.9	9.3	9.2	8.5	8.7	8.7	8.9
Service workers	.5	.5	.5	.5	.4	.5	.4	.5
Laborers	17.5	17.6	16.9	17.4	17.9	18.7	19.4	19.4

[1] The data in this table are based on household surveys. A distribution of employment by occupation based on establishment surveys indicates a somewhat smaller proportion of employed persons in the white-collar occupations and a somewhat larger proportion in blue-collar occupations, especially construction laborers.

NOTE.—Because of rounding, sums of individual items may not equal totals.

Source: Bureau of the Census and Bureau of Labor Statistics.

CONSTRUCTION EMPLOYMENT BY TYPE OF CONTRACTOR

In viewing employment trends in the construction industry, valuable insight can be gained from examining employment shifts by broad type of construction activity. The Bureau of Labor Statistics collects data for private wage and salary employees on the payrolls of general building, heavy construction, and special trades contractors. However, these data are not directly comparable with the construction employment data (from the Monthly Report on the Labor Force) discussed earlier, which are for all employees (wage and salary, self-employed, government, and unpaid family workers). Also, unlike the labor force data an employee may be counted more than once if he appears on more than one payroll.

In 1965, almost half of the workers in the contract construction division were employed by special trades contractors; about 30 percent were employed by building construction general contractors; and the remainder worked for heavy construction general contractors. (See table 4.)

Employment increased by about 80 percent in the special trades contractors major industry group between 1947 and 1965, mainly because of the increasing importance of electrical, plumbing, air conditioning, and other work usually performed by special trades contractors. Employment grew by about three-fourths in the heavy construction contractors major industry group—spurred by a fourfold increase in highway construction (in constant dollar terms), as well as increases in the construction of sewer and water systems, airports,

bridges, dams, and similar projects. Employment by building construction general contractors increased by about 35 percent between 1947 and 1965—less than half as rapidly as in the other two segments; however, employment was 5 percent lower in 1965 than in 1956, reflecting in part, a slowdown in the rate of increase in residential construction activity.

TABLE 4.—*Wage and salary employees in the contract construction industry and major subgroups, annual averages, 1947–65*

[In thousands]

Year	Contract construction		General building contractors		Heavy construction		Special trade contractors	
	All employees	Construction workers	All employees	Construction workers	All employees	Construction workers	All employees	Construction workers
1947	1,982	1,759	762.0	689.0	363.0	321.0	857.0	749.0
1948	2,169	1,924	837.0	756.0	389.0	343.0	944.0	825.0
1949	2,165	1,919	809.0	731.0	401.0	354.0	955.0	834.0
1950	2,333	2,069	875.0	791.0	419.0	370.0	1,039.0	908.0
1951	2,603	2,308	991.4	895.8	461.6	407.0	1,149.6	1,005.2
1952	2,634	2,324	983.2	882.3	481.4	423.6	1,168.8	1,018.2
1953	2,623	2,305	969.2	863.3	480.1	426.7	1,174.0	1,015.2
1954	2,612	2,281	937.1	832.0	471.0	418.7	1,203.5	1,030.5
1955	2,802	2,440	997.2	880.1	483.8	429.7	1,320.8	1,130.1
1956	2,999	2,613	1,074.6	950.4	556.7	493.4	1,367.6	1,168.8
1957	2,923	2,537	986.8	866.2	576.0	512.9	1,360.6	1,158.2
1958	2,778	2,384	893.6	775.2	564.6	498.1	1,320.2	1,110.3
1959	2,960	2,538	959.0	834.4	586.5	516.8	1,414.1	1,186.9
1960	2,885	2,459	908.4	785.4	585.7	511.5	1,390.7	1,162.3
1961	2,816	2,390	874.9	752.6	583.3	505.7	1,357.9	1,131.3
1962	2,902	2,462	882.1	755.8	593.1	514.8	1,426.6	1,191.8
1963	2,963	2,523	914.1	787.0	599.2	522.5	1,449.3	1,213.9
1964	3,056	2,602	956.6	823.9	610.5	526.5	1,488.4	1,251.2
1965	3,211	2,731	1,024.9	880.6	634.1	547.6	1,552.3	1,302.9

Source: Bureau of Labor Statistics.

EMPLOYMENT OUTLOOK FOR BUILDING TRADES WORKERS IN THE CONSTRUCTION INDUSTRY

Employment in the building trades is expected to increase moderately through the mid-1970's, assuming relatively full employment nationally and the high levels of economic activity needed to achieve this goal. (If the high levels of economic activity are not achieved, employment in the building trades will increase at a slower rate than that projected.) In addition to employment growth, tens of thousands of job openings will result from the need to replace experienced workers who transfer to other fields of work, retire, or die.

The moderate increase in total employment in the building trades is expected to result primarily from the rapid rise in the level of construction activity. The factors that will stimulate construction activity include anticipated large increases in population and in the number of households; a continuing shift of families from the cities to the suburbs; increases in government expenditures for highways and schools; a rise in expenditures for new industrial plant capacity; and higher levels of personal and corporate income. In addition, there will be a growing demand for alteration, modernization, and maintenance work on existing structures.

The increase in building trades employment will not be as great as the total expansion in construction activity, because continued technological developments in construction methods, tools and equip-

ment, and materials will permit increasing output per construction worker.

The rates of employment growth will differ among the various building trades. Employment growth is expected to be most rapid for structural metal workers; excavating, grading, and road machinery operators; and cement masons. Among the trades that will have a much slower growth are bricklayers, stonemasons, and marble and tile setters; painters; and carpenters.

TABLE 5.—*Estimated opening for selected craft occupations in the construction industry resulting from growth of employment requirements and from retirements and deaths, 1965–75* [1]

[In thousands]

Occupation	Employment 1965	Employment requirements 1975	Openings, 1965-75		
			Total openings	Net growth	Deaths and retirements
Carpenters	665	670	165	5	160
Bricklayers, stonemasons, and tile and marble setters	180	200	50	20	30
Cement and concrete finishers [2]	55	75	30	20	8
Electricians	165	200	65	35	30
Excavating, grading, and road machinery operators	190	265	105	75	30
Painters	285	305	95	20	75
Paperhangers	10	13	6	3	3
Plasterers	50	55	15	5	10
Plumbers and pipefitters	220	265	90	45	45
Roofers and slaters	55	65	20	10	8
Structural metal workers	40	60	30	20	8

[1] These projections were developed by the Bureau of Labor Statistics in the course of its continuing occupational outlook research program, especially its work for the 1966–67 edition of the Occupational Outlook Handbook.

[2] Includes terrazzo workers.

UNEMPLOYMENT IN THE CONSTRUCTION INDUSTRY

Since the end of World War II, unemployment in the construction industry has averaged more than twice that of all workers. Two major reasons for the higher than average rate of unemployment in the construction industry are: (1) Construction activity is affected by weather and is a very seasonal industry, especially in the less temperate parts of the country where the winter months are a slow season; and (2) construction workers have to spend time finding new jobs as individual construction projects are completed. (Construction workers may work for a dozen or more employers in a calendar year.) Over the 1948–65 period, the unemployment rate for experienced workers in the construction industry has been between 2 and 2½ times the unemployment rate for all experienced workers, except in 1953 when it was 2.7.

SHORTAGES OF CONSTRUCTION WORKERS

Because construction is cyclical as well as seasonal, the demand for construction workers rises and falls significantly over the course of the business cycle. The construction labor force is fairly flexible, with considerable movement of building trades workers between construction and other industries.[4] But, despite this flexibility, the con-

[4] See Special Labor Force Report No. 35—Job Mobility in 1961, Bureau of Labor Statistics, U.S. Department of Labor.

struction industry sometimes is not able to attract sufficient skilled workers during peak periods of demand. Short-term deficiences of skilled building trades workers are not readily alleviated through increased training activity because of the long period generally required to train skilled building trades workers. (In fact, training of apprentices may be reduced during a period of high demand to the extent that some apprentices prematurely terminate their training program because of the ease of obtaining work at the journeyman level.)

Because of the local nature of much of the construction industry, there may be shortages of skilled building trades workers reported in one region—while at the same time unemployment is higher than normal in another region. This, in combination with the ordinarily high level of frictional unemployment associated with the industry, means that shortages for building trades workers can exist even when unemployment rates for these workers are high relative to the national rates for all workers in the labor force.

Current employment data indicate growing pressures on the supply of trained construction manpower during the remainder of 1966. Employment in the construction industry in 1965 averaged 4.6 million, 2.9 percent above 1964. Conversely, unemployment for experienced workers in the industry during 1965 averaged 9.0 percent compared with 9.9 percent in 1964. The current employment rate in construction is the lowest (for comparable months) since Korea. In March 1966, the unemployment rate for experienced workers in the construction industry was 8.8 percent, considerably below the 12.3 percent in March 1965. For carpenters, the rate had fallen from 11.8 percent to 8.1 percent. For other construction craftsmen the rate had fallen from 10.3 percent to 7.8 percent. For laborers the rate fell from 22.7 percent to 15.6 percent. The most recent data indicate that laborers made up approximately one-third of total unemployed construction workers.

Currently, shortages of some building trades workers are being reported, especially in the North Central States. Trades most often mentioned as being in short supply are electrical workers, plumbers and pipefitters, ironworkers, carpenters, bricklayers, and sheet metal workers.

AGE DISTRIBUTION OF EMPLOYEES IN THE CONSTRUCTION INDUSTRY

In 1960 the median age of male employees in the construction industry was approximately the same as for all employed male workers in the American economy. One major difference was a relatively smaller proportion of construction workers employed in the very young group, 14 to 19 years of age. (See table 6.)

This lower proportion of young workers in the construction industry is probably due to regulations prohibiting employment of extremely young workers in many of these occupations in many States.

Data are not available on the age distribution of building trades workers in the construction industry; however, they are available for selected building trades in all industries. (Approximately 70 percent of all building trades workers are employed in the construction industry.) The following table presents these data plus the proportion of workers in each occupation 45 and over—a key factor in determining future replacement needs.

TABLE 6.—*Age distribution and median age of all employed males and males employed in the construction industry, 1950 and 1960 (14 years old and over)*

[Percentage distribution]

Years of age	1960		1950	
	All employed males	Employed in construction	All employed males	Employed in construction
Total	100.0	100.0	100.0	100.0
14 to 19	5.7	3.2	4.9	2.9
20 to 24	8.4	8.4	9.7	9.3
25 to 29	10.4	10.5	12.2	12.3
30 to 34	12.0	12.7	12.2	12.2
35 to 44	24.2	26.2	23.5	24.6
45 to 54	20.7	21.7	18.8	20.1
55 to 64	13.8	13.4	13.0	13.5
65 and over	4.8	3.9	5.6	5.1
Median age (years)	40.6	40.8	39.7	40.4

Source: Bureau of the Census.

TABLE 7.—*Median age and proportion 45 years of age or more for selected building trades, 1950 and 1960 (males, 14 years of age or more)*

Occupation	Median age		Change in years 1950 and 1960	Proportion 45 and over	
	1950	1960		1950	1960
Brickmasons, stonemasons, and tile setters	40.4	37.7	−2.7	39.8	30.4
Carpenters	43.4	43.3	−.1	46.1	45.5
Cement and concrete finishers	41.7	40.0	−1.7	41.6	35.0
Electricians	39.2	40.8	+1.6	34.2	37.8
Excavating, grading, and road machinery operators	37.8	39.8	+2.0	25.6	34.3
Painters	43.6	45.4	+1.8	46.4	50.9
Paperhangers	49.2	50.9	+1.7	57.6	65.5
Plasterers	41.0	40.1	−.9	41.1	36.4
Plumbers and pipefitters	40.9	42.2	+1.3	38.6	41.8
Roofers and slaters	36.3	37.0	+.7	28.3	30.1
Structural metal workers	39.2	41.0	+1.8	33.8	37.0

Source: U.S. Bureau of the Census.

Seven of the eleven selected building trades shown in table 7 experienced an increase in median age between 1950 and 1960. Only two had a change of 2 or more years.

In general, the median age was highest in occupations growing slowest, or even declining, reflecting the relatively slight influx of young workers. For example, the three occupations with the highest median age in both 1950 and 1960—paperhangers, painters, carpenters—recorded employment declines during the 10-year period.

POPULATION AND CONSTRUCTION EMPLOYMENT

Trends in the contract construction industry are closely related to population growth. A growing population requires additional housing units, schools, hospitals, commercial buildings, factories, and highways. Logically, the relationship between population and construction employment would seem to be particularly close for housing, schools, and hospitals. In addition, population growth increases the need for

construction workers to perform remodeling, maintenance, and repair work.

In spite of the importance of population as a longrun determinant of changes in contract construction by State, other factors also play a significant role. Expenditures for national defense, natural resources development, highway construction, and other government programs, as well as shifts in industrial distribution, can obscure the relationship between population and contract construction employment. North Dakota, for example, ranked 3d in contract construction employment growth between 1947 and 1965, although it ranked 45th in population growth increase. Apparently the increase in construction employment was a result in large part of the increase in military prime contract awards and expenditures for construction of new plants.

Employment in heavy construction firms (who build highways, dams, pipelines, refineries, etc.), is not as dependent upon population as employment by general and special trade contractors, who are more likely to work on schools, homes, medical facilities, and perform necessary maintenance and repair.

UTILIZATION OF PUBLIC WORKS FACILITIES

Information gathered from various parts of the Nation revealed that, in the main, public facilities are being fully utilized, although there are a few instances, particularly in medical services, where utilization of facilities is below capacity because of shortages of skilled personnel, especially in the nursing profession.

Several hospitals were found to have delayed opening of additional facilities or new wings because of a shortage of nurses. The information gathered may indicate that in some instances construction of additional facilities may be delayed somewhat because hospital administrators find it difficult to staff additional facilities. However, most hospitals are required to operate and serve the community in spite of all difficulties. If necessary, this may sometimes mean lowering personnel requirements. But in hospitals, which deal with human lives, the possibility of lowering standards for doctors, nurses, etc., is extremely limited. Through the greater use of practical nurses, nurses aids, medical technologists, etc., manpower shortages have been lowered to some extent. In some States, an accelerated 2-year training program has been utilized to train associate nurses, who subsequently qualify as registered nurses.

In general, school systems seem to have much more leeway than hospitals in adjusting to personnel shortages by lowering standards. A school district faced with a pressing school population may be required to utilize all available classroom space with insufficiently accredited teachers. There is no widespread evidence that the education structures of this Nation are not being fully utilized. On the contrary, school construction expands each year throughout the Nation to meet the challenge of a growing population. In New York City, for example, the public school system has had a general shortage of accredited teachers. To solve this problem, the board of education has recruited out-of-city teachers and noneducation degree college graduates as qualified instructors.

TRAINING CONSTRUCTION WORKERS

Workers who entered the construction industry between 1946 and 1965 acquired their skills in a variety of ways. Workers whose skills are not unique to the construction industry, such as accountants, draftsmen, bookkeepers, office machine workers, and secretaries received their training in much the same way as these workers in other industries; for example, through training in high schools, colleges, business schools, correspondence schools, and on-the-job instruction. Although construction craftsmen are employed in nearly every industry, more than 70 percent are employed in the construction industry and their training is more specifically oriented to that industry than the training of the workers referred to above.

Table 8, based on a BLS survey for the Office of Manpower Training and Automation,[5] shows the ways in which construction craftsmen (as of April 1963) learned their skills and what ways they thought most helpful. Formal methods included technical school training, apprenticeship, and training in the Armed Forces. On-the-job learning included instruction by supervisors and fellow workers. Casual methods included learning from friends or relatives or "just picking it up." The study showed that construction craftsmen believed casual methods most important in learning their skills, on-the-job training next important, and formal methods least important. About one in nine construction craftsmen believed that apprenticeship was the most helpful way. However, the contribution of apprenticeship is probably more significant than indicated by this ratio. Most training authorities recommend formal apprenticeship training as the best way to acquire the all-round proficiency of craftsmen in the building trades. This type of training provides the apprentice with a balanced knowledge of his field of work and enables him to perform his operations completely. In large part, apprenticeship provides the highest skilled workers (who provide guidance to others) and a significant proportion of future foremen. A study of apprentices who completed their programs in 1950 found that by 1956 about 20 percent were employed as supervisors, and another 10 percent as contractors.[6] Table 9 shows the average number of apprentices per 100 active journeymen during the 1950–64 period, adn provides some indication of the extent of apprenticeship training in the construction trades between 1950 and 1964.

Table 10 shows the number of apprentice registrations,completions, and cancellations for construction craftsmen in Bureau of Apprenticeship and Training registered programs; however, not all apprentices are covered in these data.[7]

Cancellations represent a loss of potentially highly trained workers, but this loss is not as significant as it appears since many apprentice dropouts secure some training and eventually become skilled journeymen through less formal means. Indeed, many apprentices may drop their apprenticeship because of opportunity for employment at the journeyman level. The proportion of apprentices who complete their apprenticeship varies significantly by occupation. (See table 10.)

[5] U.S. Department of Labor, Formal Occupational Training of Adult Workers, Manpower/Automation Research Monograph No. 2, December 1964. Table 11, p. 43.
[6] Bureau of Apprenticeship and Training, Career Patterns of Former Apprentices, Bulletin T-147, 1959.
[7] "Training of Workers in American Industry," U.S. Department of Labor, Bureau of Apprenticeship and Training.

TABLE 8.—*All ways and most helpful way of learning current job, by current occupation, April 1963*

[Percent distribution of civilian workers 22 to 64 years old who completed less than 3 years of college]

Current occupation	Total in occupation	All ways of learning					Most helpful way of learning										Not available
							Formal training			On-the-job learning			Casual methods				
		No training needed	Formal training	On-the-job learning	Casual methods	Not available	School	Apprenticeship	Armed Forces	On-the-job instruction	Company training course	Worked way up	From friend or relative	Picked it up	Other		
Total, all occupations	100	7.5	30.2	56.2	45.4	1.6	8.7	2.0	1.2	29.6	3.6	3.9	6.0	20.4	2.5		14.6
Construction craftsmen	100	1.7	39.4	54.8	57.2	.9	4.3	11.0	2.2	24.8	.9	2.2	10.5	21.9	1.5		19.0
Brickmasons, stonemasons, and tile-setters	100	2.5	44.7	56.6	53.5	-------	6.9	12.6	-------	27.7	-------	1.3	15.1	13.2	-------		20.8
Carpenters	100	2.8	31.1	48.7	67.8	.6	2.4	7.0	2.3	21.9	1.2	2.3	14.2	28.1	1.7		16.2
Electricians	100	-------	72.9	71.2	33.4	-------	10.7	20.5	4.9	24.9	1.9	2.2	1.9	6.6	1.4		24.9
Excavating, grading, and road machinery operators	100	2.2	11.2	47.0	72.2	1.0	.6	.6	2.6	23.6	-------	3.2	8.6	40.6	3.5		14.4
Painters	100	1.9	27.8	46.9	58.7	.5	5.4	12.0	.5	22.9	.9	1.2	17.2	21.5	-------		16.5
Plumbers and pipefitters	100	.7	55.0	66.6	39.1	2.6	3.0	15.6	.7	35.1	-------	2.3	5.3	10.3	2.0		25.1
Tinsmiths, coppersmiths, and sheet-metal workers	100	-------	70.9	58.1	44.4	1.7	10.3	13.7	4.3	20.5	1.7	4.3	-------	27.4	1.7		16.2
Other construction craftsmen	100	1.1	34.1	59.1	68.8	2.3	-------	14.8	3.4	27.9	-------	1.1	9.1	17.0	1.1		24.4
Cranemen, derrickmen, and hoistmen	100	1.7	17.5	60.0	49.2	1.7	-------	-------	7.5	35.0	4.2	4.2	5.8	23.3	3.3		15.0

Source: U.S. Department of Labor, Formal Occupation Training of Adult Workers Manpower/Automation Research Monograph No. 2, December 1964.

NOTE.—Since some persons indicated more than 1 way, sums of ways, when added to "No training needed," exceed 100 percent.

TABLE 9.—*Average ratio of apprentices per 100 active journeymen for selected occupations 1950–1964* [1]

Occupation	Average 1950–64
Bricklayers	7.4
Carpenters	4.3
Electricians	13.2
Iron Workers	5.0
Painters, paperhangers, and glaziers	3.3
Plasterers and cement masons	6.8
Plumbers and pipefitters	10.2
Roofers	12.3
Sheet metal workers	12.7

[1] Based on the number of journeymen working or available for work, to the number of persons working under apprenticeship agreements.

Source: Bureau of Apprenticeship and Training, based on data collected by the Bureau of Labor Statistics from building trades unions in 52 cities with 1950 populations of 100,000 or more.

TABLE 10.—*Registered apprentices in training, new registrations, completions, and cancellations, 1952-64*

Year	In training on Jan. 1—	New registrations [1]	Completions	Cancellations [2]	In training on Dec. 31—
1952	77,920	33,316	15,679	18,756	76,801
1953	76,801	37,102	13,523	18,393	81,987
1954	81,987	34,238	15,537	18,951	81,737
1955	81,737	47,238	13,444	14,632	100,899
1956	100,899	42,873	14,588	16,565	112,619
1957 [3]	114,166	38,506	17,344	24,466	110,862
1958	110,862	34,485	20,255	16,278	108,814
1959	108,814	37,894	21,067	18,942	106,699
1960	106,699	33,939	16,656	21,019	102,963
1961	102,963	33,446	17,251	18,407	100,751
1962	100,751	36,994	16,477	18,222	103,046
1963	103,046	36,763	15,559	17,337	106,913
1964	106,913	38,556	16,286	19,347	109,836
1965	109,836				

[1] Includes reinstatements.
[2] Cancellations are not synonymous with "dropouts," since they included layoffs, discharges, out-of-State transfers, upgrading within certain trades, and suspensions for military service, as well as voluntary "quits."
[3] Lathers included for the 1st time, no prior reports for this trade.

Source: U.S. Department of Labor, Bureau of Apprenticeship and Training.

TABLE 11.—*Apprenticeship completions and cancellations in selected building trades, 1964*

Occupations	Completions	Cancellations [1]
Construction trades	16,286	19,347
Brick, stone, and tile workers	1,369	1,692
Carpenters	2,882	6,255
Cement masons	222	276
Electricians	3,887	2,526
Glaziers	266	182
Iron workers	732	755
Lathers	240	502
Painters	770	1,711
Plasterers	267	223
Plumbers and pipefitters	3,101	1,697
Roofers	282	1,500
Sheet metal workers	1,742	1,340
Construction workers, not elsewhere classified	526	688

[1] Cancellations are not synonymous with "dropouts," since they include layoffs, discharges, out-of-State transfers, upgrading within certain trades, and suspensions for military service, as well as voluntary "quits."

The Manpower Development and Training Act of 1962 provides institutional and on-the-job training programs for unemployed, employed but underskilled, and partly employed workers. MDTA training in the building trades occupations, cumulative to December 1965, has provided training and/or retraining to nearly 11,000 construction workers (see table 12). Training is at the entry level (preapprenticeship) or represents an upgrading of skills. For example, 400 journeymen operating engineers and 120 carpenters in California were upgraded in new skill requirements of their trades during 1965. Apprentice-entry bricklayer training programs were started to prepare 300 workers in Georgia and 160 workers in the District of Columbia as apprentice-entry bricklayers.

TABLE 12.—*MDTA training in the building and construction trades occupations, 1962 through 1965*

Occupation	Institutional		On-the-job	
	Projects	Trainees	Projects	Trainees
Total	289	9,045	84	1,674
Bricklayer	41	1,069	12	588
Bulldozer operator	2	48		
Cabinetmaker	24	596	16	139
Carpenter	90	2,333	20	462
Cement finisher	11	341	2	20
Concrete mixer operator			1	2
Electrician	29	694		
Glazier			2	2
Heavy equipment operator			2	8
Structural steelworker	4	172		
Ornamental ironworker			8	132
Painter	12	320	5	36
Pipefitter [1]	13	1,613	3	180
Plumber	17	341		
Power shovel operator	1	16		
Sheet metal worker	41	1,446	13	105
Tile setter	3	41		
Truck crane operator	1	15		

[1] Includes pipefitters trained in ship and boat industry.

Source: U.S. Department of Labor.

The most obvious point that emerges for data on training of construction craftsmen is that it takes place on the job. Even formal apprenticeship combines on-the-job instruction with classroom work. Obviously, construction contractors and unions play a key role in training the future supply of skilled workers, even when through informal means.

III. TECHNOLOGICAL DEVELOPMENTS IN THE CONSTRUCTION INDUSTRY

The Bureau of Labor Statistics has recently prepared a report on the technological developments in 40 important industries.[8] Included in the report are the following statements of technological trends in the construction industry.

"Continuing increases in the size, capacity, power, speed, and durability of earthmoving equipment, such as trucks, tractors, scrapers, and shovels are resulting in the moving of many times the amount of material than was previously possible."

[8] "Techological Trends in Major American Industries," Bureau of Labor Statistics, Bulletin 1474, issued 1966.

"*New portable construction equipment and handtools are increasingly being introduced.*—This equipment, used in all types of building construction to reduce unit labor requirements, job costs, and completion time, includes power trowels, paint and plaster spraying guns, power nailing and stapling machines, and motorized wheelbarrows."

"Improvements in forklift trucks, conveyor belt systems, motorized wheelbarrows, pneumatic pipe systems, and conventional cranes are facilitating the moving and handling of construction materials."

"Another important development in material handling is the tower crane. Especially useful in the construction of tall buildings, tower cranes can be used to deliver material to any part of the top of a tall building—not just near the edge as do conventional crawler cranes—and to hoist material to greater heights. Because tower cranes can be used to deliver material where it is required, labor crews normally needed to shift material about when using conventional cranes are significantly reduced."

"*Significant advances continue to be made in paving.*—Major advances in both asphalt and concrete paving, which are improving the quality of highways and reducing unit labor requirements, construction costs, and completion time of construction jobs, include more portable and automatically controlled mixing plants; larger capacity and higher speed transit mix trucks; and more automatic, electronically controlled grading and paving machines."

"Still another significant advance in concrete paving is the slipform method which eliminates the fixed side forms used in conventional paving. Instead, forms are a part of the paving machine (slip-form paver) and slide forward with it leaving the concrete slab edges unsupported. This method of paving reduces costs by eliminating the need for crews to erect and remove forms."

"*Standardization of dimensions of construction materials and in design (modular coordination) decreases labor and material requirements.*"

"This system, utilizing a standard unit of measurement of 4 inches and its multiples, also is gaining in use in commercial construction."

"*The trend toward prefabrication (preassembly of building components in manufacturing plants) will accelerate.*"

"Prestressed concrete structural elements used for larger buildings and heavy construction, such as beams, roof and floor slabs, columns, and pilings, may increase by 150 percent between 1964 and 1970."

"Among the major factors contributing to this advancing trend toward prefabrication are the significant savings possible in time, materials, and onsite labor requirements, the higher degree of quality control possible in factories, and the greater opportunities fof economies of large-scale production and mass-production techniques in construction. For example, a carpenter can install a complete prefabricated door (prehung in its frame with hardware attached) in about one-tenth to one-sixth of the time usually required to hang a door in the conventional manner."

"*New and improved materials continue to reduce significantly material and labor costs.*—By 1970, new products introduced during the decade of the 1960's are expected to account for a substantial portion of all building products sold in this country, reflecting the continuing advances in plastics, steel, concrete, paints, and other materials."

"Prestressed concrete products, expected to double in sales by 1970 offer considerable labor and other cost savings in many uses. Developments in structural design using high strength steel products can reduce the frame weight of buildings by as much as one-half in some instances, thereby resulting in significant material and labor cost savings."

"New paints require less on-site preparation, flow more smoothly, go on in fewer coats, and last longer, thus reducing costs and substantially reducing maintenance requirements. Adhesives are being more widely used to save time and reduce costs in floor bonding, exterior wall section fabrication, and in drywall erection."

"*Improvements in design are continually being made.*—New concepts of architectural and engineering design make possible cost savings and productivity increases. More than a dozen new structural design concepts—all directed toward the economical utilization of space, materials, and the lowering of costs—have emerged since 1945."

"*New systematic scheduling techniques are gaining acceptance among large contractors on complex projects.*—Techniques such as the program evaluation and review technique (PERT) and the critical path method (CPM), particularly when used in conjunction with electronic computers, significantly improve management's

capability to plan, schedule, coordinate, and monitor all steps involved in the completion of a complicated construction project. Basically, PERT and CPM are systems for charting the work flow of an entire construction project in detail."

The greatly expanded expenditures for construction by State and local authorities have more than offset the increased productivity resulting in a steady rise in employment in this sector of the construction industry.

Since increased efficiency in the production of any material is frequently accompanied by a greater use of that material, the net effect is to offset the disemployment effect of the increased efficiency. For example, the technological changes in the preparation and use of concrete has actually created an increased demand for concrete workers.

It is important to note that the decreased use of certain materials does not always mean a reduction in the number of workers traditionally employed with that material. For example, carpenters frequently install materials which have replaced wood in the modern structures.

IV. Outlook for Labor Requirements for State and Local Public Works, 1966–75

Projections of construction volume for 1975 have been prepared by the Department of Commerce based on two different unemployment rate assumptions. Projection A assumes a 3-percent and projection B a 4-percent unemployment rate for the total labor force. Both of these projections are also dependent on specific assumptions of GNP, personal income, government expenditure, and other factors discussed elsewhere in this analysis.

Projection A assumes a 133-percent increase in current dollar value of such construction reaching $41.7 billion in 1975. Projection B anticipates $36.6 billion of State and local construction, more than double the current rates. The constant dollar estimates for the two projections are $26.3 billion and $25.0 billion.

Allowing for increased productivity, it is estimated that 2,802,000 full-time workers will be needed in 1975 for this work under projection A, and 2,744,000 under projection B.[9] Thirty-eight percent of these (1,070,000 and 1,048,000, respectively), would be needed in the construction industry and the balance in sectors supplying the necessary materials and service.

For on-site construction workers, the estimated man-year requirements for State and local construction are shown in table 13.

[9] The ratio of constant dollar value for A over B is higher than that ratio for employment since the increased growth of A would presumably increase productivity.

TABLE 13.—*On-site employment requirements for State and local public construction, selected occupations, 1950–75*

Occupation	Thousands of man-years			
	1950	1960	1975A	1975B
Carpenters	46	55	73	72
Plumbers	15	20	33	32
Masons	13	20	32	31
Electricians	9	16	32	31
Steel workers	9	13	22	22
Cement finishers	5	10	21	21
Sheet metal workers	5	7	11	11
Painters	5	6	8	8
Plasterers	4	4	8	6
Lathers	3	4	6	6
Operating engineers	66	109	165	162
Unskilled	157	206	307	301
Other	44	68	156	153
Total	378	537	874	856

PART II. PUBLIC FACILITY CATEGORIES

CHAPTER 1

Regional and River Basin Water Supply Systems*

INTRODUCTION

This chapter describes the present situation of storage for municipal and industrial water supply purposes in reservoirs constructed by the Corps of Engineers of the Department of the Army, the Bureau of Reclamation of the Department of the Interior, and the Soil Conservation Service of the Department of Agriculture. In each instance, the reservoirs are the result of dams built for multiple-purpose control of the waters of river basins or other significant drainage areas. Therefore, the dams may involve flood control, hydroelectric power, flow regulation for navigation and pollution control, irrigation, recreation, and fish and wildlife habitat as well as municipal and industrial water supply and other purposes.

Only storage is usually provided for the water supply purpose. Pumps, transmission lines, and treatment works must usually be furnished by municipalities or firms using the water. The storage is authorized by several Federal acts as noted below. In a few cases transmission works and pumps have been provided; but treatment works, like for the District of Columbia, are very exceptional.

Until recently there has been no call for a systematic effort by the Federal Government to appraise the total national status and need for municipal and industrial water supplies. Present Federal legislation, generally, is designed only to assure that municipal and industrial water supply is considered when Federal agencies plan dams for river basin development. However, the Water Resources Planning Act of 1965 now calls for a unified and systematic effort among the Federal agencies and the States to meet all water needs, including water supply. The act requires a biennial appraisal of the demand and supply situation for water for all purposes on a regional and drainage-area basis. Furthermore, the act provides financial assistance to the States to improve their water resources planning including that of municipal water supply. In addition, the Water Resources Council coordinates the efforts of the Federal agencies concerned, and will cooperate with Federal-State river basin commissions authorized by the act in the preparation of comprehensive plans for water resource development by river basins and major regions. The present schedule for the preparations of comprehensive water and related land resource river basin plans calls for the entire Nation to be covered by 1972.

These efforts of the Water Resources Council, related Federal agencies, and the States are designed to produce a systematic appraisal of the municipal water supply situation for the Nation to the year 2000. Uutil that task is further along, the following information indicates the situation as it is known today as regards the provision of municipal and industrial water supplies in reservoirs con-

*Prepared by the Corps of Engineers, Department of the Army; Bureau of Reclamation, Department of the Interior; and the Soil Conservation Service, Department of Agriculture, with minor editing by committee staff.

structed under the programs of the Corps of Engineers, Bureau of Reclamation, and the Soil Conservation Service.

Department of the Army: Corps of Engineers

A. Nature and Composition of Public Work or Facility

In 1948, the Corps of Engineers initiated a program of providing municipal and industrial water supply storage in reservoir projects. The water so stored is made available to States, municipalities, private concerns or individuals in accordance with specific legislation.

For the existing capital plant in the United States, provided by the Corps of Engineers, see table I, "Water supply storage as of June 30, 1965."

Table I.—*Water supply storage as of June 30, 1965*

Project in operation	Storage (acre-feet)	Local agency served
Allatoona, Ga.	13,140	Cob County-Marietta Water Authority.
Baldhill, N. Dak. (1)	69,500	Eastern North Dakota, Water Development Association.
Beaver, Ark.	108,000	Beaver Water District, Ark.
Belton, Tex.	12,000	Fort Hood, Tex.
Do.	113,700	Brazos River Authority, Tex.
Do.	247,000	Brazos River Authority, Tex.
Berlin, Ohio	19,400	Mahoning Valley Sanitray District.
Canton, Okla.	90,000	Oklahoma City, Okla.
Canyon, Tex.	366,400	Guadalupe-Blanco River Authority, Tex.
Clark Hill, Ga. and S.C.	163	McCormick, S.C.
Do.	92	Lincolnton, Ga.
Council Grove, Kans.	24,400	Council Grove and Emporia, Kans.
Dam B, Tex.	94,200	Lower Neches Valley Authority.
East Brimfield, Mass.	1,140	American Optical Co., Mass.
Fort Supply, Okla.	400	Oklahoma State Board of Public Affairs.
Ferrells Bridge, Tex.	251,100	Northeast Texas Municipal Water District.
Grapevine, Tex.	85,000	Dallas, Tex.
Do.	50,000	Park Cities, Tex.
Do.	1,250	Grapevine, Tex.
Heyburn, Okla.	1,000	Keifer, Okla.
Do.	300	Rural Water District No. 1, Creek County, Okla.
Homme, N. Dak. (1)	3,650	Grafton and Park River, N. Dak.
Hords Creek, Tex.	5,780	Coleman, Tex.
Hulah, Okla.	15,400	Bartlesville, Okla.
Do.	2,000	Oil Recovery Corp., Oklahoma.
John Redmond, Kans.	34,900	State of Kansas.
Lake Texoma, Okla. and Tex.	21,300	Denison, Tex.
Do.	16,400	Texas Power & Light Co.
Do.	1,150	Sinclair Oil & Gas Co.
Lavon, Tex.	100,000	North Texas Municipal Water District.
Lewisville, Tex.	415,000	Dallas, Tex.
Do.	21,000	Denton, Tex.
Littleville, Mass.	9,400	Springfield, Mass.
Monroe, Ind.	159,900	State of Indiana.
Mosquito Creek, Ohio	11,000	Warren, Ohio.
Navarro Mills, Tex.	53,200	Trinity River Authority, Texas.
Oologah, Okla.	38,000	Tulsa, Okla.
Do.	500	Collinsville, Okla.
Do.	5,000	Public Service Co. of Oklahoma.
Do.	2,500	Claremore, Inc., Claremore, Okla.
Do.	100	Rural District No. 1, Nowata County, Okla.
Pomona, Kans.	230	Rural Water District No. 3, Kans.
Do.	160	Pomona Reservoir Water Co., Kansas.
Proctor, Tex.	31,400	Brazos River Authority.
San Angelo, Tex.	80,400	Upper Colorado River Authority.
Sam Rayburn, Tex. (2)	1,383,500	Lower Neches Valley Authority.
Tenkiller Ferry, Okla.	300	East Central Water Authority, Oklahoma.
Texarkana, Ark. and Tex. (1)	13,400	Cities of Texarkana, Ark. and Tex.
Tom Jenkins, Ohio	5,800	State of Ohio.
Toronto, Kans.	265	City of Toronto, Kans.
Waco, Tex.	91,074	Brazos River Authority, Tex.
Do. (3)	13,026	Waco, Tex.
W. Kerr Scott, N.C.	33,000	Winston-Salem and Wilkes County, N.C.
Wister, Okla.	1,600	Heavener Utilities Authority.
Total	4,118,520	
Total (rounded)	4,119,000	

B. Costs and User Charges

The Corps of Engineers provides space in multipurpose reservoirs for water supply storage. Where necessary, facilities are incorporated in project structures to provide for the release or withdrawal of stored water for water supply purposes. This water supply storage space is sold to States, municipalities, private concerns, or individuals, who, in turn, may sell water withdrawn from the storage space to others.

The purchase price of the storage space consists of the total investment cost of specific water supply facilities, plus an allocated share of the investment cost of the joint-use facilities. Since the cost of water supply storage space varies with the cost of the structure, it is not practicable to develop a standard unit of cost. The present trend is for costs allocated to water supply storage space to be in the range of $30 to $100 per acre-foot. The Corps has no information concerning the extent to which tax resources or borrowings are used to cover the cost of purchasing water supply storage space, or the user charges for the sale of water to the consumer.

C. Trend of Capital Outlays

Between January 1948 and July 1958 about 3.4 million acre-feet of water supply, worth about $41.3 million, were placed under agreement and included in Corps of Engineers reservoirs. The Water Supply Act of 1958 (title III of Public Law 87–88) greatly expanded the authority to include water supply and, subsequent to passage of that act, agreements have been completed covering water supply storage of about 1.8 million acre-feet of storage worth approximately $87.2 million. In addition, 800,000 acre-feet of storage for which contracts have not been signed are included in projects now under construction. The trend of water supply storage contracts is shown in table II.

Table II

Fiscal year	Water supply acre-feet	Storage space agreements dollar value	Fiscal year	Water supply acre-feet	Storage space agreements dollar value
1948	16,780	$572,030	1958	637,600	$10,931,473
1949	80,351	755,000	1959	42,000	3,489,021
1950	5,800	785,000	1960	86,200	3,241,749
1951	92,500	1,671,420	1961	696,400	20,030,515
1952			1962	443,100	19,307,638
1953			1963	45,540	4,004,970
1954	606,950	6,756,360	1964	16,782	1,415,323
1955	284,200	4,705,791	1965	395,755	29,983,349
1956	251,263	2,150,000	1966	90,781	5,745,575
1957	1,383,500	13,900,000			

Construction of these projects was and is being financed with appropriated funds. The cost of water supply storage is reimbursed by the users in accordance with section 301 of the Water Supply Act of 1958.

D. Needs and Prospective Capital Outlays

It is estimated that approximately 75 million acre-feet of storage will be needed by the year 2000 to assure adequate supplies of water for municipal and industrial use. This projected need is based on expected population growth, anticipated increase in the per capita

consumption of water, and urbanization and industrialization of various sections of the country. The most critical areas of municipal and industrial water supply shortages over the next 35 years are considered to be in the Texas Gulf area and the southern California area.

It is estimated that approximately 8 million acre-feet of municipal and industrial water storage in projects could be constructed by the year 1975, assuming no budgetary or appropriation restrictions. Provision of 8 million acre-feet of water supply storage in Corps of Engineers projects by the year 1975 would require the construction of multiple-purpose projects, including projects currently under construction, having a total cost of approximately $3 billion. Of this amount, it is estimated that approximately $400 million would be chargeable to municipal and industrial water supply. If budget and appropriation actions permit full funding of the above projects and these projects are selected for construction in the order now considered optimum, the estimated portion of future expenditures allocable to municipal and industrial water supply follows:

Fiscal year	*Millions of dollars*
1968 (prior to)	117. 5
1968	34. 4
1969	36. 7
1970	34. 1
1971	33. 9
1972	39. 2
1973	36. 8
1974	37. 4
1975	30. 0

Department of the Interior: Bureau of Reclamation

A. Nature and Composition of Public Work or Facility

The role of the Bureau of Reclamation is one of planning and constructing multiple-purpose water resource developments involving such functions as irrigation, hydroelectric power, municipal and industrial water, flood control, navigation, fish and wildlife, recreation, and water quality control. These relate, generally within the Western States, to the construction of multipurpose dams and reservoirs to regulate riverflows and of the necessary conveyance facilities. Municipal and industrial water supplies are usually developed as a part of a multipurpose project, but a few projects where municipal and industrial water was by far the greatest purpose have been constructed.

The water so produced by the investment of funds appropriated by the Congress is sold to the communities on an acre-foot basis. Needs and requirements for such water are determined after close cooperation with the local entities. Such items as population growth, per capita use, water quality, future industrial growth, and alternative sources of supply are considered.

Because of the nature of large multipurpose dams and reservoirs, it is obvious that they have long economic lives, generally well in excess of 100 years. In the case of conveyance canals and associated features, their lives are somewhat less but still usually in excess of 50 years.

As of June 30, 1965, the Bureau of Reclamation had 44 projects, either authorized, under construction, or constructed, that included the function of municipal and industrial water supply. Table III

indicates the distribution of these projects by States. Except for a few isolated instances, all of these projects were built after 1941. Because of the great variation in the size and types of projects constructed, the sale of water to cities, based on a ranking of population size, varies from a few hundred people to several million.

In cases of relatively simple projects, operation and maintenance of the structures are many times a local responsibility. In those instances where large, complex, multipurpose developments are involved, particularly those including hydroelectric power, the operation and maintenance are performed by the Federal Government. The Bureau of Reclamation, however, maintains title to these projects and, therefore, the ownership remains with the Federal Government.

As of June 30, 1965, the total Federal investment (costs allocated to the municipal and industrial function) was in excess of $400 million.

B. Costs and User Charges

Again because of the highly variable nature of these projects, the range of typical construction costs allocated to municipal and industrial water varies from a few thousand dollars to many millions of dollars. Likewise, the range in operation and maintenance expenses is highly variable, depending upon such things as economic and physical desirability of the damsite, whether only storage is involved, or whether both storage and conveyance are provided.

The construction and operating costs of these multiple-purpose water resource projects are allocated to the several functions served by the project, using an interdepartmentally approved method of cost allocation. Current reimbursement policy requires that the investment costs allocated to municipal and industrial water supply be returned by the water users to the Federal Treasury with interest within 50 years. Under certain conditions, interest may be waived for a period up to 10 years on a portion of the storage investment costs allocated to municipal and industrial water supply. The water users are also required to pay the annual operating costs allocated to municipal and industrial water supply. Under current policy execution of a repayment contract with the water users for repayment of costs allocated to municipal and industrial water supply is required before construction of the multiple-purpose project is initiated. As a minimum, water rates are set at a level which insures the return of the allocated investment costs with appropriate interest within 50 years and covers the annual operating costs. Water rates may be set at a higher level if such revenues are required to assist in the repayment of project costs allocated to irrigation. However, under no circumstances would the rate be set at a level that would exceed the cost of water if that water were developed by the most likely alternative which would be constructed in the absence of the Federal multiple-purpose project.

C. Trend of Capital Outlays

Capital outlays for municipal and industrial water supply facilities made by the Bureau of Reclamation have increased from about $5 million in 1946 to over $35 million in 1965. The annual amounts are shown in table IV. These annual outlays are the proportion of annual construction expenditures for multipurpose projects which are

properly allocable to the furnishing of municipal and industrial water. After 1961 the amounts shown in table IV contain appropriations for operation, maintenance, and replacement costs associated with Federal operation. The pattern of expenditures has not been in response to any overall program to meet municipal and industrial water needs as such but rather to meeting the municipal and industrial water demands of particular service areas of projects authorized to serve as many purposes as can economically be accommodated.

D. Needs and Prospective Capital Outlays

That municipal and industrial water needs will increase in nearly all areas in the future is a foregone conclusion. That there will be an increasing amount of municipal and industrial water in connection with multiple-purpose project development seems equally certain. In special cases it may become necessary to build single-purpose projects to provide municipal and industrial water supplies. Table V shows the expected future expenditures for capital outlays which may be allocable to municipal and industrial water service. These estimates are based upon presently authorized or planned projects and expected construction schedules over the next 10 years.

Table III.—*Number of projects containing municipal and industrial water service features*

State:	Number of projects
Washington	1
Oregon	1
California	8
Arizona	1
New Mexico	1
Wyoming	2
Montana	4
Colorado	1
Utah	7
Nevada	1
North Dakota	1
South Dakota	5
Kansas	4
Texas	2
Oklahoma	4
Idaho	1
Total	44

Table IV.—*Portion of annual expenditures allocable to municipal and industrial water service*

Fiscal year:	Millions of dollars
1946	5.5
1947	2.0
1948	2.0
1949	4.9
1950	9.1
1951	8.6
1952	8.1
1953	6.0
1954	4.6
1955	6.4
1956	5.8
1957	6.8
1958	11.4
1959	12.6
1960	9.1
1961	10.3
1962	15.1
1963	22.6
1964	37.6
1965	35.3

Table V.—*Estimated portion of future expenditures allocable to municipal and industrial water service*

Fiscal year	Millions of dollars
1966	34.1
1967	33.5
1968	24.7
1969	36.7
1970	50.3
1971	78.5
1972	65.3
1973	61.0
1974	57.0
1975	53.0

Department of Agriculture: Soil Conservation Service

Pursuant to the Flood Control Act of 1944, as amended and supplemented, and the Watershed Protection and Flood Prevention Act (Public Law 566—83d Cong.), as amended, the Department of Agriculture cooperates with the States and their political subdivisions in a program to prevent erosion, floodwater, and sediment damages in the watersheds of rivers and streams and to further the conservation, development, utilization and disposal of water. Although watershed protection and flood prevention are basic objectives in watershed projects, other purposes, essential to meeting the watershed community needs, are included in the work plan whenever they can be justified and the local sponsors decide they should be included. These other purposes are improved agricultural drainage, irrigation, public recreational or fish and wildlife developments, water quality control, and municipal or industrial water supply.

The work under the Flood Control Act is carried out in 11 authorized watersheds embracing some 31 million acres in 12 States, whereas authority under Public Law 566 is nationwide. The Soil Conservation Service has general responsibility for administering these programs, except for loans and the repayment of advances. Administration of these provisions is the responsibility of the Farmers Home Administration.

Specific authority to include provisions for municipal or industrial water supply in watershed projects is contained in Public Law 1018, 84th Congress. Included in that legislation also were provisions authorizing the Secretary of Agriculture to make loans or advancements to local organizations to finance the local share of costs of carrying out works of improvement included in watershed projects.

Public Law 87–703, September 27, 1962, amending the Watershed Protection and Flood Prevention Act, authorized the Secretary of Agriculture to advance funds to local organizations for developing water supply for future use in watershed projects. This authority is the same as the Secretary of the Army and the Secretary of the Interior has under the Water Supply Act of 1958 (Public Law 85–500).

A. Nature and Composition of Public Work or Facility

1. DESCRIPTION OF FACILITIES

(*a*) Works of improvement in small watershed projects include multiple-purpose reservoirs for flood prevention, municipal or industrial water supply, irrigation, and fish and wildlife or recreational use. Additional features that may be included as project measures for municipal or industrial water supply are limited to intake and outlet works which are an integral part of the reservoir structure and raw water supply lines leading to a treatment plant. Water treatment plants and distribution systems are not eligible for assistance.

(*b*) Water supply is provided for rural and urban communities for residential, commercial, and industrial use.

(*c*) Water supply needs for municipal or industrial use are determined by the sponsoring organization's staff or private consultant and are based on an evaluation of present and foreseeable needs, adequacy of yield from the watershed drainage area, water quality, and cost comparisons with alternative sources.

(*d*) Multiple-purpose water supply reservoirs normally have a design life of 50 to 100 years based upon the expected sediment accumulation in the reservoir.

2. EXISTING CAPITAL PLANT IN THE UNITED STATES

(*a*) As of June 30, 1965, a total of 31 reservoirs, incorporating nearly 112,000 acre-feet of water supply storage for municipal or industrial use, had been constructed in watershed projects under authority of Public Law 566 or the Flood Control Act of 1944. Thirteen additional reservoirs, having an aggregate municipal and industrial storage capacity of 36,455 acre-feet, were under construction on that date. Watershed work plans had been completed which provide for 79 more reservoirs having a combined municipal and industrial storage allocation of 131,255 acre-feet.

(*b*) Reservoirs completed and in operation on June 30, 1965, are distributed in 12 States as shown in table VI. Reservoirs under construction are located in 10 States. The 79 structures for which plans have been made but not yet under construction represent projects in 24 States.

(*c*) The distribution of these facilities by size of community served is shown in the following tabulation:

Status as of Jan. 30, 1965	Size of community served				
	50,000 to 999,999	10,000 to 49,999	2,500 to 9,999	Under 2,500	Total
Completed (in operation)		7	12	12	31
Under construction	1	2	7	6	16
Planned		13	21	45	79

(*d*) Of the 31 reservoirs in operation, 5 were completed in the late 1950's and the balance since 1960.

(*e*) Water supply facilities installed as integral parts of small watershed projects are owned, operated and maintained by cities, counties, towns, special districts, public authorities or other local public bodies.

(*f*) The estimated current value (end of 1965) of the municipal or industrial water supply storage in the 31 completed reservoirs is approximately $6,500,000.

B. Costs and User Charges

1. CONSTRUCTION COSTS AND OPERATING COSTS

(*a*) *Construction costs.*—A cost analysis of the 126 reservoirs planned to date under the watershed program shows that the cost per acre-foot varies widely. This is due to differences in site conditions and size of reservoir. As might be expected, the unit cost generally is greatest for the smaller reservoirs. The following tabulation illustrates this relationship:

	Size, acre-foot	Cost per acre-foot
79 reservoirs	0 to 999	$141.20
47 reservoirs	1,000 to 9,999	114.86
7 reservoirs	Over 10,000	55.30

(*b*) Local sponsoring organizations, qualified by State law, assume full responsibility for operation and maintenance of municipal and industrial water supply facilities installed under the watershed program. Consequently, only limited information is readily available upon which to determine annual maintenance and operating expenses. From a limited sample of the projects, for which some information is available, estimated operation and maintenance costs range from less than $10,000 to about $50,000 yearly depending upon the size and complexity of the facility.

2. USER CHARGES

As in the case of operation and maintenance costs, only limited data are available on user charges. Therefore, we are not in a position to state the extent to which user charges cover services, operation and maintenance costs, or liquidation of the indebtedness.

C. Trend of Capital Outlays

1. The following tabulation shows the annual accomplishments since provisions for municipal or industrial water supply were included in the watershed program:

Year	Number of reservoirs with municipal and industrial water supply completed	Capital investment (non-Federal)
1957–59	6	$2,084,658
1960	1	3,880
1961	4	1,335,847
1962	4	162,628
1963	5	587,029
1964	8	1,706,856
1965 (to June 30, 1965)	3	409,152

2. All of the capital outlays listed above were accounted for by cities, counties, towns, special districts, public authorities, or other local public bodies.

3. The source of financing for these capital outlays was distributed as follows:

	Percent
Appropriations from tax resources and borrowing in municipal bond market	59
Federal Government grant assistance (ARA)	5
Borrowing from the Federal Government (Farmers Home Administration)	36

D. Needs and Prospective Capital Outlays

1. (*a*) In projecting the needs and prospective capital outlays during the decade 1966–75, consideration was given to such factors as the current backlog of unmet needs, expanding population and increasing per capita consumption, greater industrial needs, and recognition by a growing number of communities of the opportunities afforded by participation in the watershed program.

(*b*) The estimated capital requirements to be met by sponsoring organizations for municipal or industrial water supply facilities installed

in watershed projects are as follows: 1966 fiscal year, $3.2 million; 1967 fiscal year, $11 million; 1968 fiscal year, $12.7 million; 1969 fiscal year, $14.3 million; 1970 fiscal year, $16 million; 1971 fiscal year, $17.8 million; 1972 fiscal year, $19.7 million; 1973 fiscal year, $21.5 million; 1974 fiscal year, $23.5 million; and 1975 fiscal year, $25.5 million.

(*c*) It is expected that these facilities will be provided to different size communities in the following proportions:

	Percent
Over 50,000	1
10,000 to 50,000	17
2,500 to 10,000	32
Under 2,500	50

(*d*) Based upon past experience it is expected that cities, towns, counties, special districts, public authorities, or other local public bodies will assume full responsibility for the capital outlays involved.

2. Contingent upon the availability of appropriated funds, it is anticipated that the percentage of capital outlays to be financed through Farmer's Home Administration loans will increase to approximately 50 percent. The balance would be derived from tax revenue, operating income, or sale of bonds in established municipal bond markets.

TABLE VI.—*Municipal and industrial storage reservoirs in existence or operation June 30, 1965 [constructed under authority of Public Law 566 or Flood Control Act of 1944]*

State	Community served	Storage allocated to municipal and industrial	Non-Federal cost allocated to municipal and industrial	Population served
		Acre-feet	*Dollars*	
1. Alabama	Roanoke	500	21,017	5,288
2. Arkansas	Lincoln	1,500	218,000	820
3. Arkansas	Waldron	2,100	316,600	1,619
4. Georgia	Camella	150	9,062	2,963
5. Georgia	Temple	72	3,880	788
6. Georgia	Villa Rica	445	23,712	3,450
7. Georgia	Winder	1,200	61,084	5,555
8. Georgia	Dalton	400	40,693	17,868
9. Illinois	Pittsfield	4,391	223,552	3,772
10. Kansas	Sedan	660	41,600	1,677
11. Kentucky	Lewisburg	93	13,577	512
12. Kentucky	Hopkinsville	1,757	218,350	19,465
13. Louisiana	Plain Dealing	710	79,095	1,357
14. Oklahoma	Colgate	3,000	352,721	1,689
15. Oklahoma	Wilburton	3,000	249,547	1,772
16. Oklahoma	Sallisaw	3,000	470,402	3,351
17. Oklahoma	Perry	2,125	59,010	5,210
18. Oklahoma	Chickasha	31,700	1,500,000	14,866
19. Oklahoma	Duncan	10,681	340,396	20,009
20. Oklahoma	do	14,600	323,315	20,009
21. Oklahoma	Marlow	505	97,050	4,027
22. South Carolina	Edgefield	120	15,000	2,876
23. Texas	Brady	24,000	1,012,183	5,338
24. Texas	Kaufman	1,346	17,728	3,087
25. Virginia	Albemarle County	1,600	67,873	30,969
26. Virginia	Culpeper	500	38,400	2,412
27. Virginia	Keysville	200	15,823	733
28. Virginia	Augusta County	304	116,686	37,363
29. West Virginia	Green Valley-Glenwood	241	105,000	600
30. West Virginia	Cameron	129	71,448	1,700
31. West Virginia	Keyser	960	167,415	6,192
12 States, total	Total 30 communities	111,989	6,290,050	207,328

CHAPTER 2

Public Water Supply Systems*

INTRODUCTION

The public water supply utility industry is one of the Nation's oldest industries. Its history can be traced back to colonial times to the system built in Boston in 1652 consisting of wooden pipe and conduits used to convey water from wells and springs to a wooden tank from which people could fill their water buckets. Almost a century later, in 1746, a farmer named Schaeffer piped water from his Pennsylvania farm to the community now called Schaefferstown. This was the first water supply in the United States built to serve an entire town.

Despite these early examples, public water service did not enjoy immediate acceptance. People preferred to take water from their own wells and springs. There were, for example, only 16 public water systems in 1800, and 83 in 1850. The situation changed rapidly, however, during the second half of the 19th century, so that by 1890 there were 1,878 public water supply systems serving 22,500,000 people. Today water utilities constitute one of the Nation's largest and most essential industries, serving almost 160 million people. The industry has established a record for safety, reliability, and service unmatched elsewhere in the world.

A. NATURE AND COMPOSITION OF THE WATER UTILITY INDUSTRY

1. DESCRIPTION OF FACILITIES

(a) *General Physical Characteristics*

The main components of a public water system are:

1. *Source of water supply.* Surface water sources are lakes, ponds, and streams. Water may be taken directly from a stream on a continuous basis, or a dam may be built, creating a reservoir to hold flood waters. Ground water sources are wells, springs, and infiltration galleries, wells being most commonly used for public supply.

2. *Collection works and transmission mains.* Collection and transmission works comprise intakes, pumping stations, and pipelines as necessary to collect and transport the water to the treatment plant or distribution system.

3. *Treatment plants.* Minimum treatment for sources of excellent natural quality usually consists of disinfection as a safeguard. Treatment may be much more extensive in order to produce a safe and palatable water and may include application of various chemicals together with mixing, flocculation, settling, and filtration. Other processes are employed as needed to soften the water and remove objectionable amounts of iron and manganese.

*Prepared by the American Waterworks Association, with minor editing by committee staff.

4. *Distribution works.* Distribution works include pumping and storage facilities, water mains and their appurtenances—such as valves, hydrants, service connections, and meters—all of which are needed to transport the water to the consumer, measure it for billing, and afford fire protection.

(b) *Services Rendered*

Water utilities traditionally provide water service to residential, commercial, and industrial customers, as well as for general municipal purposes. Residential uses include drinking, cooking, bathing, toilet flushing, air conditioning, laundering, and sprinkling. Commercial service is furnished to a variety of businesses, including restaurants, hotels, motels, laundries, and florists, for the same general purposes. A prime factor in attracting and keeping industry is an adequate water supply to meet such varied industrial needs as water for cooling, process use, and cleaning. General municipal service consists of public uses like street sprinkling, swimming pools, fountains, public buildings, and—most important—firefighting. Provisions for the latter represent a substantial portion of the investment in water works facilities, especially for the smaller utilities.

Depending on the type of utility organization and State and local requirements, water utilities render these services both within and outside corporate limits and on both a retail and a wholesale basis An example of wholesale basis would be the sale of water to another utility or community, which then distributes the water to its own retail customers.

An approximate allocation of water to the various categories of users is shown in table 1.

Water production

The water industry uses average daily per capita water production as a measure of output. This is calculated by dividing the total gallons of water produced or purchased by the utility (or both) during the year by 365 and then again by the total population served. This gives a figure in gallons per capita per day (gpcd).

Per capita water production is lowest for small utilities and progresses upward with increasing size of utility, as shown in table 2.

Per capita water production varies among utilities. It also varies regionally, as shown in table 3, which includes data for cities of more than 10,000 population only for the years 1950, 1955, and 1960.

(c) *Standards of Performance*

The following general standard of performance for public water supply systems is taken from a policy statement of the American Water Works Association:

> Delivered water should as a minimum meet U.S. Public Health Service Drinking Water Standards. In addition, it should be as free of objectionable taste and odor, color, turbidity and staining elements, and as noncorrosive as practicable. It should be adequate in quantity for all sanitation and other domestic uses; safe and desirable for industrial and commercial use; adequate for fire protection service, and available on an uninterrupted basis with a minimum of fluctuations in pressure.

The 1962 Drinking Water Standards of the U.S. Public Health Service prescribe requirements for drinking water and water supply systems used by carriers and others subject to Federal quarantine regulations. Most States have adopted these standards as minimum

requirements for public water supplies generally. Because the USPHS standards relate primarily to the health aspects of water, many water utilities have adopted their own higher standards to reflect the improved performance that they are able to attain in their operations. A similar step is being taken by AWWA, which is preparing goals or objectives for water utilities generally to emphasize such consumer aspects of water quality as color, taste, odor, clarity, softness, corrosivity, and staining.

TABLE 1.—*Public water supply use by category* [1]

Type of use:	*Use; percent of total*
Residential	45
Commercial	18
Industrial	32
Municipal	5
Total	100

[1] Hirshleifer, J.; DeHaven, J. C.; Milliman, J. W. "Water Supply Economics, Technology, and Policy." University of Chicago Press (1960), p. 25.

TABLE 2.—*Mean per capita production of water utilities of varying size* [1]

Population served (thousands)	Number of cities	Mean production gpcd
1 to 5	97	121
5 to 10	261	123
10 to 25	308	124
25 to 50	184	137
50 to 100	109	129
100 to 250	80	137
250 to 500	28	131
Over 500	37	147

[1] Seidel, H. F., and Cleasby, J. L. "A Statistical Analysis of Water Works Data for 1960." (Unpublished.)

TABLE 3.—*Regional trends in mean per capita production of water utilities* [1]

Geographic region	Mean production—gpcd		
	1950	1955	1960
New England	111	123	108
Middle Atlantic	145	139	118
Northeast central	132	130	116
Northwest central	127	127	124
South	115	109	119
Mountain	226	220	205
Pacific	189	193	202

[1] For cities of more than 10,000 population only, from Seidel, H. F., and Cleasby, J. L. "A Statistical Analysis of Water Works Data for 1960." (Unpublished.)

In addition to meeting domestic, commercial, and industrial water needs, the water industry has important responsibilities for fire protection. In this regard, the "Standard Schedule for Grading Cities and Towns of the United States With Reference to Their Fire Defenses and Physical Conditions" of the American Insurance Association (formerly the National Board of Fire Underwriters) prescribes standards for grading the fire defenses of cities, guides insurance companies in their underwriting procedures, and serves as the basis for

recommendations for improvement of fire protection. Although the AIA standards are voluntary, they are widely applied throughout the industry.

2. EXISTING CAPITAL PLANT

Table 4 shows the growth in number of water utilities from 1800 to 1963 and gives the populations served in selected years. There were 19,236 utilities as of January 1963, more than 10 times as many as in 1890. The population served in 1963 was 150 million, almost seven times as many as in 1890. Water utilities have amost doubled in number since the 1930's, and the population served today is considerably more than twice what it was in the 1903's.

The distribution of water utilities by State is given in table 5. Table 6 gives a breakdown of utilities according to size of city. It shows that 87 percent of all the utilities serve populations of 10,000 or less. The remaining 13 percent in the over-10,000 population class serve 81 percent of the total population served by public water systems.

TABLE 4.—*U.S. water utility growth, 1800–1963* [1]

Year	Number of utilities	Estimated population served	Year	Number of utilities	Estimated population served
1800	16		1896	3,196	
1825	32		1924	9,850	
1850	83		1934	10,790	
1875	422		1939	12,760	81,243,480
1880	598	11,809,231	1948	16,439	93,455,135
1885	1,013		1958	17,608	133,126,310
1890	1,878	22,678,350	1963	19,236	150,602,164

[1] Statistical summary of municipal water facilities in the United States, Jan. 1, 1963. U.S. Public Health Service, U.S. Department of Health, Education, and Welfare, Washington, D.C. (1965).

TABLE 5.—*U.S. water utilities and populations served, by States* [1]

State	Number of utilities	Population served	State	Number of utilities	Population served
Alabama	297	2,230,935	Nevada	57	287,345
Alaska	39	86,585	New Hampshire	117	488,230
Arizona	224	1,382,815	New Jersey	413	5,604,460
Arkansas	232	1,065,300	New Mexico	252	713,830
California	1,690	17,508,320	New York	1,014	15,653,155
Colorado	314	1,555,225	North Carolina	367	2,292,380
Connecticut	155	2,193,805	North Dakota	178	370,760
Delaware	41	409,845	Ohio	546	7,798,245
District of Columbia	2	1,092,870	Oklahoma	397	1,865,160
Florida	467	3,890,990	Oregon	353	1,373,120
Georgia	419	2,796,250	Pennsylvania	959	9,856,291
Hawaii	83	594,075	Puerto Rico	70	1,643,555
Idaho	192	450,069	Rhode Island	47	816,130
Illinois	913	8,857,430	South Carolina	215	1,420,835
Indiana	394	3,196,060	South Dakota	252	416,680
Iowa	708	1,896,720	Tennessee	277	2,423,290
Kansas	488	1,627,985	Texas	1,160	8,619,510
Kentucky	273	1,806,993	Utah	298	1,001,550
Louisiana	280	2,539,795	Vermont	185	255,959
Maine	159	769,620	Virginia	508	2,590,670
Maryland	169	2,574,085	Virgin Islands	3	23,390
Massachusetts	275	5,061,435	Washington	463	2,427,992
Michigan	506	6,442,370	West Virginia	394	1,171,305
Minnesota	603	2,432,330	Wisconsin	426	2,750,140
Mississippi	234	981,595	Wyoming	102	249,075
Missouri	430	3,530,365			
Montana	165	474,505	Total	19,236	150,602,164
Nebraska	431	1,040,735			

[1] Statistical summary of municipal water facilities in the United States, Jan. 1, 1963. U.S. Public Health Service, U.S. Department of Health, Education, and Welfare, Washington, D.C. (1965).

Table 7 shows the distribution of water utilities by type of ownership. The breakdown gives the number of municipally owned and investor-owned utilities by class size and total population served. Seventy-one percent of the water utilities are municipally owned; 29 percent are investor owned. Municipally owned utilities serve 85 percent and investor owned 15 percent of the population served by public water systems. The examples of dual ownership are so few that they may be safely omitted from the analysis.

Investor-owned water utilities include individual, partnership, and corporate enterprises. This type of utility comes under the regulation of public service commissions in all but two States.

TABLE 6.—*Classification of water utilities according to population size* [1]

Population group	Number of utilities	Population served
Under 500	5,433	1,724,981
500 to 1,000	3,751	2,901,512
1,000 to 5,000	6,054	14,269,131
5,000 to 10,000	1,503	10,150,890
10,000 to 25,000	1,225	16,707,415
25,000 to 50,000	573	14,791,775
50,000 to 100,000	298	12,900,250
Over 100,000	399	77,156,210
Total	19,236	150,602,164

[1] Statistical Summary of Municipal Water Facilities in the United States, Jan. 1, 1963. U.S. Public Health Service, U.S. Department of Health, Education, and Welfare, Washington, D.C. (1965).

TABLE 7.—*Distribution of U.S. water utilities by type of ownership* [1]

Population group	Municipally owned utilities		Investor-owned utilities	
	Number	Population served	Number	Population served
Under 500	3,245	1,127,491	2,078	564,720
500 to 1,000	2,762	2,195,468	922	644,004
1,000 to 5,000	4,692	11,636,921	1,315	2,545,255
5,000 to 10,000	1,113	8,595,635	372	1,471,450
10,000 to 25,000	876	13,768,010	340	2,812,050
25,000 to 50,000	362	12,283,770	204	2,384,570
50,000 to 100,000	173	10,405,000	123	2,411,750
Over 100,000	245	67,843,060	147	8,646,280
Total	13,468	127,855,355	5,501	21,480,079

[1] Statistical Summary of Municipal Water Facilities in the United States, Jan. 1, 1963. U.S. Public Health Service, Department of Health, Education, and Welfare, Washington, D.C. (1965).

Municipally owned utilities include those owned by municipalities, water districts, counties, and other forms of government organization. In all but a few States—notably Indiana, Maine, Montana, Nevada, West Virginia, Wisconsin, and Wyoming—they are not regulated by public service commissions.

At the end of 1965, it is estimated that there were more than 20,000 water utilities serving 157 million people in the United States. Assuming that today's cost to provide water works facilities averages $300 per capita, the current replacement value of the water industry is more than $47 billion.

B. Costs and User Charges

1. CONSTRUCTION COSTS

Table 8 shows the incremental costs of waterworks for varying periods in the development of the water industry. It is interesting to note that the investment for the last decade almost equals the amount spent during the previous 35 years, and that the expenditure since the end of World War II is more than three times the amount spent during the entire previous history of the industry. Average per capita investment in water facilities has risen accordingly and for 1956–65 it averaged $275. It continues to grow as the result of rising costs and the necessity for utilities to go further for new water sources. Figure 1 illustrates water utility cost indexes for two typical types of systems, the weighted components of which are shown in table 9.

TABLE 8.—*Incremental costs of water facilities* [1]

Period	New investments (millions)	Growth in population served (millions)	Per capita investment
Before 1896	$450	22.7	$20.00
1896 to 1910	510	15.3	33.30
1910 to 1920	640	12.0	53.00
1920 to 1946	3,350	40.0	83.75
1946 to 1955	7,050	30.0	233.00
1956 to 1965 [2]	10,200	37.0	275.70

[1] Howson, L. R., "50 Years' Experience With Water Utility Costs and Revenues." Journal AWWA, 51:693 (June 1959).

[2] Figures for 1956–65 have been added to Howson's original table. Population growth is based on data of the U.S. Public Health Service and the U.S. Department of Commerce.

TABLE 9.—*Weighted components for two typical plants* [1]

[In percent]

Component	Plant A	Plant B
Land	1	13
Reservoirs	5	17
Buildings	10	25
Pumps, motors, and so on	5	5
Mains	60	32
Services	10	2
Meters	7	4
Other equipment	2	2
Total	100	100

[1] Fick, H. H., "Cost Indexes for Water Utility Property." Journal AWWA, 56:1021 (August 1964).

Construction costs vary considerably, depending on size of utility, type and proximity of source of supply, type of treatment, and other factors. This is illustrated in figure 2, which shows the total investment in waterworks expressed in dollars per million gallons of average daily capacity for each of six water systems, the general features of which are given in figure 3. Plant investment costs range from $700,000 per million gallons daily to more than $1,700,000 per million gallons daily. Portions of the totals are allocated to various categories: source of supply, pumping station and treatment, transmission and distribution system, fire hydrants, and a miscellaneous category including such things as offices, laboratory, and other equipment. It should be added that the graphs in figure 2 are based upon the historical cost of the works, which are much less than the reproduction cost at current prices.

The annual operations and maintenance expenses for the six utilities, expressed in dollars per million gallons of water produced, are shown in figure 4. Expenses range from $100 to $250 per million gallons, and are broken down into the following categories: source of supply, pumping, treatment, transmission and distribution, customer accounting, and general expenses.

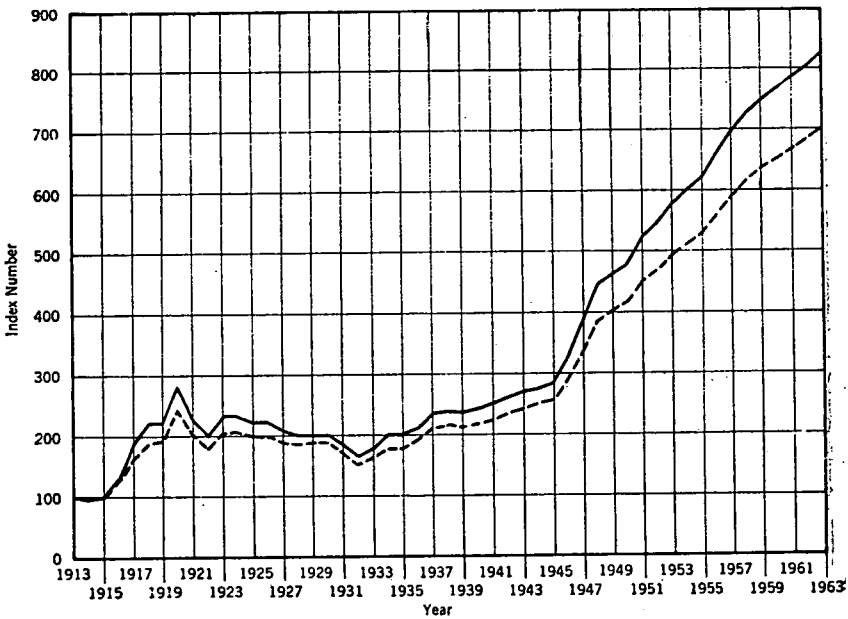


FIGURE 1. TYPICAL WATER UTILITY COST INDEXES

The cost indexes for two existing water plants are shown for the period 1913–63, with 1913 as the base year. The weighted components of water utility property are given in table 9. Data for plant A are indicated by the solid line; data for plant B by a broken line. From: Fick, Henry H., "Cost Indexes for Water Utility Property." Journal AWWA, 56:1022 (August 1964).

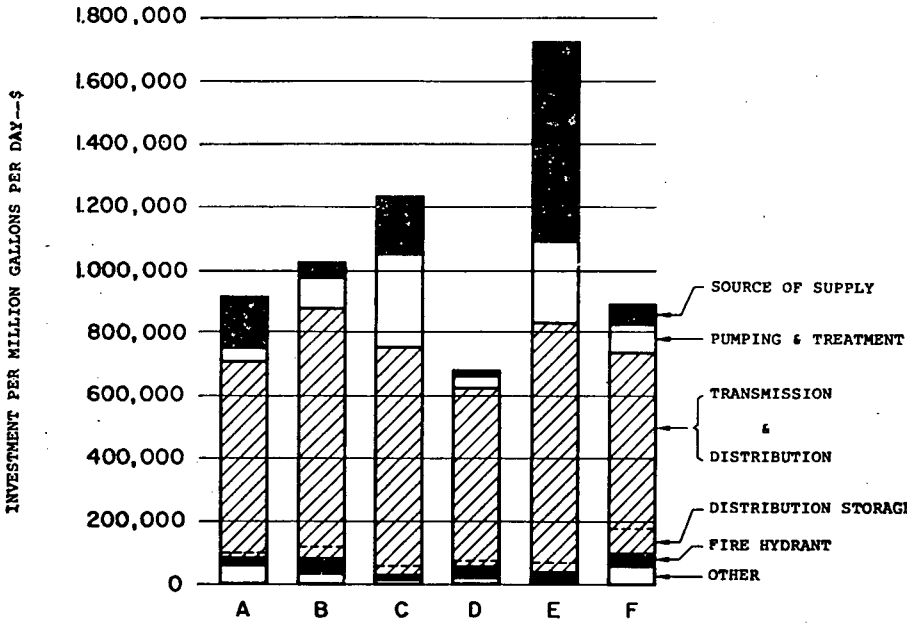


FIGURE 2. PLANT INVESTMENT

From: Hazen, Richard. Water Is Not Free. Proceeding, 8th Sanitary Engineering Conference on Cost Aspects of Water Supply, Univ. of Illinois Experiment Station, Urbana, Ill. (1966).

	UTILITY					
	A	B	C	D	E	F
OWNERSHIP	I	I	M	I	M	M
AVE. PRODUCTION - MGD	52	22.3	22.0	17.3	9.2	8.9
SOURCE OF SUPPLY						
Number	8	1	1	3	1	3
Type	SURF. G.W.	G.W.	SURF.	SURF.	SURF.	SURF. G.W.
PUMPING REQD.	PART	YES	YES	YES	YES	PART
FILTRATION REQD.	NO	NO	YES	PART	YES	YES
SOFTENING REQD.	NO	NO	NO	NO	NO	PART

FIGURE 3. PLANT FACILITIES

From: Hazen, Richard. Water Is Not Free. Proceedings, 8th Sanitary Engineering Conference on Cost Aspects of Water Supply, Univ. of Illinois Experiment Station, Urbana, Ill. (1966).

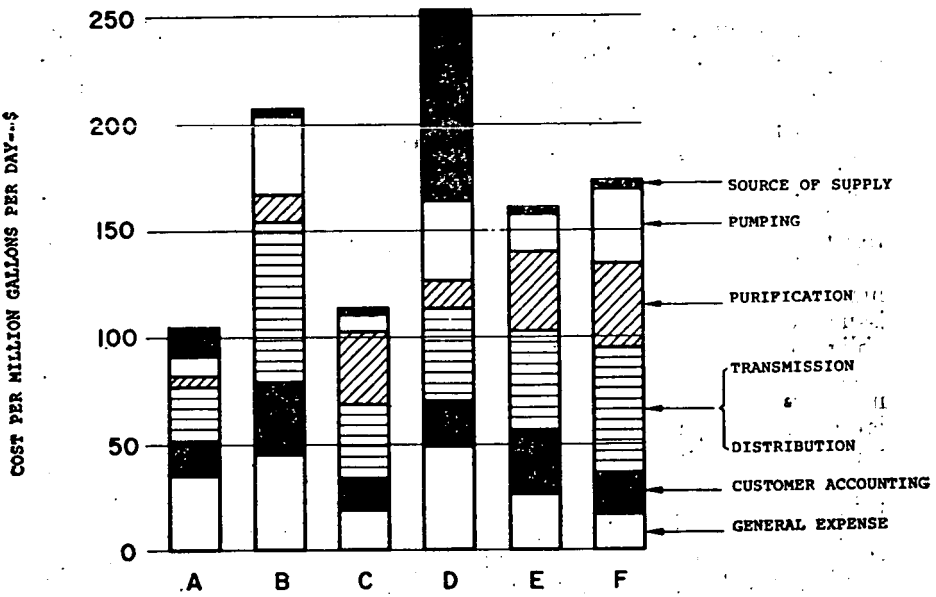


FIGURE 4. ANNUAL EXPENSE, OPERATIONS AND MAINTENANCE

From: Hazen, Richard. Water Is Not Free. Proceeding, 8th Sanitary Engineering Conference on Cost Aspects of Water Supply, Univ. of Illinois Experiment Station, Urbana, Ill. (1966).

2. WATER UTILITY FINANCING AND USER CHARGES

The following conditions prescribe a test for self-sustaining water utility operations:

To furnish good service, a water utility, whether municipally or investor-owned, should receive sufficient revenue through water sales and other charges to—

(1) cover operation and maintenance expenses, taxes or payments in lieu of taxes, depreciation, fixed charges or return on investment, and

(2) provide sufficient surplus to pay for ordinary capital additions and attract the necessary capital for major expansion.

Investor-owned utilities in all but two States and municipally owned utilities in at least seven States are under the jurisdiction of State regulatory commissions. Under such control, water utilities formulate rate schedules to provide gross revenues approved by the commissions.

Of the total number of utilities, 65 to 75 percent are unregulated. Most of these are municipally owned. Most are supported out of revenue from rates, a few by a combination of rates and taxes. Generally, municipally owned utilities may be classified according to two general types of financial operation:

1. *Self-supporting enterprises.*—Such utilities receive sufficient revenue through rates, charges, and fire protection tax levies to meet all expenses, maintain and expand the system, and contribute funds to the municipality in lieu of taxes. They maintain a separate identity

from other public functions and have control over their funds in separate accounts. To finance large capital additions, they have authority to issue revenue bonds. Their revenues after operating and maintenance expenses must be adequate to pay the interest and redemption.

2. *Tax-supported enterprises.*—Typical of this group is the utility that is budgeted and accounted for within the city's overall operations. Revenues from water sales are deposited in the general municipal fund together with other receipts, including tax receipts, out of which the expenditures for all city operations, including the water utility, are made. In such cases, taxes are levied to meet payments on bonds issued to expand the water system. The bonds would be general obligation bonds backed by the taxing power of the municipality.

Regardless of the type of financial organization—and there are a number of variations—revenues from water rates are employed to a large extent to pay the costs of doing business, including operation and maintenance expenses, taxes, debt service, payments to the general fund (municipally owned utilities) or dividends (investor-owned utilities), and payments to reserves and surplus.

Water utilities obtain most of their income from water sales. A study in 1955 covering 78 municipally owned utilities showed that water sales furnished 92 percent of total income, with residential customers providing 56 percent, commercial customers 18 percent, industrial users 17 percent, and municipal service 1 percent. The largest single source of income after water sales is fire service. Most investor-owned and about one-half of the municipally owned utilities, according to a 1960 AWWA survey, levy a charge for fire service, usually in the form of a hydrant rental in the range of $10 to $50 per fire hydrant per year.

Revenue sources and disposition for 875 municipally owned and 90 investor-owned utilities of all sizes in 1960 are shown in Table 10.

TABLE 10.—*Water utility revenue sources and disposition* [1]

Item	Municipally owned		Investor owned	
	Dollars per million gallons	percent	Dollars per million gallons	percent
Revenue:				
Water sales	302	91.5	382	95
All other	28	8.5	20	5
Total	330	100.0	402	100
Disposition:				
Operating and maintenance	174	53.0	188	47
Taxes	3	1.0	88	21
Debt service	62	19.0	35	9
Current capital additions	48	14.0	35	9
To general funds or dividends	20	6.0	33	8
Reserves and surplus	23	7.0	23	5
Total	330	100.0	402	100

[1] H. F. Seidel and J. L. Cleasby, "A Statistical Analysis of Water Works Data for 1960" (unpublished).

The income of the municipally owned group averaged $330 per million gallons, of which $174 was spent for operation and maintenance and the remainder for taxes, debt service, current capital additions, de-

posits to the general funds, and reserves and surplus. Investor-owned utilities received $402 per million gallons and paid $188 for operation and maintenance. It should be noted that this group paid $88 per million gallons for taxes and $33 for dividends as compared with $3 for taxes and $20 in lieu of taxes paid by the other group.

Both municipally and investor-owned utilities may be able to finance small capital additions out of current earnings. To finance large additions, municipally owned utilities issue revenue or general obligation bonds. Investor-owned utilities issue mortgage revenue bonds and short-term notes.

C. Trend of Capital Outlays

1. ESTIMATED ANNUAL CAPITAL OUTLAY

Various public and private organizations publish data on the capital outlay for water utility facilities, including: McGraw-Hill, Inc., of New York City in its publication "Engineering News-Record"; the U.S. Department of Commerce, in such publications as "Construction Review," issued by the Business and Defense Services Administration, and "Historical Statistics on Government Finances and Employment," a report of the Bureau of the Census; and the U.S. Department of Health, Education, and Welfare, in "Sewage and Water Works Construction," and "Water and Sewer Bond Sales in the United States," both publications of the U.S. Public Health Service.

None of the above-mentioned publications report the total capital outlay for water utility facilities which would represent contract and direct expenditures of both municipally and investor-owned segments of the industry. In fact, the various published data are not strictly comparable because of different collection and reporting methods. They provide, nevertheless, a good indication of the trend in water utility construction expenditure.

Annual values reported by the various organizations for 1946–65 are shown in table 11. Two of the columns in the table are related only to municipally owned utilities. The third represents the Business and Defense Services Administrations' estimates of total construction put in place for both municipally and investor-owned utilities, including contract and force account construction.

The annual expenditure for waterworks construction grew steadily during 1946–65. The rate of growth is indicated by table 12, which compares contract award figures as reported by the U.S. Public Health Service in actual and constant dollars.

Table 12 shows that in actual dollars annual public water utility construction rose during a 13-year period (1952–64) from $227 to $654 million, an increase of $427 million, whereas in constant dollars (1957–59 base), it grew from $303 to $532 million, an increase of only $229 million.

Water utility construction was curtailed during World War II and picked up slowly immediately following the war when prices rose sharply and population expanded rapidly. As a result, the industry accumulated a sizable deficiency in facilities, which it has been correcting gradually ever since. A substantial backlog still exists, as is explained in part IV of this statement.

TABLE 11.—*Indicators of annual water works construction*

[In millions of dollars]

Year	ENR contract awards [1]	USPHS contract awards [2]	BDSA total waterwork construction [3]
1946	109		
1947	139		
1948	209		
1949	207		
1950	215		
1951	209		
1952	231	227	451
1953	247	283	527
1954	245	293	572
1955	314	394	788
1956	356	441	800
1957	369	457	838
1958	306	419	856
1959	373	504	989
1960	454	645	950
1961	430	573	1,145
1962	391	507	1,050
1963		590	1,082
1964		654	1,188
1965			1,300

[1] Annual total public works contracts for waterworks construction reported by "Engineering News Record." Minimum project included for 1946 was $22,500; for 1947–49, $28,000; for 1950–54, $34,000; for 1955–58, $44,000; and for 1959–62, $53,000.

[2] Annual contract awards for public waterworks construction as reported by the U.S. Public Health Service in "Sewage and Waterworks Construction, 1964." The figures exclude engineering, architectural, legal, and financial fees and contract expenditures of investor-owned water utilities.

[3] Construction put in place, including contract construction, force account construction, and materials and equipment for municipally owned and investor-owned water utilities, as provided by the Water Industries and Engineering Services Division, Business and Defense Services Administration, U.S. Department of Commerce.

TABLE 12.—*Comparison of annual water utility contract awards in actual and constant dollars* [1]

Year	Actual dollars (millions)	Constant dollars [2] (millions	Year	Actual dollars (millions)	Constant dollars [2] (millions)
1952	227	303	1959	504	480
1953	283	358	1960	645	597
1954	293	353	1961	573	516
1955	394	453	1962	507	441
1956	441	485	1963	590	500
1957	457	481	1964	654	532
1958	419	419			

[1] Sewage and Waterworks Construction, 1964. U.S. Public Health Service, U.S. Department of Health Education, and Welfare, Washington, D.C. (1965).

[2] Constant dollars are reported on a 1957-59 base, using the "Engineering News-Record" construction cost index.

2. SOURCES OF EXPENDITURE

A breakdown of capital outlay by source of expenditure is unavailable, but an indication is given by table 13 which shows the number and total value of bond issues for municipal waterworks construction in 1964 according to various issuing authorities. Municipal authorities led in number of issues with 381 out of a total of 607, followed by special water districts with 157, and statutory authorities with 36. In total dollar volume, municipalities again led with $305 million out of a total of $769 million, followed by State authorities with $250 million. The State bonds relate to California's huge Feather River project.

Table 14 gives a breakdown of the public bonds issued in 1964 according to type of issue. General obligation bonds accounted for 64 percent and revenue bonds for 36 percent of the total value.

Investor-owned utilities, which comprise 29 percent of the total number of utilities and serve 15 percent of the total population served, obtain capital from various sources—loans, bonds, and common and preferred stock—in proportion to debt ratios prescribed by State public service commissions and in accordance with policies that will assure satisfactory credit rating and low money costs. In its estimates of total waterworks construction in table 11, the Business and Defense Services Administration has assumed that investor-owned utilities account for about 20 percent of the total annual investment in facilities.

TABLE 13.—*Water and sewer bond sales in 1964* [1]

[Dollar amounts in thousands]

Type of issuing authority	Number of issues	Amount	Percent of total
State	3	$250,000	32.5
County	9	12,849	1.7
Municipality	381	305,798	39.8
Township	21	5,653	.7
Special district	157	102,805	13.3
Statutory authority	36	92,202	12.0
Total	607	769,307	100.0

[1] Water and Sewer Bond Sales in the United States, 1964. U.S. Public Health Service, U.S. Department of Health, Education, and Welfare, Washington, D.C. (1965).

TABLE 14.—*Types of water and sewage bonds sold in 1964* [1]

[Dollar amounts in thousands]

Type of issue	Number of issues	Value
GENERAL OBLIGATION BONDS		
Unlimited tax	374	$467,914
Unlimited tax secured by utility revenue	9	6,610
Unlimited tax secured by special assessment	22	3,654
Limited tax	12	11,090
Limited tax secured by utility revenue	1	522
Limited tax secured by special assessments	4	695
REVENUE BONDS		
Utility revenue	179	271,043
Special tax revenue	1	122
Rental revenue	5	7,657
Total	607	769,307

[1] Water and Sewage Bond Sales in the United States. U.S. Public Health Service, U.S. Department of Health, Education, and Welfare, Washington, D.C. (1965).

Both municipal and investor-owned segments of the industry spend substantial sums each year on force account construction and direct purchases of equipment, the investment varying from 20 to 25 percent of the total annual capital outlay, according to studies of the BDSA made during 1952–59. Sources of funds for this work are water sales revenue taxes, short-term loans, bonds, contributions in aid of construction (for example, customers-financed main extensions, service connections, and meter installations), and advances in aid of construction (subject to refund over a period of time). Water utility policies vary considerably in the method of financing of this type of work.

Up to 1965, Federal and State loans and grants were not a significant factor in water utility development, with the exception of the work performed during the 1930's. As is pointed out in part IV, this situation is expected to change as a result of legislation passed in 1965. Prior to 1965, there were the following Federal programs:

1. The Farmers Home Administration of the U.S. Department of Agriculture has made loans for the construction of rural water systems since 1938.

These systems serve farm areas with a low population density that cannot be served economically by conventional public water systems. Rural supplies differ from public supplies in that they are designed to furnish considerably less water per capita, use pipelines of smaller diameter, and do not normally provide conventional fire protection. Table 15 shows the number and amount of FHA loans made during 1961–65.

2. Grants and loans made for the construction of water utility facilities, as provided under the accelerated public works and public facility loan programs, are summarized in table 16.

3. Financial assistance has been provided for storage of public water supply in connection with the reservoir projects of the Corps of Engineers, the Soil Conservation Service, and the Bureau of Reclamation. The terms call for repayment when the storage is used for public water supply.

TABLE 15.—*Farmers Home Administration credit assistance, 1961–65* [1]

Fiscal year	Number of loans		Amount loaned	
	Direct funds	Insured funds	Direct funds	Insured funds [2]
1961	18	15	$1,408,700	$536,900
1962	55	28	5,928,950	4,213,050
1963	72	63	7,054,925	7,638,770
1964	99	168	10,876,680	23,023,000
1965	138	249	13,285,720	37,069,960

[1] This information supplied by the Farmers Home Administration, U.S. Department of Agriculture.
[2] Advanced by private investors and insured by the Government.

TABLE 16.—*Community Facilities Administration—Accelerated public works program grants and public facility loans for water utility construction* [1]

PUBLIC FACILITY LOANS, 1956–65

[Dollar amounts in thousands]

Year	Number of projects	Amount	Estimated total cost
1956	17	$1,624	$1,805
1957	41	7,249	7,443
1958	51	11,611	12,227
1959	37	5,872	6,448
1960	22	6,306	7,728
1961	51	6,791	7,428
1962	87	32,633	35,477
1963	80	18,603	29,830
1964	41	8,031	10,847
1965	68	33,419	45,203
Total	495	132,139	164,436

ACCELERATED PUBLIC WORKS PROGRAM GRANTS, 1962–64

1962	117	23,114	50,096
1963	818	108,147	245,642
1964	86	12,728	25,621
Total	1,021	143,989	321,359

[1] Data supplied by the Community Facilities Administration, U.S. Department of Housing and Urban Development.

D. WATER INDUSTRY NEEDS AND PROSPECTIVE CAPITAL OUTLAYS

1. CAPITAL NEEDS

Public water supply capital investment to meet population and industrial growth requirements, replace worn out and obsolete facilities, and partially eliminate a sizable construction backlog is estimated to grow from $2 billion in 1966 to $3 billion in 1975. The total outlay for the 10-year period would amount to $24 billion, more than twice the amount spent during the previous decade.

Table 17 shows the cost breakdown for the 1966–75 period. The basis for the estimates is given in the following discussions on population growth, depreciation, and deficiencies.

(a) *Population growth*

Of the present U.S. population of 195 million, the industry serves 157 million people or approximately 80 percent of the total. Over the next 10 years, the population is expected to grow at a rate of 1.5 percent, or roughly 3 million per year, reaching 225 million by 1976. Public water supplies will serve at least 80 percent of the annual increase and probably more. It is assumed in this report that 2.5 million more, or 83 percent, will be served each year.

The cost to provide water system capacity for growth alone is estimated to rise from $775 million in 1966 to $1 billion in 1975. This is based on the assumption that the initial cost will be $300 per capita and construction prices will increase 3 percent per year, a low figure in view of the price rise experienced in 1965.

The formation of water district, authority, or metropolitan water systems serving several communities will reduce per capita construction costs. On the other hand, many systems will develop water

sources that are located greater distances away, or provide more extensive treatment for polluted sources, both of which will result in increased per capita costs.

(b) *Depreciation*

To offset depreciation and obsolescence, it is estimated that the industry should spend at an annual rate of 1.5 percent of its current replacement value. This amounts to $630 million in 1966 based on a replacement value of $48.5 billion. The annual expenditure will rise to more than $1 billion in 1975, assuming that population growth needs are met.

TABLE 17.—*Capital requirements of the water utility industry, 1966–75* [1]

Item	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
U.S. population (millions)	195	198	201	204	207	210	213	216	219	222
Population served by public water systems (millions)	157	159.5	162	164.5	167	169.5	172	174.5	177	179.5
Per capita investment to serve population increase (dollars)	310	320	330	340	350	360	370	380	390	400
Total annual investment to serve population increase (millions of dollars)	775	800	825	850	875	900	925	950	975	1,000
Replacement value of systems (billions of dollars)	48.5	51	53.5	56	58.5	61	63.5	66.5	69	72
Annual depreciation and obsolescence [2] (millions of dollars)	730	765	800	840	875	915	950	995	1,030	1,080
Annual cost of correcting deficiencies [3] (millions of dollars)	560	575	595	610	630	650	670	690	710	730
Total annual expenditure (millions of dollars)	2,070	2,140	2,220	2,300	2,380	2,470	2,550	2,640	2,720	2,810

[1] Figures denote population at beginning of year; an annual increase of 3,000,000 is assumed, of which 2,500,000 will be served by public water supplies.
[2] Estimated at 1.5 percent of replacement value.
[3] Based on studies of Picton and Faust and on the assumption that deficiencies will be corrected over a 15-year period.

Investor-owned and some municipally owned utilities provide funds for at least part of this type of expenditure by accruing depreciation reserves from water sales revenues.

(c) *Deficiencies*

R. J. Faust [1] estimated in 1960 that it would take $1.9 billion to improve the quality of the water delivered by public water systems. He was referring to the need for many utilities to go beyond the production of a safe water by providing treatment to remedy objectionable characteristics, including tastes, odors, hardness, and corrosiveness.

W. Picton [2] in 1962 reported that many water systems lacked sufficient capacity to meet the water demands of their consumers under all conditions. He estimated that the cost to correct system deficiencies was $5,157 million (in 1960 dollars).

Although the annual investment in public water systems has increased steadily since the above-cited studies were made, the quality and capacity problems have not been corrected. Lack of adequate system capacity continues to show up in various parts of the country at different times, as, for example, in the Northeast during the

[1] Faust, R. J. "Challenges in the Water Industry." Willing Water, 4:7:3 (July 1960).
[2] Picton, W. L. "Construction Requirements for Water and Sewerage Works, 1962–70." Construction Review (September 1962).

1961–66 drought. In this instance, a survey showed that 129 of 351 water utilities that answered the questionnaire restricted water service during 1964 because of inadequate capacity in source, transmission, treatment, or distribution facilities.

Because a recent analysis of utility deficiencies is not available, the estimates of Faust and Picton have been employed to indicate the investment required during 1966–75 to eliminate the industry's construction backlog. Their cost estimates have been combined, converted to the 1965 price level, and spread over a 15-year period. To account for rising construction prices, it is assumed that the cost to correct deficiencies will increase 3 percent per year.

2. CAPITAL OUTLAY

On the basis of past performance, it is highly unlikely that the water industry will spend $2 billion in 1966 for construction. A realistic estimated would place the total expenditure at $1.3 to $1.5 billion, or $500 to $700 million short of the desired level.

The industry has the resources, however, to achieve a higher level of plant investment and to overcome rising costs. By raising water rates, it can obtain the revenue necessary to finance the projected programs.

It is expected that Federal assistance programs resulting from legislation passed in 1965 will have a prominent part in water utility financing during the next decade.

(a) *Water Rates*

Rate increases have been occurring at the rate of 1 in each 7 utilities in any given year according to an AWWA survey in 1960. Within the 4 years prior to the survey 55 percent of those reporting had had rate increases, and within the 10 years before the survey, 90 percent had raised their rates. A number of rate schedules, however, had been in effect for more than 20 years. Rate increases according to the survey commonly fall in the range of 10 to 35 percent.

A brief review of the history of rate increases since the end of World War II shows that rates and, consequently, water sales revenue rose only slightly during 1945–50, while construction, operation, and maintenance costs increased sharply. As a result, many utilities were unable to finance expansion programs. During 1950–55 some of this lost ground was regained, and during 1955–60 rates improved generally, leaving water utilities in a much healthier financial position. Further increases are required, however, to keep pace with rising costs and to finance improvements.

Water rates traditionally have been kept too low. The average customer pays considerably less for water service than for other utility services, as shown in figure 5, which compares the annual revenue per customer of electric, gas, telephone, and water utilities. The chart, representative of a limited number of utilities located principally in the Midwest, shows that during the 1952–63 period average water utility revenue per customer rose from $40 to $71; electric, $155 to $254; gas $124 to $209; and telephone, $131 to $218.

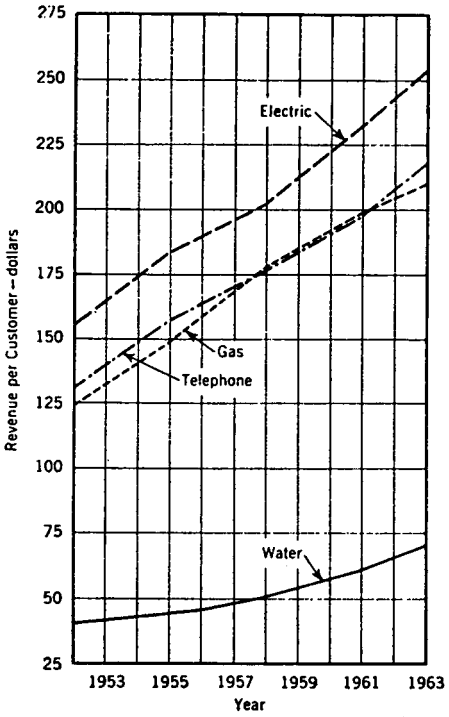


FIGURE 5. AVERAGE ANNUAL REVENUE PER CUSTOMER FOR UTILITIES, 1952–63

Since 1952, average annual revenues per customer have increased as follows: water utilities, from $40 to $71; electric, $155 to $254; gas, $124 to $209; and telephone, $131 to $218. From: Patterson, W. L., Comparison of Elements Affecting Rates in Water and Other Utilities. JOURNAL AWWA, 57:554 (May '65).

(b) *Availability of Private Investment Capital*

The water industry has not experienced difficulty in securing capital funds, nor should it in the future, provided that rates are raised to assure sufficient net income.

Very small utilities pose a special problem because their debt issues are small and costly to underwrite. Investors may regard them as too risky, particularly if their financial records are incomplete. Occasionally, their water supply development costs may be extremely high in relation to potential revenues. The answer in such cases frequently lies in consolidation of the small units into larger district or authority systems. Small systems also may be absorbed by or connect to existing larger systems.

Water utilities generally have low debt ratios. Table 18 shows the ratios of debt to gross plant for 358 municipally owned water utilities in 1960. The median debt ratio for this group was 32 percent. Debt ratios of investor-owned utilities are regulated by public service commissions within prescribed limits.

With adequate rates and sound accounting practices, water utilities would be able to attract capital at reasonable cost.

TABLE 18.—*Ratios of debt to gross plant for municipal water utilities in the United States, 1960* [1]

Gross plant in millions of dollars	Range of ratios of debt to gross plant—Percent													Class total
	No. debt	0.0 to 9.9	10.0 to 19.9	20.0 to 29.9	30.0 to 39.9	40.0 to 49.9	50.0 to 59.9	60.0 to 69.9	70.0 to 79.9	80.0 to 89.9	90.0 to 99.9	100.0 or more	Not available	
	Number of utilities in range													
0.0 to 0.9	4	0	0	3	3	1	2	4	1	2	1	6	7	34
1.0 to 2.4	19	13	11	16	13	7	7	7	2	0	1	1	20	117
2.5 to 4.9	7	8	8	13	10	11	9	4	2	2	0	4	13	91
5.0 to 7.4	3	2	1	9	10	7	1	4	0	1	0	1	9	48
7.5 to 9.9	2	0	2	2	4	4	1	3	3	1	1	0	2	25
10.0 to 14.9	2	4	4	6	1	2	1	1	0	0	0	0	1	22
15.0 to 19.9	0	4	2	4	1	0	0	1	1	1	0	4	4	22
20.0 to 29.9	0	0	1	1	4	0	4	2	0	0	0	0	1	13
30.0 to 39.9	0	1	1	3	2	0	1	1	1	0	0	0	0	10
40.0 to 49.9	0	0	1	1	0	1	0	0	0	0	0	0	1	4
50.0 to 59.9	0	0	0	0	3	1	0	0	1	1	0	0	0	6
60.0 to 69.9	0	0	1	2	0	2	0	0	0	1	0	0	1	7
70.0 to 79.9	0	0	0	1	0	1	0	0	0	0	0	0	0	2
80.0 to 89.9	0	0	0	1	0	0	0	0	0	0	0	0	0	1
90.0 to 99.9	0	0	0	1	0	0	0	0	0	0	0	0	0	1
100.0 and over	0	0	3	1	3	4	0	2	0	0	1	0	0	14
Total	37	32	35	64	54	41	26	29	11	9	4	16	59	417
Cumulative total	37	69	104	169	222	263	289	318	329	338	342	358	417	
Index	10.3	19.3	29.0	46.9	62.0	73.5	80.7	88.8	91.9	94.4	95.5	100.0		

[1] Source: "A Survey of Operating Data for Water Works in 1960." Staff report, American Water Works Association, New York (1964).

(c) *Federal Assistance Programs*

Congress approved several programs in 1965 to assist in the development of water systems.

The Housing and Urban Development Act (Public Law 89–117) authorizes $200 million in grants to finance up to 50 percent of the cost of basic public water and sewer facilities. It is estimated that $50 million of this will be spent on public water supply facilities in fiscal 1966 and again in 1967.

The Public Works and Economic Development Act (Public Law 89–136) authorizes $500 million per year for 4 years in grants of up to 50 percent for public works in economically distressed areas. The law also authorizes $170 million per year for loans to assist in public works development and improvement.

Public Law 89–240, the Rural Water and Sanitation Facilities Act, increases the loan insurance limit of the Farmers Home Administration to $450 million, authorizes $55 million a year in grants for facilities, and provides $5 million in grants for planning. The law covers both water supply and waste disposal systems in rural areas (towns up to 5,500 population). Grants are limited to no more than 50 percent of the project cost.

CHAPTER 3

Rural-Agricultural Water Supply Systems: Irrigation*

INTRODUCTION

This chapter is confined to a discussion of irrigation water supply systems that are either public facilities or group facilities operated by various types of irrigation water organizations. The public bodies and other groups treated here include: mutual irrigation organizations, commercial water suppliers, irrigation districts, the U.S. Bureau of Reclamation, the Bureau of Indian Affairs, and some States and cities.

Much of the information is presented here as complete and comparable only within a broad region, such as the Western or the Eastern United States. The statistical information was supplied mainly by agricultural census publications and Bureau of Reclamation reports.

A. NATURE AND COMPOSITION OF IRRIGATION FACILITIES

1. DESCRIPTION OF FACILITIES

(a) *Physical Characteristics*

Irrigation facilities usually include several systems, the number and type varying between and within regions according to the nature of the irrigation water supply, the time that the facility was constructed, the local topography, soil conditions, etc. Irrigation facilities always include a source of fresh water. This source may be a natural lake or stream, but it is usually a constructed reservoir or a ground water source.

A water conveyance system is also present and consists of canals and ditches and/or pipes leading from the water supply source to the place of use. Large ditches and canals carry water to a system of smaller ditches, called laterals. Some large conveyance canals are hundreds of miles long.

In porous or easily eroded soil the canals and ditches are usually lined with concrete. Gravity serves to propel water from the place of storage through the conveyance system to the point of use. Pumps are used for propelling irrigation water in cases where gravity cannot be employed; for instance, to lift ground water to surface level and from there to the point of use, or to raise water to a higher elevation in a main irrigation canal.

Steel or wooden flow gates and valves, plus flow gages for measuring amounts used by individual growers are often part of the conveyance systems, also.

Water-application and land-preparation systems are typically not a public enterprise, but they are sometimes a group enterprise. Their

*This report was prepared by the U.S. Department of Agriculture. The authors were Clifford Dickason and Howard Hill, Natural Resource Economics Division, ERS, with minor editing by committee staff.

cost, being an associated cost of irrigation, is not readily available in irrigation statistical sources. Most water-application systems fall into three main categories: ditch-furrow systems, piped water sprinkler systems, and field flooding. In the ditch-furrow system, the grower's fields are furrowed in such a way that each of several parallel furrows abuts a water supply ditch. When water is needed in the furrows, the grower usually inserts tubular plastic or metal siphons at the ends of the furrows to siphon water from the supply ditch, over an intervening few feet of ground, and into each furrow. The standard diameter and flow of the siphons assures an equal flow of water in each furrow. The crops are planted between water furrows, and their roots receive moisture soaking through the soil from the furrows.

The ditch-furrow system is employed where the land is quite flat, although the land may have the form of an inclined plane. Ditch-furrow systems are constructed with great care and effort to assure even, level water flow. Often the land itself is meticulously leveled before the furrows are made.

Water sprinkler systems are used in situations where they are more practical than ditch furrows because of somewhat irregular terrain, close planting of crops, or infrequency of irrigation need. The pipes are generally of an aluminum alloy, sometimes supplemented by plastic. They often have steel end connections. The pipes are usually movable; and, having irrigated one sector of a field, are rolled or carried on to the next sector.

Some wheeled pipe-sprinkler systems move themselves slowly across the fields as they spray water. Since piped water sprinkler systems are not inherently difficult to move, it is often not economical for a grower to build a large stationary pipe system that can spray his entire crop without being moved.

Field-flooding is used mainly to suit the characteristics of certain crops, such as rice, alfalfa, and some orchard fruits. Here again, the land is often carefully leveled.

In the dry areas of the United States, where water salinity and soil salinity present a problem, subterranean drainage tile systems are often constructed as an associated part of the irrigation systems. These systems fill with residual irrigation water and conduct soluble salts out of the irrigated fields. This prevents the irrigated soil from becoming increasingly saline because of constant evaporation of the slightly saline irrigation water.

Most of the elements of irrigation facilities, such as are described above, may be publicly owned or group owned as well as individually owned. Piped water sprinkler systems, for instance, may occasionally be owned by a group and moved from one grower's fields to another.

Available cost statistics concerning irrigation water supply systems as public or group facilities usually concern only the cost of supplying the water up to the point at which the grower receives it. Also, land preparation and other associated activities of irrigating crops are usually not done as a group enterprise employing public facilities. Therefore, the treatment of group and public facilities here will proceed only to the point at which water reaches the growers' fields.

(b) *Services Rendered*

An irrigation system, of course, supplies water at the proper times to the growers' crops. A reliable water supply translates into several services to the grower: (1) it is insurance against destruction of the crop by drought; (2) it reduces capricious variation in crop yields from year to year; and (3) it significantly increases the quantity and quality of crop yields per acre in the geographic areas where irrigation is most prevalent.

There are qualitative standards that irrigation systems should meet. For instance, they should provide a reliable, continuously available supply of water to the growers at the times in the growing season when irrigation water is needed by the crops.

The allowable water quality in irrigation varies by crops. Some growers irrigate certain types of crops with the effluent from the sewage system of a nearby community. Rather high levels of salt content can be tolerated without continually increasing the salinity of the soil, as was mentioned earlier; and some crops are considerably more tolerant of salinity than others. Piped water-sprinkler systems, of course, must use water that is filtered free of large particles which would clog the pumps or the sprinkler heads.

2. EXISTING CAPITAL PLANT IN THE UNITED STATES

(a) *Growth and Distribution*

There is a dearth of statistics showing the size and number of various irrigation structures in the United States. Also, there are great variations in size of the various irrigation structures. Therefore, the extent of irrigation facilities provided by various public and quasi-public irrigation organizations can best be expressed in terms of acres of land irrigated.

As of 1959, there were over 33 million acres of irrigated land in farms in the United States. The distribution of acreage irrigated by public and quasi-public facilities is shown in table 1.

TABLE 1.—*Acreage irrigated by organizations; regions and United States, 1920–59*

Year	Acreage			As a percent of total irrigated acreage in—		
	Western States	Eastern States [1]	United States excluding Alaska	Western States	Eastern States [1]	United States excluding Alaska
	1,000 acres	*1,000 acres*	*1,000 acres*	*Percent*	*Percent*	*Percent*
1920	[2] 12,144	[3]	[3]	[2] 65.3	[3]	[3]
1930	[2] 12,906	[3]	[3]	[2] 68.1	[3]	[3]
1940	[2] 16,179	[3]	[3]	[2] 68.3	[3]	[3]
1950	[2] 14,714	[3]	[3]	[2] 55.5	[3]	[3]
1959	[4] 17,786	32	17,818	[4] 56.7	1.8	53.7

[1] Conterminous United States, minus the 17 Western States and Louisiana. The 17 Western States are California, Oregon, Washington, Idaho, Montana, Nevada, Arizona, New Mexico, Colorado, Utah, Wyoming, North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, and Texas.

[2] The 17 Western States.

[3] Not available.

[4] The 17 Western States, plus Louisiana and Hawaii.

Sources: 1959 Census of Agriculture; vol. III, Irrigation of Agricultural Lands; U.S. Department of Commerce (Washington, D.C., 1962), pp. 5 and XXV; 1959 Census of Agriculture; vol. V, Special Reports, pt. 2, Irrigation in Humid Areas; U.S. Department of Commerce (Washington, D.C., 1962), pp. 3 and 6; and 1950 Census of Agriculture; Irrigation of Agricultural Lands; U.S. Department of Commerce (Washington, D.C., 1952), p. 93.

The total farm acreage irrigated by organizations and single-farm systems appears in table 2.

TABLE 2.—*U.S. farm acreage irrigated, by geographic divisions, 1959*

Geographic division:	*Acres irrigated in 1959, thousands*
New England	31
Middle Atlantic	148
East North Central	111
West North Central	3,066
South Atlantic	597
East South Central	137
West South Central	7,050
Mountain	12,095
Pacific Continental	9,787
Hawaii	141
Conterminous United States and Hawaii	33,163

Source: 1959 Census of Agriculture.

Statistics concerning irrigation in the East—and especially investment and organization statistics—are sparse. A brief qualitative description of irrigation in the 30 humid Eastern States follows:[1]

Irrigation water has much less effect on increasing crop yields in the humid States, because of the more abundant rainfall there. Certain crops respond unusually well to irrigation, however. Arkansas, Florida, and Mississippi were the three States having the largest total area irrigated in 1960. Rice was the leading irrigated crop in Arkansas and Mississippi. Citrus fruits and vegetables were the leading irrigated crops in Florida. In 1960, the largest single irrigated crop acreage in the humid States was rice, which was produced on 424,657 acres.

Wells were the principal source of irrigation water in 1960, supplying water for 61.7 percent of the irrigated acreage in the humid States. Natural streams and rivers were the water source for 14.3 percent of the area irrigated in the Eastern States. Natural lakes and ponds, drainage ditches, farm runoff, springs and seepage, and constructed reservoirs accounted for the remaining 24 percent.

The age distribution of public and quasi-public irrigation facilities is not available.

(b) *Ownership Proportions*

The proportion of ownership of irrigation systems by various classes of irrigation organizations cannot be stated in terms of systems or structures. Of the acreage irrigated by systems operated by organizations in the 17 Western States, the proportion of land irrigated by each of the various types of organizations in 1959 is shown in table 3.

Of the 17.7 million irrigated acres, 6.8 million acres, or 38.4 percent, were supplied partly or entirely from Bureau of Reclamation facilities operated by the Bureau or by the various water users' organizations mentioned.[2] (Usually a completed project's operation is turned over to a water users' organization.) Only 4 percent of the total acreage irrigated by organizations received water from Bureau of Reclamation facilities operated by the Bureau itself.

[1] 1959 Census of Agriculture; vol. V, pt. 2, Irrigation in Humid Areas, pp. XVI and XVII.

[2] Crop report and related data, 1964. U.S. Department of the Interior, Bureau of Reclamation (Wash., D.C., 1965), p. 30.

TABLE 3.—*Distribution of acreage irrigated, by organizations in 17 Western States, 1959*

Type of organization	Irrigated acres (thousands)	Percent
Mutual organizations:		
Unincorporated	2,067	11.7
Incorporated	6,733	38.0
Commercial suppliers	573	3.2
Irrigation districts	6,921	39.2
U.S. Bureau of Reclamation projects or storage operated directly by the Bureau	711	4.0
U.S. Bureau of Indian Affairs	579	3.3
States	44	.2
Cities	73	.4
Total	[1] 17,701	100.0

[1] Total differs from total in table 1 because Hawaii was excluded here.

Source: 1959 Census of Agriculture.

(c) *Current Value of Irrigation Facilities*

Gross capital investment chargeable to irrigation by irrigation organizations in the 17 Western States was estimated at $1.38 billion as of 1950. An additional $1.04 billion was invested by organizations in the period 1950 through 1959.[3] Neither estimate is corrected for capital replacement or for depreciation. Also, the estimates are not corrected for price-level changes. Thus, their total of $2.42 billion does not accurately portray the 1959 net capital value of irrigation systems investments in the Western States.

No estimate of total capital investment in irrigation works is available for the 31 conterminous Eastern States, which contained 1.8 million acres of irrigated land in 1959.

B. Costs and User Charges

CONSTRUCTION COSTS

The Bureau of Reclamation estimates that the average construction costs of future potential projects in the West will be about $920 per acre of irrigated land or irrigated land equivalent, though many proposals exceed this figure considerably.[4] This estimate was developed for projects identified by the Bureau as potential Federal projects. Approximately two-thirds of the projects identified were classified as potential Federal projects. An ex post approximation of irrigation construction cost can be made for the 17 Western States, plus Louisiana, by dividing the total of new capital investment by organizations, 1950–59 ($1,040 million) by the increase in organizations' irrigated acreage, 1950–59 (2.7 million acres).[5] This amounts to $381 per additional irrigated acre. This figure is not corrected for changes in the price level during the 1950's. New capital investment, 1950–59, reported by the Census of Agriculture includes some unknown amount of new capital invested in existing irrigation struc-

[3] "Census of Agriculture, 1959," vol. III; p. 69.

[4] "Water Resources Activities in the United States," Committee Print No. 14, Select Committee on National Water Resources; U.S. Senate (Washington, D.C., 1960), p. 19. Irrigated land equivalent is the number of acres fully supplied with irrigation water. It is made up of (*a*) newly irrigated land, and (*b*) land presently irrigated but not fully supplied with water. For example, a project may (*a*) newly irrigate 10,000 acres, and (*b*) upgrade water supplies for an additional 10,000 acres where supplies had been only 50 percent adequate. The project in this case would be considered to involve 15,000 acres of irrigated land equivalent.

[5] "Census of Agriculture, 1959," vol. III, pp. 30, 77, and 192.

tures that is neither maintenance nor replacement cost and does not necessarily lead to the irrigation of additional acres. Such an investment might have been made to increase a canal's peak flow capacity, or to supplement a pump engine with an additional engine that would increase the capacity of an existing pumping system. Also, supplemental water might have been provided for existing irrigated acreage by the investment of new capital.

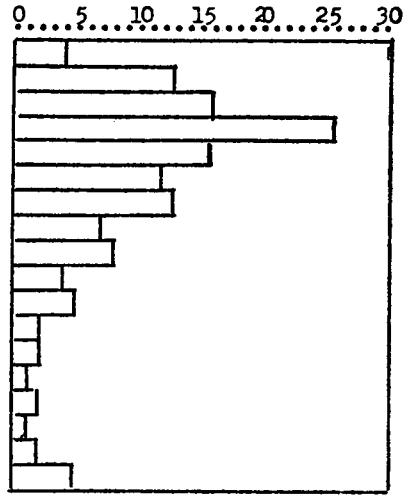
2. OPERATION AND MAINTENANCE COSTS

Operation and maintenance costs of supplying water to growers were estimated to average $4.81 per acre for 1949 in the 17 Western States.[6] No later data are available. There are no comparable statistics available for the Eastern United States.

An approximation of the typical annual range of operation and maintenance cost of irrigation water per acre of irrigated land in the year 1964 was made, using selected data from pages 109–111 of the Bureau of Reclamation's "Report of the Commissioner, 1965; Statistical Appendix." According to this estimate, the current range of typical operation and maintenance costs per irrigated acre in projects constructed by the Bureau of Reclamation is from about $3.90 in the Kansas. Nebraska, Dakota, Wyoming, Utah, Montana, Idaho area to about $19.40 in the Arizona-southern California area. Chart 1 shows the numbers of projects having given annual operation and maintenance costs per irrigated acre.

CHART 1.—FREQUENCY DISTRIBUTION OF SELECTED BUREAU OF RECLAMATION PROJECTS' ANNUAL OPERATION AND MAINTENANCE COSTS PER IRRIGATED ACRE

Cost per acre	Number of projects per O&M cost category
$ 0-$ .99	4
$ 1.00-$ 1.99	13
$ 2.00-$ 2.99	16
$ 3.00-$ 3.99	26
$ 4.00-$ 4.99	16
$ 5.00-$ 5.99	12
$ 6.00-$ 7.00	13
$ 7.00-$ 8.00	7
$ 8.00-$ 9.00	8
$ 9.00-$10.00	4
$10.00-$11.00	5
$11.00-$12.00	2
$12.00-$13.00	2
$13.00-$14.00	1
$14.00-$15.00	2
$15.00-$16.00	1
$16.00-$17.00	2
$17.00 and over	5



Source: U.S. Bureau of Reclamation; Report of the Commissioner, 1965.

[6] "Census of Agriculture, 1950," vol. III, p. 88;

3. USER CHARGES

Complete national cost and revenue statistics from cooperatives, irrigation districts, and other organizations are not available at this time; thus, it is not possible to determine the extent to which irrigation costs are covered by user charges. Irrigation districts are supported in part by tax levies in addition to water charges assessed against users.

Aggregate cost and price statistics are available for Bureau of Reclamation projects. Allocation of project costs (which excludes on-farm associated costs of land preparation, etc.) varies between projects. Revenues for reimbursement of Bureau of Reclamation projects are obtained from payments on repayment contracts, water service, and rental revenues, power revenues, and other sources. Irrigation costs are interest free and are repaid over a contractual repayment period by water users on the basis of their ability to pay, as determined by an economic analysis of the particular project. Irrigation costs above water users' ability to pay are repaid through financial assistance from surplus power revenues, and other miscellaneous project revenues.

In the Bureau's existing reclamation program, including projects authorized, under construction or completed, the total amount of reimbursable expenditures allocated to irrigation purposes as of June 30, 1965, was $3.842 billion of which $1.875 billion, or 49 percent will be paid for mainly by power revenues.[7] Nonreimbursable irrigation costs on Bureau of Reclamation projects as of June 30, 1965, were $78.4 million.[8]

Another source of Federal financing of irrigation water sources is through the Watershed and Flood Prevention Act (Public Law 83–566). Under this program, which is administered by the Department of Agriculture, cost sharing up to 50 percent of total costs is authorized for construction of certain structures, including impoundments for irrigation water.

Comparable statistics concerning charges to irrigators on projects administered by State and local governments are not available.

C. The Trend of Capital Outlays

In 17 Western States and Louisiana, the trend of annual capital outlays for irrigation water supply systems of organizations has been as follows for two recent periods: From 1940 through 1949, $520 million, or an average of $52 million per year. From 1950 through 1959, $1,039.6 million, or $103.96 million per year.[9] These capital outlays have been applied mainly to irrigating additional acreage, but not entirely so.

1. A POSSIBLE ACCOUNTING FOR THE NEW INVESTMENT IN IRRIGATION

Of the $1,045.2 million new capital investment by organizations in the 17 Western States, Louisiana, and Hawaii in 1950–59, $496 million was invested in California and $200.8 million in the State of

[7] Report of the Commissioner, 1965; U.S. Department of the Interior, Bureau of Reclamation (Washington, D.C., 1965) p. 79.
[8] Report of the Commissioner, 1965; p. 77.
[9] "Census of Agriculture, 1959," vol. III, p. 69.

Washington. Various amounts of less than $70 million were invested in new irrigation capital by each of the remaining 15 States.[10]

If we consider the additions to irrigated acreage rather than additions to capital investment, the largest expansion from 1950 to 1959 was recorded in Texas, which experienced an increase of 2,524,104 irrigated acres. Next was Nebraska, with 1,201,667 newly irrigated acres. Third was California, with an increase of 957,246 acres for the 10-year period.[11]

2. PROPORTIONS OF CAPITAL OUTLAY BY ORGANIZATIONS

In the period 1940–50 various proportions of new capital outlays of irrigation organizations for irrigation in 17 Western States were accounted for by the following agencies and other organizations:[12]

	Percent
Mutual, unincorporated organizations	1. 1
Mutual, incorporated	6. 3
Commercial water suppliers	1. 6
Irrigation districts	8. 3
U.S. Bureau of Reclamation	79. 8
U.S. Bureau of Indian Affairs	2. 6
States	. 1
Cities	. 2

There are no comparable statistics showing the proportions of new capital outlays accounted for by various organizations from 1950 to 1959, except that for the 17 Western States and Louisiana the proportion of new capital outlays by the Bureau of Reclamation was 76.5 percent and for all other organizations was 23.5 percent.

3. MEANS OF FINANCING

Bureau of Reclamation irrigation projects have been financed by Federal appropriations, contributions, and advances by water users, by the reclamation fund, and other special funds. The reclamation fund is comprised of collections from Bureau of Reclamation project power revenues, royalties from oil leases, sale of public lands and timber, construction repayments from water users' organizations, and other miscellaneous collections within Bureau of Reclamation projects.

State projects are financed by sources such as appropriations from general tax revenues, bonds, and Federal grants.

For sources of finance cities, towns, and counties issue bonds to the public and also receive U.S. loans. In addition, they may receive nonreimbursable aid from the United States in the form of payments of up to one-half of the cost of certain irrigation system structures (such as dams), that are a part of Public Law 566 projects.

Irrigation districts may sell bonds, where this is allowed by State law. In some cases these bonds are purchased by the State. Irrigation districts sometimes tax local property owners in advance of new capital outlays. The more usual practice, however, is to tax property owners later, when the time comes to retire bonds. If eligible, districts may construct federally assisted Public Law 566 projects, as do cities and towns. In addition, irrigation districts

[10] 1959 Census of Agriculture, vol. III, pp. 69 and XXVI.
[11] 1959 Census of Agriculture, vol. III, pp. 8-27.
[12] 1950 Census of Agriculture, vol. III; p. 95.

are often empowered to accept State or Federal loans (such as Farmers Home Administration loans) and State grants. Irrigation districts are the chief users of irrigation facilities built and financed by the Bureau of Reclamation.

Unincorporated irrigation mutual associations or cooperatives issue bonds and borrow from banks. Incorporated mutual associations issue bonds and borrow on notes secured by liens on fixed capital and water rights, but not on the land. They also receive Federal grants and loans. Their capital stock almost always represents funds of the water users themselves and not "outside" funds.

When the Bureau of Reclamation supplies facilities for irrigation, the Bureau, of course, is the body that supplies the financial resources. Most commonly, the "water users organizations" are irrigation districts, water districts, and conservancy districts. In order to have irrigation facilities constructed, a water users association must assume an obligation to repay the United States for a certain portion of the cost of the irrigation facilities. This is similar to the repayment of a loan. Still, it is not customary for the title to the irrigation facilities to pass from the Bureau to an irrigation district when the obligation has been repaid, although the irrigation district is likely to assume the operation of the facilities soon after construction is completed.

Lastly, commercial water suppliers who are not also water users usually finance construction of facilities with equity capital and with bond sale proceeds.

D. Projected Change in Irrigated Acreage and Development, 1964–75

As of 1959, nearly half of the irrigated acreage in the Western States and nearly all of the irrigated acreage in the Eastern States was supplied with water from privately developed sources. Moreover, farm water-application and land-preparation systems, including those systems on farms supplied by irrigation organizations, are not considered to be public irrigation facilities. These systems do represent some portion of the total capital structure of irrigation, however, and their purchase can be encouraged or facilitated through such means as cost sharing, credit, and watershed project development.

For the United States (mainland), the remaining irrigation potential is estimated to be 40.4 million acres, of which 15.5 million acres are in the East and 24.9 million acres are in the West.[13] Potentials for Federal and non-Federal are estimated to be as follows:

[In millions of acres]

	Federal	Non-Federal	Total
Western mainland	16.2	8.7	24.9
Eastern mainland	4.3	11.2	15.5
United States	20.5	19.9	40.4

In the West, roughly two-thirds of the remaining irrigation potential has been classified by the Bureau of Reclamation as potential Federal projects. The total cost of these projects is estimated by the Bureau

[13] Pavelis, George A. "Irrigation Policy and Long-Term Growth Functions," Agricultural Economics Research, vol. XVII, No. 2, April 1965. U.S Department of Agriculture, p. 55.

of Reclamation to be about $16.3 billion at 1959 prices, of which about $12.7 billion would be allocated to irrigation under present procedures.

Federal irrigation development in the East is expected to be limited to federally assisted small watershed projects (Public Law 566), mainly in the Southeastern and South Central States.

Projections of irrigated acreages for 1964 and 1975, and the net increase for 1964–75, broken into West and East sectors of the United States are as follows: [14]

[In millions of acres]

	West	East	United States
Projected irrigated acreage, 1975	38.0	3.9	41.9
Estimated irrigated acreage, 1964	34.2	2.8	37.0
Increase in acreage, 1964–75	3.8	1.1	4.9

The increase in irrigated acreage is allocated according to the estimated distribution of total remaining irrigation potentials in each region, as follows:

[In millions of acres]

	West	East	United States
Federal development	2.5	0.3	2.8
Non-Federal development	1.3	.8	2.1
Total additions, 1964–75	3.8	1.1	4.9

Bureau of Reclamation estimates of unit investment costs of western irrigation facilities range from $2,780 per equivalent acre in the South Pacific region to $566 in the lower Arkansas-White-Red region. The average is $920 per equivalent acre. These unit investment costs are for the irrigation water supply portion of projects and do not include farm development costs.

For western projects identified as non-Federal, the investment cost estimates ranged from $140 per equivalent acre in the Colorado region to $659 in the western gulf region. The average was $310 per equivalent acre of irrigated land.

Given existing legislation, Federal irrigation potentials in the East are assumed here to be limited to the acreages that could be irrigated by federally assisted small watershed projects (Public Law 566). At present, there are 15 such projects in the East; costs allocated to irrigation on a per-acre basis are available for 11 of the projects. These costs average $150 per irrigated acre, of which a maximum of half may be borne by the Federal Government. (In practice, approximately half of such costs have been borne by the Federal Government.)

[14] Irrigated acreages for 1964 were not available at the time the chapter was prepared. Projections for 1964 and 1975 were obtained from Pavelis, cited previously. The projection reported here assumes modest development of Federal and non-Federal potentials, resulting ultimately in development of half of the remaining potential of each.

Applying these average cost figures to the projected acreage increases, estimates of capital needs for irrigation development in the next 10 years are as follows:

Federal irrigation development	(*Million dollars*)
West, 2.5 million acres by $920	2,300.0
East, 0.3 million acres by $75	[1] 22.5
Total	2,322.5

[1] Federal share of small watershed project construction costs.

Non-Federal irrigation development	(*Million dollars*)
West, 1.3 million acres by $310	403.0
East, 0.3 million acres by $75	[1] 22.5
Total	425.5

[1] Non-Federal share of small watershed project construction costs borne by local organizations.

The estimated capital requirements for irrigation expansion shown above may be considered capital needs in the sense that additional capital will be required to finance the projected development. The projections do not purport to demonstrate the national need for irrigated acreage by 1975.

There is a wide range for investment decisions in both East and West with respect to future irrigation development. In both regions, the Federal or non-Federal development potential is sufficient to fulfill the projected increase in irrigation development. In the East, non-Federal development is expected to consist chiefly of independent development by private farm operators. Except for small watershed project construction costs borne by local organizations (estimated to be $22.5 million from 1964–75), non-Federal irrigation development in the East is largely independent of State and local government and private organization financing. It is expected that irrigation development in the East will continue to be carried out largely by individual farm operators.

Non-Federal irrigation development in the West includes irrigation by individual farm operators, mutual organizations, commercial water suppliers, irrigation districts, States, and cities. In 1959, non-Federal organizations irrigated 53 percent of all irrigated land in the 17 Western States and Louisiana, and 4 percent of irrigated land was supplied water directly by the Bureau of Reclamation and Bureau of Indian Affairs. Individual farm operators irrigated 43 percent of the West's irrigated land. In the period 1940–50, 35 percent of total capital investment in western irrigation systems was made by single farms; excluding investment in projects operated directly by the Bureau of Reclamation, single-farm investment was 73 percent of the total. Data for single-farm irrigation investment for later periods are not available. However, capital investment by non-Federal irrigation organizations in the West more than doubled between the two periods 1940–50 and 1950–59, from $106 to $244 million. Thus, even if there were no change in the amount of new investment by organizations other than the Bureau of Reclamation by 1975, these organizations would account for over half the projected $403 million non-Federal irrigation investment in the West.

The means by which new investment will be financed may differ greatly by type of organization. Between the two periods, 1940–50 and 1950–59, nearly 90 percent of the increased investment on western projects, excluding those operated directly by the Bureau of Reclamation, was by mutual organizations and irrigation districts. Separate investment data for cities and States are not available for the recent periods, but from 1940–50 their new irrigation investment combined amounted to $1.8 million.

Chapter 4

Sanitary Sewer Collection Systems*

A. The Nature and Composition of Sanitary Sewers

1. DESCRIPTION OF FACILITIES

Sanitary sewer collection systems provide a means of performing one of the most essential services required, if man is to exist in a communal fashion—the removal of wastes generated by him. Man cannot survive when too intimately surrounded by his own body wastes. These wastes including excreta are the breeding grounds of pestilence and the method of transmission of many diseases including cholera, typhoid and paratyphoid fevers, bacillary and amoebic dysentery, hookworm and ascaris infections, poliomyelitis and various other virus infections. As civilization evolved mankind has instinctively improved upon his methods of waste removal.

The origin of sanitary sewer collection systems employing water as the vehicle for transporting the waste is unknown, though portions of the Nippur, India, and Tell Asmar, Turkey, systems were constructed over 6,000 years ago. Waterborne waste systems were constructed throughout the then known world by the Romans. However, with the decline of the Roman Empire waterborne waste systems fell into disuse, and though the nucleus of many systems were subsequently constructed, they were installed as ground or surface drains, and the discharge of excreta into them was prohibited by law. Cesspools and pit privies replaced the water flushed devices in city homes, and as population concentrations increased the privies and cesspools proved to be inadequate. They tended to fill and overflow or otherwise malfunction, polluting the local ground and surface water, creating general nuisances and providing rodents and all manner of pests a friendly environment, thus contributing to the plagues that swept Europe during the middle ages.

Following a series of cholera epidemics in London at the beginning of the 19th century, it was demonstrated that the disease was waterborne through contamination of a water supply by leaching cesspools. To eliminate this problem, London in 1815 legalized the discharge of excreta into the existing drainage system of the city, and undertook the construction of facilities for the explicit purpose of providing drains from the existing cesspools to places where it was then considered safe to discharge their contents. These points of discharge were normally surface streams or rivers where the material would be flushed beyond the reaches of the community.

In providing a method of waste removal an even greater problem was created, that of stream pollution. When cholera again raged

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throughout London in the mid-1840's and early 1850's this problem of stream pollution was recognized, and remedial steps taken through the construction of interceptor sewers to concentrate all of the drains at a few points so that their discharge might be treated rather than pollute the streams. At the same time efforts were made to provide treatment of raw water supplies.

The first American city to follow London's example was Boston, Mass., which legalized the discharge of human wastes into its drainage system in 1833. It was not until 1857, however, that a sewer system in the United States was designed for the specific purpose of collecting waterborne excreta. In that year, both the city of Chicago, Ill. and the (then) city of Brooklyn, N.Y., undertook the construction of comprehensive consolidated sewer collecting systems. These systems were the forerunners of the modern sanitary sewer collecting systems which are currently providing service in over 12,000 communities in the United States.

(a) *Physical Characteristics*

In order that a distinction may be made between the public works categories of sanitary sewer collecting systems, storm sewer collecting systems, and sanitary sewage treatment systems, the following definitions have been employed:

> Sanitary sewage treatment systems include all the various devices used in the treatment or stabilization of sewage or industrial wastes of a liquid nature, including the necessary intercepting sewers, outfall sewers, pumping, power, and other equipment and their appurtenances, and includes any extensions, improvements, remodeling, additions, and alterations thereof.
>
> Storm sewer collecting systems include all the various devices used in the carrying off of, or removal of storm and surface water, street washings and other wash water or drainage, and include any extensions, improvements, remodeling, additions or alterations thereof, but exclude any device used in the carrying off of, or removal of liquids, wastes or drainage of an industrial, commercial or domestic origin.
>
> Sanitary sewers include all the various devices used in the carrying off of, or removal of liquid wastes or drainage of an industrial, commercial, or domestic origin through a pipe or conduit arrangement, either separately (separate sewers), or in combination with storm and surface water, street washings and other wash waters or drainage (combined sewers), including any extensions, improvements, remodeling, additions, or alterations thereof, but excluding all devices included as part of a sanitary sewage treatment systems, and all local buildings and household connections.

The modern sanitary sewer collecting system which evolved from the experience gained in the mid-1800's is a complex arrangement of pipes and conduits strategically located—throughout a community, in such a fashion—as to provide all improved property with a safe and sanitary method of disposal of the waterborne wastes that might originate thereon. The system provides service to not only households, but also to business and commercial establishments and industrial complexes.

Since the systems provide a necessary service to any and all parties on a demand basis, they are generally considered a utility, and as such the public has come to rely upon them for fully automatic service wherever they are employed.

(b) *Standards of Performance*

To be fully functional, collecting sewers must be constructed below the frost line, and at sufficient depth to allow for the drainage of basements adjacent thereto. In order to make the system as automatic as possible, the collecting sewers are laid on continually descending grades sufficient to produce self-cleansing velocities (not less than 2 feet per second when flowing one-third full) but not excessive enough to produce velocities in excess of 15 feet per second when flowing eight-tenths full which might damage the facility. In those areas where excessive depths would needlessly be encountered, it is often economically feasible to employ pumping stations to raise the level of the line to a reasonable depth. Similarly where ravines or other low areas are encountered which cannot be conveniently bridged, due to lack of clearance or for some other reason, or to prevent the sewer line from intersecting some other subsurface facility, inverted siphons are employed.

To facilitate maintenance and eliminate as many potential stoppages as possible, access to the system is provided by manholes strategically located throughout the system. The manholes, normally 4 or more feet in diameter, are spaced not more than 400 feet apart on small lines and 500 feet apart on larger lines (those over 24 inches in diameter). Manholes are also installed wherever the slope, direction or size of a line is charged, where two or more lines intersect, or at the terminus of a line.

In order to provide for the maximum service area with a minimum of pipe footage, the sanitary sewer collecting systems are normally installed in the center of streets or other public rights-of-way, being equally accessible from properties located on either side. Normally, the line or pipe from the building or other facility to be served to the sewer located in the public rights-of-way is the responsibility of the owner of the properties served and is not considered a part of the public sewer collecting system. The location of the sewers in the public domain also provides ready access to the system for purposes of maintenance and repair.

Sanitary sewer systems are normally designed to provide service for the estimated ultimate tributary population, based upon current and projected land use patterns of the area to be served for at least the next 50 years.

In those instances where economies of scale dictate a shorter design period, it should not be for a period of less than 25 years. In addition to the population requirement, adequate allowances for anticipated commercial establishment, institutions such as hospitals and nursing homes, et cetera, and industrial complexes should be taken into consideration.

Smaller sewers, those less than 24 inches in diameter, should be designed so that when they are flowing full, they provide a capacity of at least 400 gallons per day per person served, with adequate allowances for any industrial or commercial wastes and infiltration. In

the case of combined sewers, an additional allowance for storm and other surface runoff tributary to them must be included. Large sewers should have similar capacities, but due to the inherent time lag of concentrating the full flow of the smaller collecting lines in the larger main or trunk sewers, the per capita requirement when flowing full can be reduced to not less than 250 gallons per day per person served.

In order to minimize maintenance and prevent undue stoppages, no sanitary sewer collecting lines should be constructed less than 8 inches in diameter. The selection of material with which the system is constructed should include an appraisal of the characteristics of any possible industrial wastes which might be contributed to the system, the local soil and ground water characteristics, the possibility of septicity occurring in the lines, the durability and strength of the material itself, as well as its ability to withstand abrasion and the continuous pounding caused by traffic passing over it.

Under normal circumstances, sewer conduits have a reasonable life in excess of 50 years, as demonstrated by the many sections of sewer systems throughout the United States that were constructed prior to the turn of the century. Of these older conduits, many have had their efficiency substantially reduced by the failure of the material used for joining the pipes. This failure of the joint material has allowed roots, earth, and ground water to enter the lines, thereby blocking them, or increasing the amount of infiltration thereto, and in some instances even undermining the line to the point of collapse. Routine maintenance alleviates part of these problems through the removal of the tree roots and other materials that tend to block the lines. Infiltration and undermining are often not detected until a major failure on the part of the system is discovered, at which time either replacement of some sections of systems has to be undertaken, not because of structural failure or loss of efficiency of the existing sewer collecting system, but, because of radical changes in the use of the area served by the system. Areas that were originally utilized for single-family dwellings, have through time become locations of high population density concentrations, or even industrial complexes, whose needs far exceed the design capacities of the original system in the area. This problem will continue to persist as long as society continues to be mobile, but can in part be met through the planned orderly growth and development of our metropolitan complexes.

2. EXISTING CAPITAL PLANT

(a) *Growth and Distribution*

The inventory of municipal waste facilities conducted by the Public Health Service of Department of Health, Education, and Welfare in 1962 disclosed that there were 11,420 communities in the United States served by 11,655 sewer collecting systems in 1961. An estimated 118 million people, as well as innumerable commercial establishments and industrial complexes were provided service by these facilities. The number of facilities and the estimated population served by them, population size group and geographic location are presented in table 1.

TABLE 1.—*Summary of sanitary sewer systems in the United States as of 1962*

	Total		Type of sewer collecting system					
			Separate		Combined		Both or undefined	
	Number of systems	Population served	Number of systems	Population served	Number of systems	Population served	Number of systems	Population served
POPULATION SIZE GROUP								
Under 1,000	3,098	1,590,516	2,701	1,347,460	212	134,930	185	108,126
1,000 to 4,999	5,049	9,840,904	4,145	8,014,501	567	1,159,195	337	667,208
5,000 to 9,999	1,357	7,653,310	1,061	5,893,827	149	908,516	147	850,967
10,000 to 49,999	1,510	23,172,045	1,144	15,884,276	188	3,717,515	178	3,507,254
50,000 to 99,999	206	10,207,350	137	6,070,000	36	2,258,960	33	1,878,390
Over 100,000	435	65,907,794	274	20,098,985	57	17,721,939	104	28,086,870
STATES								
Alabama	216	1,495,043	214	1,493,218			2	1,825
Alaska	21	61,620	8	3,260			13	58,360
Arizona	74	710,649	72	689,734	1	20,000	1	915
Arkansas	161	792,675	141	705,285	2	64,300	18	23,090
California	506	11,458,492	477	9,359,536	17	2,057,910	12	41,046
Colorado	176	1,421,106	170	1,309,431	3	107,000	3	4,675
Connecticut	91	1,491,656	66	574,837	15	490,919	10	425,900
Delaware	16	267,241	9	25,158	1	2,700	6	239,383
District of Columbia	1	1,323,470					1	1,323,470
Florida	346	2,170,514	333	2,111,239	2	21,500	11	37,775
Georgia	276	2,268,492	262	1,083,157	6	914,515	8	270,820
Hawaii	27	362,166	27	362,166				
Idaho	91	302,999	79	244,894	10	48,905	2	9,200
Illinois	472	7,908,321	329	1,227,256	107	4,833,140	36	1,847,925
Indiana	321	2,867,845	103	364,915	206	2,445,065	12	57,865
Iowa	438	1,576,800	400	983,090	18	184,760	20	408,950
Kansas	335	1,468,250	325	1,180,005	2	107,000	8	181,245
Kentucky	161	1,263,145	134	563,080	20	658,620	7	41,445
Louisiana	161	2,100,673	158	2,095,553			3	5,120
Maine	109	479,453	37	68,720	39	198,650	33	212,083
Maryland	72	1,352,909	54	1,327,134	7	16,800	11	8,975
Massachusetts	144	4,389,580	81	619,165	40	131,760	23	2,838,655
Michigan	236	6,170,560	110	570,100	66	4,252,685	60	1,347,775
Minnesota	404	2,062,595	373	857,145	27	1,185,710	4	19,740
Mississippi	168	779,456	164	755,056			4	24,400
Missouri	466	2,643,725	411	1,065,225	6	44,945	49	1,533,555
Montana	114	385,220	103	299,680	4	19,600	7	65,940
Nebraska	300	802,230	275	517,470	13	26,790	12	257,970
Nevada	37	314,030	33	233,430	4	80,600		
New Hampshire	78	283,460	19	45,660	29	91,350	30	146,450
New Jersey	210	4,504,015	169	2,314,640	9	366,375	32	1,823,000
New Mexico	76	599,821	76	599,821				
New York	548	13,443,148	389	2,709,148	53	519,525	106	10,214,475
North Carolina	359	1,751,365	355	1,742,940	1	1,020	3	7,405
North Dakota	185	321,175	127	118,930	48	196,855	10	5,390
Ohio	441	6,776,295	241	1,856,930	117	1,735,680	83	3,183,685
Oklahoma	284	1,452,524	279	1,438,724			5	13,800
Oregon	165	927,080	116	270,110	37	610,280	12	49,690
Pennsylvania	682	9,559,417	439	2,687,262	137	707,915	106	6,164,240
Puerto Rico	69	121,634	69	121,634				
Rhode Island	22	561,975	18	174,385			4	387,590
South Carolina	221	927,114	221	927,114				
South Dakota	181	378,257	154	343,162	20	15,925	7	19,170
Tennessee	135	1,478,443	126	1,122,268	5	195,125	4	161,050
Texas	832	6,602,147	826	6,486,007	1	55,100	5	61,140
Utah	75	695,635	75	695,635				
Vermont	52	186,157	8	8,390	7	8,555	37	169,212
Virginia	231	1,866,241	202	1,481,817	1	180,000	28	204,424
Washington	230	1,628,330	133	373,650	46	825,505	51	429,175
West Virginia	176	726,181	98	163,460	48	425,471	30	132,250
Wisconsin	392	2,668,315	306	712,263	34	1,315,600	52	640,447
Wyoming	71	222,275	68	221,155			3	1,120
Total, United States	11,655	118,371,919	9,462	57,309,049	1,209	25,964,055	984	35,098,815

Source: 1962 inventory municipal waste facilities, Public Health Service publication No. 1165.

It should be noted that over 80 percent of all the systems were designed to exclude storm water runoff as well as other surface drainage. The remaining systems which were not so designed pose the single largest problem involving adequate sewage collection facilities which must be resolved during the remainder of this century, if the metropolitan complexes are to continue to grow and prosper. This problem of combined services is discussed in detail later in the chapter.

The physical facilities that made up the 11,655 sewer collection systems included over 270,400 miles of pipe, over 4 million manholes and an indeterminate number of special structures, pumping stations and related appurtenances estimated to have a replacement value in excess of $8.5 billion in 1965 dollars. New systems, additions and extensions of existing systems that have been undertaken since the inventory have increased the total miles of pipe in service to almost 300,000 miles, providing service to over 130 million people living in 12,600 communities. The current replacement cost of 297,500 miles of pipe including all necessary appurtenances is estimated to be in excess of $9.5 billion (1965 dollars).

Though sewers have been constructed in the United States since before the Revolution, comprehensive systems for the collection of water-borne wastes of a domestic nature did not evolve until the mid 1800's.

From its beginning in 1857, the growth in the number of such systems was logarithmic, and closely approximated the growth in the number of communities with populations in excess of 2,500 people, until the mid-1920's. Thereafter though the growth rate continued, many of the systems were built to serve smaller population groups. It is now estimated that over one-third of all the systems serve communities with populations of less than 2,500. Table 2 presents a historical comparison of the number of urban communities and their population, the number of sewer facilities and the population served by them since 1860.

TABLE 2.—*Development of sewer collecting systems in the United States*

Year	Census population (in millions)	Urban communities			Sewer collecting systems			
		Number	Population (in millions)	Population as percent of census population	Number	Population served (in millions)	Population served as percent of—	
							Census population	Urban population
1860	31.4	300	6.0	19	10	1.0	3	17
1870	38.6	650	9.0	23	100	4.5	12	50
1880	50.2	1,050	15.0	30	200	9.5	19	63
1890	62.9	1,420	22.3	35	450	16.1	25	72
1900	76.0	1,800	30.4	40	950	24.5	32	81
1910	92.0	2,310	42.2	46	1,600	34.5	37	82
1920	105.7	2,790	54.3	51	3,000	47.5	45	87
1930	122.8	3,179	69.0	56	5,100	61.5	50	89
1940	131.7	3,485	74.7	57	8,256	70.5	53	94
1950	151.3	4,077	90.1	59	10,600	80.0	53	89
1960	179.3	5,022	113.0	70	11,550	115.1	64	102

Source: Extrapolated data from, "Modern Sewage Disposal" Federation of Sewage Works Association and the "1962 Inventory of Municipal Waste Facilities in the United States," publication No. 1165. (Public Health Service).

In measuring growth, by number of facilities, a conservative picture of the industry is presented since as urban complexes have evolved, existing independent sewer systems have been integrated into larger consolidated systems. Therefore the number of systems reported at any specific time, is not the sum of all systems constructed prior to the time in question, but the number of identifiable systems in service at that time. No precise data are available regarding the number of new systems built, systems incorporated or consolidated into other systems, or portions of systems that have been abandoned.

(b) *Ownership Patterns*

Similarly, no data have been amassed regarding the ownership of sewer collecting systems, since they have normally been regarded as a function of local government. Private, proprietary type systems, though, have been employed for sewage collection where no governmental agency, or cooperative group was available to undertake the activity. Due to the large capital investment and low returns thereon, and the inability to restrict service for nonpayment of service charges, the proprietary systems have tended to relinquish their franchise to governmental bodies wherever possible, through sale or other disposal methods.

Cooperative systems also have been established where governmental agencies have not been able to provide the service. Subdivisions located in rural or semirural counties have accounted for a majority of this type of ownership. On the basis of information collected by the Federal Housing Administration, approximately 5 percent of their caseload of new housing mortgages in 1960 were provided sewer collection service by cooperative or other nonprofit type corporations. By 1965 the number of such mortgages had decreased to less than 1 percent. Applying these figures nationally to sewer collection systems in general, there could be as many as 500 nongovernment owned systems. Considering this indirect method of estimating, it is conceivable that the number has decreased to less than 100, and will continue to decrease as local governments continue to expand their services and consolidate independent systems.

B. Costs and User Charges

1. CONSTRUCTION COSTS

The costs of sewer collecting systems consist of the initial capital cost for construction, and the recurring costs of operating and maintaining the system. The initial construction cost is by far the larger and least determinate cost of the two. Due to the subterranean construction involved in sewer collecting systems, the cost of a given element of a system varies widely geographically, and even within the confines of a single system. As an example, the material cost for 8-inch pipe, which is the smallest size allowed by most jurisdictions, can range from as little as $0.60 per foot to as much as $2.50 per foot, depending upon the material from which it is made. The type of soil, ground water level in which the pipe is to be laid, depth of excavation, and method of placement of the pipe also materially affect the cost of the facility. On a total systems basis, the national average price per foot of pipe when equated to a specific project or

system may produce a meaningless figure because the average number of feet of pipe per person or per unit served varies geographically, and within geographic areas they further vary on account of population densities. Historically, it has required an average of 12.06 feet of pipe per each person served, or 38.59 feet of pipe per unit served. However, in some subdivisions it may require as much as 50 to 60 feet of pipe per person served or 160 to 200 feet of pipe per dwelling unit served.

Though the size of pipe used for sewer collecting systems varies from 6 inches in diameter to massive box-type culverts, over 96 percent of all the pipe in sewer collecting systems are less than 24 inches in diameter. Over 86 percent of the total footage of collecting sewers are 12 inches or less in diameter.

2. OPERATION AND MAINTENANCE COSTS

The large percentage of the smaller sizes of pipe in sewer collecting systems, causes the maintenance and repair cost to be fairly uniform throughout the United States. Though it varies from less than 50 cents per person served to over $10 per person served per year the average maintenance and repair cost is around $2.50 per person per year.

The maintenance of a sewer collecting system involves the periodic removal of solids deposited in the lines as well as the removal of foreign objects, such as junk deposited by vandals, and tree roots which infiltrate sewer lines for moisture. Due to the diverse nature of the materials encountered, separate schedules of maintenance are required. A majority of the problems encountered are solved as they come to light. Routine inspection of lines for necessary repairs are conducted on most systems annually, or semiannually, at which time any deposits or foreign material are removed. Routine inspections are designed to detect areas of pipe settlement, collapse, deterioration, of joint failure, which then must be corrected by unearthing the pipe, or wherever practical from within the pipe. During the past several years great advances have been made in developing equipment for repairing the smaller diameter pipes from within, thus avoiding needless excavation.

The cost of repairs for sewer collecting systems consequently varies more by the method of repair employed, than by the size of facility to be repaired. Since each repair must be evaluated on the basis of the circumstances surrounding it, such as maximum permissible time allowed, disruption to other normal community services, access to the problem, et cetera, no attempt has been made to determine the range of possible costs involved for repairs. It suffices to say, however, that because of the nature of the service, the cost of repairs is insignificant, compared to the damage arising from failure to remedy the situation.

During their early development sewer systems were considered a necessary public service to protect the public health. Their construction was financed through direct assessment or general appropriation, using general obligation funds with no provisions for continuing charges to cover operations and maintenance activities. This practice is still employed in many communities.

3. USER CHARGES

Prior to the 1900's a very small number of communities employed sewer service charges to support the public borrowing necessitated by the construction of sewer facilities. In several instances sewer charges were used to help offset the cost of operating and maintaining the system. With the ever-increasing demands placed upon local governments for additional services, and the high failure rate of general obligation bonds during the early 1930's, a general trend toward sewer service charges by municipal governments began. This trend bolstered sagging tax revenues and provided a means of entering the then rapidly growing revenue secured bond market. As indicated in the sample survey detailed in table 3, the number of communities employing service charges increased over 600 percent during the 20-year period between 1930 and 1950, and an additional 1,100 percent between 1950 and 1960 over the 1930 base figure.

In order to make bond offerings more attractive and to insure collection of the service fees, sewer service charges wherever possible have been combined with water service charges, or established as liens against the property served. In so doing the communities have been able to obtain necessary funding, using combined water and sewer revenue bonds, secured in addition by a general obligation lien on tax resources.

In many States this type bond is not charged against a community's statutory general obligation debt limit, allowing the community to undertake projects which otherwise would have had to be postponed indefinitely. For communities without established credit, the use of revenue bonds is sometimes the only means by which funds to construct a basic system can be obtained through public borrowings.

It is of interest to note, that though the yield on revenue-type bonds is generally higher than on general obligation bonds, the difference between yields has continuously decreased during the past decade, as investors have become better acquainted with revenue issues.

A recent survey in 1961 of municipal sewer systems disclosed that 63 percent of the respondents employ sewer service charges. Almost three-fourths of those supplying information had established rates that are adequate to cover the cost of operating and maintaining the system as well as debt service charges. Of the remaining communities that employed service charges, almost 80 percent receive at least half of their annual fiscal needs from such charges.

The 1961 survey also disclosed that the rate structure employed by the communities for service charges varies greatly. Over 80 percent used water supply data as a base upon which the service charge was fixed. In over 50 percent of the communities, the charge for sewer service was a surcharge based on water consumption. In the remaining communities such items as front footage, number of fixtures used, number of people served, size of water connection or a flat fee were employed to determine the service charge.

An analysis of the outstanding sewer debt of the communities included in the survey disclosed that over 30 percent of the dollar amount of the debt was completely self-supporting or self-liquidating through the use of the service charge. An additional 4 percent of the debt so reported was self-supporting to some degree. The communities that reported their debt to be completely covered, represented 35

percent of the respondents, with an additional 12 percent of the communities utilizing a partially self-liquidating debt program. The balance of the outstanding debt reported by these communities represents general obligation borrowings.

TABLE 3.—*Trend in number of local governments employing service charges by population size group and decade in which service charge was adopted*

Population size group	Decade								
	1900–1909	1910–1919	1920–1929	1930–1939	1940–1949	1950–1959	1960–1961	Date unknown	Total
Under 25,000		1		3	5	27	4	8	48
25,000 to 49,000	1	1		4	4	11		9	30
50,000 to 99,000		1	2	8	10	26	1	7	55
Over 100,000			1	8	11	22	1	6	49
Undefined [1]			1		3	7			11
Total	1	3	4	23	33	93	6	30	193

[1] Special districts for which no assignment by population size group could be made.

Source: Extrapolated data from "Sewer Service Charges" by Lennox L. Moak, Municipal Finance Officers Association of the United States and Canada.

C. TRENDS IN CAPITAL OUTLAY

1. ANNUAL OUTLAYS

In the sewer collecting field, statistics on public undertakings have been compiled only since 1951. Unfortunately, no measurement of the amount of private undertaking is available, though it represents a substantial amount of the total new sewer collecting construction. Many local jurisdictions require that when a builder or developer undertakes a subdivision, he must provide the necessary public water and sewer systems to serve the area. Upon completion, these are dedicated to the local government along with other municipal type facilities such as roads and storm sewers. In order to obtain a measurement of the private undertakings, estimates were prepared using the number of housing starts per year, and the experience of the Federal Housing Administration with respect to the number of mortgages for new housing served by public sewer systems.

Since 1951, the amount of public undertakings as measured by contract awards rose from a low in 1952 of $225 million to a high of $405 million in 1963. Since 1963 contract awards have decreased slightly to their current (1965) level of $385 million. During the same period of time (1952–65) estimated private sewer construction (based on housing starts) held fairly steady at about $150 million annually until 1960 when it started to decrease to its current level of $130 million.

Combining public and private sewer construction activity by year results in a relatively small increase in the amount of work undertaken annually since 1951. (See table 4.) Comparison of the 1952–56 annual average with the 1961–65 annual average, produces an 11-percent increase between the two time periods. This relatively static situation reflects a combination of many factors, especially the great demands placed upon the limited financial resources of municipalities by other public services, primarily educational or other visible tangible

facilities, as compared to "the out-of-sight, out-of-mind" type facility such as sewers.

TABLE 4.—*Contract awards for sewer collecting systems 1952–65*

[Millions of dollars]

	Source of funds		Total
	Public [1]	Private [2]	
Year:			
1952	$225	$157	$382
1953	286	150	436
1954	211	161	405
1955	301	171	472
1956	305	140	445
1957	247	127	374
1958	310	144	454
1959	336	155	491
1960	359	125	484
1961	380	129	509
1962	320	131	451
1963	405	136	541
1964	396	130	526
1965	385	128	513

[1] Source: "Sewage and Waterworks Construction," Public Health Service Publication No. 758.
[2] Estimated from housing statistics as reported by Bureau of Census.

Though the percent of municipal expenditures obligated for sewage, including sewage treatment, has continued to be relatively constant through the years, the increasing emphasis placed on waste treatment facilities has absorbed the increase in funds available as municipal resources have increased.

2. SOURCES OF FINANCING

As indicated in table 4 one-fourth of the capital outlays for sewer. annually is undertaken by homebuilders, who in turn pass on the coss of the facility to the individual home buyers. The balance of fundt for construction is normally obtained through private borrowingss A limited amount of Federal aid has been provided through the years for sewer construction, either as a part of some other undertaking or for brief periods of time as direct grants to finance construction of sewer facilities (that is, the Public War Housing Act of 1940 and its amendments, $54 million; and the Public Works Acceleration Act of 1962, $128 million).

Though no data are available regarding sanitary sewer borrowings from private sources, the gross amount of such borrowings is exceptionally small. Long-term public borrowings through the municipal tax exempt bond market (as reported by the Investment Bankers Association to the Department of Health, Education, and Welfare (PHS publication No. 965)) however, account for 63 percent of all municipal undertakings. These borrowings are divided into three general categories on a dollar basis as follows:

Fifty-seven percent general obligation bonds
Twenty percent sewer revenue bonds
Twenty-three percent mixed sewer and/or other type revenue bonds with or without general obligation underwritings.

In order to assist local public bodies that cannot sell their bonds on the open market at a reasonable interest rate, the Federal Govern-

ment provides loans through the public facility loans program (which is administered by the Department of Housing and Urban Development). Under the PFL program 224 loans have been made through December 1965 to local public agencies involving $102 million for the construction of sewage collecting systems, and waste water treatment plants. In addition, 141 loans have been made for construction projects involving both water and sewer facilities estimated to cost $76 million. The Department of Housing and Urban Development also administers a program of advances for public works planning, which provides noninterest bearing advances to enable communities to prepare plans for needed public works. The advances become due and repayable only when the planned work is placed under construction. Over 2,400 advances have been processed under this program providing about $57 million to local public agencies to assist in planning of needed sewer facilities, having an aggregate cost in excess of $3.3 billion.

In addition to the Federal assistance, approximately one-third of the States have adopted legislation to provide financial aid for sewerage facilities in the form of grants and/or loans. Most of the State grant programs are keyed to the Federal Water Pollution Control Act, either for purposes of establishing eligibility or determining the amount of aid to be provided. California, Indiana, New Jersey, Ohio and Oregon have loan programs to assist communities to design and/or construct sewerage facilities. Delaware, New Jersey, New Mexico, New York, Pennsylvania, and Vermont have enacted grant programs to communities to assist in the development of sewage systems or part thereof. New Hampshire guarantees loans for sewer facilities and participates in a program of annual payments to defray amortization and operating expenses as do New York and Pennsylvania. The effects of the State aid programs have not been evaluated.

The balance of financing for sewer collecting systems construction which amounts to approximately 25 percent of all sewer construction undertakings, or 37 percent of the municipal undertakings, is obtained from three general sources. They are in order of importance, short term public borrowings, revolving construction funds or sinking funds related to previous borrowings and direct appropriations or "pay-as-you-go" arrangements. The exact amount of each category is unknown, but the general use of short-term public borrowings by municipalities for all purposes has increased from $2.7 billion in 1956 to $6.5 billion in 1965 or an increase of over 140 percent during the last 10 years. The "pay-as-you-go" principle is not adaptable to the sewer collection field generally because of the need to create large surpluses or reserves before construction can be undertaken. However, in areas where small additions to existing systems are to be made, the "pay-as-you-go" method is often employed.

D. Needs and Prospective Capital Outlays

1. Factors taken into account

President Lyndon B. Johnson in an address at the University of Michigan (Ann Arbor, Mich., May 22, 1964) stated:

> In the remainder of this century urban populations will double, city land will double, and we will have to build homes, highways, and facilities equal to all those built since this country was settled.

In addition to this national challenge, there are over 9 million people now living in urban areas that are not provided with sewer collecting services, yet the areas in which they live have sewer collecting systems serving portions of the communities. Over 59 million people are now served by combination sewers, which must be modified, rebuilt, or replaced during the next three decades, if we are to prevent uncontrollable water pollution. Most of the existing sewer systems currently in service have sections which are in need of extensive rehabilitation or replacement. The sum of these shortcomings is that one-third of the total population of the United States, or one-half of the sewered population, is currently provided with less than desirable sewer collecting services, based upon decent, safe, and sanitary criteria. Yet, capital investment in sewer collecting systems continues to show no increase.

To meet fully the challenge that no urban dweller should be denied the sewer collection service required for decent, safe, and sanitary housing by 1975, facilities to serve 41 million additional people must be provided, as well as the innumerable commercial and industrial establishments necessary to support this population increase. Due to the nature of the service provided; replacement, rehabilitation, and/or modification to existing systems will of necessity also have to be undertaken.

The complex problem of separating combined sewers estimated to cost between $20 and $30 billion, will be begun by many communities, or continued by others, on a relatively small scale, until economic solutions to the problem have evolved. In recognition of this problem, the Congress in 1965 included in the amendments to the Federal Water Pollution Control Act, a $20 million annual authorization for a 4-year program of investigation and demonstration of methods for controlling pollution from storm sewers and from sewers carrying both storm and sanitary wastes. The solutions evolved from this program will not be available for complete evaluation before 1969–70. Consequently, the findings of the program will not be translated into action programs until the mid 1970's, and the problem is not likely to be brought under control until the late 1980's or early 1990's. If new sanitary sewer collecting systems are the ultimate solution, the rate of expenditures for sewer collecting systems beginning in 1970 will have to be twice the currently estimated rate for the period 1971–75. Therefore, until the results of the new demonstration program have been evaluated, no proper distribution of probable activity between sanitary sewer collecting systems, storm sewer systems, and waste water treatment facilities can be made. Yet, the combined effort of the three categories of the public works beginning around 1970, will require annual capital expenditures of from $2 to $3 billion a year for the balance of the century.

As the Nation continues to urbanize, population densities will continue to increase particularly in the existing centers of population concentration. The central cities will continue to rebuild, and as today's suburbs increase in age, they will be replaced by multiunit housing and industrial and commercial complexes. Consequently the number of feet of pipe, or other quantitative measurement of need on a per capita basis will tend to decrease slightly as the population densities increase. This trend will be so small as to be inconsequential, unless there is a phenomenal change in the complex of our urban centers

toward multiunit housing and great open spaces. Such change may gradually occur during the next 30 to 50 years, but during the next 10 years it will be inconsequential, with respect to sewer collecting systems design and construction. With the continuing actual or threatened shortages of water for all purposes, efforts to decrease water uses or consumption for certain purposes through technological advances and changes in living patterns will tend to keep the per capita need at the current level of usage, though many new uses of water will evolve during the period. Consequently, the current design criteria for sewer collecting systems is likely to be continued during the next decade.

2. ESTIMATED CAPITAL REQUIREMENTS

In order to (1) provide for the existing backlog of unsewered urban dwellers and the expected increase in urban dwellers during the next 10 years, (2) replace, modify or repair obsolete or undersized facilities, and (3) commence activities toward solving the combined sewer problem through construction of new separate sanitary sewers, it will be necessary that the total annual investment in sewer collecting systems be more than doubled during the next decade. Table 5 presents the estimated capital outlay requirements in millions of dollars, by population size group for the next 10 years, for sewer collection facilities based upon the foregoing considerations.

TABLE 5.—*Projected total capital construction requirements by community size by year 1966–75*

[In millions of dollars]

Size of community	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
Less than 1,000	55	58	60	63	66	74	78	85	94	104
1,000 to 5,000	114	119	124	131	138	154	161	179	196	214
5,000 to 10,000	83	88	91	96	101	113	119	131	145	158
10,000 to 50,000	214	225	234	248	260	289	304	336	370	403
50,000 to 100,000	69	73	75	80	84	94	98	109	120	130
Over 100,000 people	233	240	255	269	283	314	330	365	403	438
Total	768	803	839	887	932	1,038	1,090	1,205	1,328	1,447

3. MEANS OF FINANCING

As in the past, the homebuilding industry will account for a portion of the projected needs. On the assumption that housing starts will increase to an annual rate of over 2 million units per year by 1975, the amount of funds expected from this source for sewer collection system construction will correspondingly increase by 33 percent. The balance of funds required consequently must be provided through public agencies, which must increase their activities in this area by 115 percent.

Based upon past activity, and current estimates of the Investment Bankers Association, the municipal tax-exempt bond market will not be able to absorb more than a 70-percent increase in dollar volume during the next decade. Assuming the two premises are correct (1) a 33-percent increase in private funds and (2) a 70-percent increase in public long-term borrowings, other sources of funds must be tripled by 1975 in order to meet the estimated dollar requirement for sewer collection system construction. Considering the variety of demands

for increased municipal services currently faced by local public bodies, an increase of over 200 percent in the amount of funds available from short-term borrowings, sinking fund and "pay-as-you-go" activities for this specific purpose is problematical. Since the estimated amount of available funds for sewer collecting systems construction will be less than required, the necessary additional funds must come from other sources than those currently employed.

Congress in 1965 recognized the need for an additional source of financial aid to communities to assist them in undertaking needed sewer facilities. As part of the Housing and Urban Development Act of 1965 (Public Law 89–117), the water and sewer facilities grant program authorized appropriations not to exceed $200 million annually through fiscal year 1969, for grants, not to exceed 50 percent of the development cost of specific projects to assist communities in the financing of public water and/or sewer facilities (other than sewage treatment plants and their appurtenances). Since there are three general categories of facilities (i.e., (1) water, (2) sanitary sewer, and (3) storm sewer) eligible for this aid, no attempt has been made to prorate the probable amount of funds which will eventually be expended for each of the categories.

In addition, Congress has also provided assistance under the Public Works and Economic Development Act of 1965 (Public Law 89–136, authorizations not to exceed $500 million per fiscal year through fiscal year 1969), the Appalachian Regional Development Act of 1965 (Public Law 89–4 authorization of $6 million), and the Consolidated Farmer's Home Act of 1961 as amended (Public Law 89–240, authorizations not to exceed $50 million per fiscal year) for grants and/or loans to construct public facilities including sewer collecting systems. Due to the unique purpose for which each of the programs was enacted, no distribution of probable financial assistance among the eligible categories of public facilities construction has been attempted.

An evaluation of the extent to which local public bodies will utilize the various Federal financial assistance programs would be premature.

Chapter 5

Storm Sewer Systems*

A. Nature and Composition of Facilities

1. Description of Facilities

(a) *Characteristics, Functions, and Fundamental Principles*

Storm sewer systems consist of manmade and natural channels and conduits which, together with inlets, catch basins and outfall structures, function collectively to convey surface waters to disposal points outside the area of collection. The waters so collected are generally the residual fraction of precipitation remaining on the land surface after other fractions have been lost to surface ponding, evaporation, and infiltration into the ground. This fraction of the total precipitation is referred to as storm runoff, or simply runoff.

Another type of sewer system, frequently installed in urban areas in past years, conveys sanitary and industrial wastes combined with runoff. Sewers of this type are termed "combined" sewers. Such sewers intercept sanitary flow in dry weather for conveyance to a treatment plant. During periods of storms a portion of the combined flow is conducted to a treatment plant and the balance is discharged into the local drainage canals or waterways. Although storm sewers and combined sewers are distinctly different in function, each of these sewer types conveys runoff. To simplify terminology, the term "storm sewers," where used in this chapter, is meant to include both separate storm sewers as well as combined sewers, except where indicated otherwise.

Surface water resulting from various domestic uses of water, such as auto washing, excess lawn watering and cleansing of walks, driveways and parking lots also produce runoff. Many mechanical devices, such as water-cooled air conditioners, sump pumps, condensate equipment and some types of industrial equipment also contribute to the total runoff. The amounts thus contributed, with the exception of that from nonrecirculating, water-cooled air conditioners, either do not constitute significant quantities or are not normally produced during periods of precipitation. Although the cooling water from nonrecirculating water-cooled air conditioners, where disposed of through storm sewer systems, is an important factor in the total quantity of drainage in some localities, this fraction will not be included since the problem is nonexistent in some areas and it can be, and often is, controlled by regulatory measures in others. Thus, runoff is considered here to be only the fraction of precipitation resulting from rainfall or the melting of snow and ice.

The general lack of available records and data relating to design and construction of storm sewers became increasingly evident as this

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study progressed. This lack of information highlights a need for comprehensive and coordinated programs of research and development in the field of urban hydrology and hydraulics.

The inescapable consequence of decisions regarding storm drainage is the selection of space for the temporary storage of storm water. If nothing is done to convey storm water away, it will occupy space near the place where it falls. If a storm sewer is constructed, storm water will occupy space at the downstream end of the storm sewer. Regardless of what decision is made regarding storm drainage, there results a selection of space for the temporary storage of storm water. This is an important fundamental principle.

In urban areas space has typically high economic values. Complete economic analyses must include the cost of the space selected for the temporary storage of storm water, since the use of that space for other purposes is curtailed. This concept is relatively new to the field of storm-drainage economics, and warrants thoughtful consideration by all persons who make decisions in that field. A subsequent part of this paper further develops this concept.

(b) *Services Rendered; Dangers and Damages*

The runoff produced in rural areas can cause considerable damage to crops, soil, animals, farm buildings, and roads and highways. At times it may even result in loss of life in both humans and animals. The U.S. Soil Conservation Service works with local rural groups to plan and construct drainage facilities to alleviate such problems. Corrective measures employed in rural areas must be entirely different from those used in urban areas. Such measures normally include contour plowing, selective area and crop farming, reforestation, maintenance of natural ditches and watercourses, and the construction of embankments and levees along with judicious location of buildings, feedlots, pastures, crop-fields, roads, ponds, and impoundments.

The runoff from urban areas, if not properly conveyed to disposal points, can result in very significant losses. Most important of these is the great damage inflicted upon both real and personal property. As a result of discussing such losses with knowledgeable individuals, it is estimated that the total average annual losses in all parts of the United States in recent years is $1 billion or more. However, this estimate merely indicates the general magnitude of losses since data on the evaluation of losses is not available. Considering the present rate of industrial expansion and population growth in urban areas, it is not difficult to visualize an increase in losses due to such property damage.

Inadequate disposal of runoff often results in widespread loss of valuable time and frequently, causes great inconvenience to urban populations. This is characterized by persons arriving late to places of employment, or perhaps not reporting at all, because of delays in transportation caused by street flooding, or resulting from the need to care for property being endangered by flooding.

Flooding of basements can result from unsatisfactory or nonexistent storm sewer systems. The results may vary, from mere inconvenience and loss of use of basement facilities, upward to very serious threats to health and safety. The extensive use of combined sewers presents a threat of disease to the helpless public in such areas. In commercial areas, where food may be served in basement cafeterias and restau-

rants, such basement flooding admits sewage which could cause disease to spread rapidly to many persons and, if communicable, thence to others over wide geographic areas. In industrial and commercial areas, basement flooding, from combined sewers, frequently causes serious damage to mechanical, electric and process equipment, such as power generating equipment, heating and cooling equipment, transformers, mechanical shop equipment and stored equipment, goods, and supplies.

There are, in many communities, low-lying areas which flood frequently due to the runoff from local storms. There are also areas which are inundated by rising waters of natural watercourses. In the latter case, the protective measures to be employed involve the construction of flood control facilities, which are beyond the scope of, and are not included in, this report. In either of the above cases, funds required to minimize property damage are often not available. In such cases a logical solution to the flooding problem is the use of flood plain zoning. This procedure limits the usage of such areas in a manner which minimizes damages. The construction of permanent structures and improvements are prohibited, in favor of the type of development or usage which will suffer only temporary and relatively small damages. The development of parks and recreational areas in flood plains, in lieu of residential, commercial, and industrial development, is an example. Such zoning does, however, meet with considerable opposition from landowners and, in some cases, persons in the government responsible for fiscal matters.

(c) *Quantitative Standards of Performance and Design*

The measurement of the standard of performance of storm sewer systems is mainly a quantitative one. A system which is entirely adequate would carry off, without damage, all drainage from miscellaneous sources and the runoff resulting from any conceivable storm that may occur in the future, no matter how rare in frequency of recurrence. To conceive and design such a system would be impractical and economically unsound. In fact, a greater storm than heretofore experienced may occur after such a system is constructed. The system is then no longer completely satisfactory.

Today, storm sewer systems are designed for hypothetical rainstorms of an "intensity, duration, and frequency of recurrence" which appears economically justified for the particular locality. At some future date, when sufficient and accurate data are available for a given geographic locality, and after somewhat more refined methods of data analysis and design procedures have been developed, it will be possible to design a storm sewer system for such a locality in a more precise and meaningful manner than is now possible.

The customary design procedure now used is to design storm sewer systems protecting residential areas for the storm likely to be equaled or exceeded, on the average, once in a given period of time. The period used ranges from 2 to 10 years (five is common). Whether the 2-year or 10-year frequency, or another, is selected depends upon the relative value of the property being protected, and the ability to pay. Systems protecting industrial and commercial areas are sometimes designed for storms of greater intensity.

Whether or not a storm sewer system should be built, or improved, should be based, in part, upon a thorough survey and analysis of annual

benefits and costs. The annual total cost of a storm sewer system can be expressed as the sum of the amortized capital investment, interest on investment, operating and maintenance expenses and estimated annual damages occurring after installation of the system.[1] If such costs, when amortized over the estimated life of the system, are less than the annual damage expected to be inflicted under existing or anticipated circumstances, there is economic justification for the installation of the system as designed. However, if the annual cost is estimated to exceed the annual expected damage, the design should be revised and further cost analyses made until the benefit-cost ratio equals or exceeds unity. Further analyses may be made, assuming sufficiency of available data, until the optimum design is determined. Naturally, the economic consideration presented above constitutes only one of the many factors influencing the decisions regarding the need or desirability of a sewer project.

The adequacy of a storm sewer system of an urban area may also be described in terms of the percentage of total urbanized area that is provided with sewer systems, regardless of the design capacities. Unlike many other public services, the contribution made by sewers toward a community's environment is not normally measured per capita.

In summary, the quantitative standards of performance of systems of storm sewers, within an urban area, are generally described in terms of (1) the capacity for handling the runoff from an assumed hypothetical storm, (2) the percentage of the urbanized area which is sewered, and (3) the percentage of the total runoff sewered.

(d) *Qualitative Standards of Performance and Design*

Esthetics can influence the design of storm sewer systems and may be considered as a quality measure. As an example, a very large underground conduit may be constructed to carry runoff from a large drainage area; whereas, an open, paved, trapezoidal channel, constructed more economically on the ground surface may suffice quantitatively. The underground conduit would often be demanded to satisfy the esthetic requirements of many communities, and would also be demanded in some developed areas where the loss of usable land areas creates serious problems.

Construction material and workmanship are also quality measures. Materials and workmanship of the specified quality may usually be assumed. However, an entirely satisfactory design may, if construction inspection is superficial or missing, result in unsatisfactory performance of the system due to the use of materials and workmanship which do not meet the requirements of the plans and specifications of the design engineer.

Systems of "combined" sewers are not regarded as entirely acceptable in most communities because of the pollution often resulting from overflows carrying sanitary wastes, during period of rainfall. The installation of combined sewers is no longer permitted in some areas.

The installation of sewer systems, designed and constructed to meet both quantitative and qualitative standards of performance, often benefits adjacent properties by enhancing land values and by

[1] Knapp, John Williams. "An Economic Study of Urban and Highway Drainage Systems." Johns Hopkins University, Department of Sanitary Engineering and Water Resources, storm drainage research project, Baltimore, Md. 21218, June 1965; 175 pages. Technical Report No. 2.

increasing the usage of existing facilities (such as basements, yards, and streets) and may, therefore, be looked upon as part of a "reclamation" program. The importance of careful and efficient design of sewer systems is an important factor affecting quality.

2. EXISTING CAPITAL PLANT OF STORM SEWERS

(a) *The History of Storm Sewers*

When our country was first settled, sewers were generally nonexistent except for natural ditches and hastily constructed surface swales. It was possible to locate buildings and farm areas in favorable locations and the extent of damages suffered during flooding was small measured in terms of today's consequential damages.

As the urbanization of the country expanded and moved westward, the increased population, commercialization and industrial development imposed demands upon citizens, particularly property owners, to develop means of safeguarding their health and property. One of these safeguards developed through primitive stages (from the hand-dug ditch to the paved gutter, the rubble masonry ditches, and the underground wood sewer) and later developed into the modern underground conduit systems, provided with inlets, manholes, and catch basins; all integrated into a system of laterals, mains, trunks, and outfall sewers.

The development of systems of sanitary sewers naturally received priority as communities became congested. This was necessary to reduce the incidence of epidemics of disease and to provide for the esthetic demands and living standards of a progressing people. As communities grew, transportation became a problem. The horse and wagon, the surrey, and later the horseless carriage, again placed demands upon the citizens to provide negotiable transportation arteries through the growing communities. It was necessary to divert water away from the unpaved roadways. Later, storm sewers were the outgrowth of the communities' progress, and generally developed simultaneously with the construction of street pavements as cities modernized and developed into urban communities.

In many rapidly developing urban areas it became evident that a single system of sewers could be designed to serve both the need for disposal of sanitary waste as well as the surface drainage. Many cities thus began to construct systems of combined sewers. A 1964 publication of the U.S. Department of Health, Education, and Welfare [2] names large cities, including Boston, Chicago, Cleveland, District of Columbia, New York, St. Louis, and many others, as being served by combined sewers. Many large urban areas in the United States are served almost entirely by systems of combined sewers. A noteworthy example is the city of Chicago, Ill. Chicago, as of the year 1965, has approximately 4,000 miles of combined sewers and only a few miles of separate storm sewers.

Combined sewers satisfactorily convey sanitary wastes to disposal points during periods of dry weather but during periods of rainfall, they are generally unsatisfactory, when judged by today's living standards and functional and legal requirements. For example, with the advent of stringent laws regulating the disposal of untreated wastes into lakes and natural watercourses, it became necessary for

[2] U.S. Public Health Service, Division of Water Supply and Pollution Control, "Pollutional Effects of Stormwater and Overflows From Combined Sewer Systems—A Preliminary Appraisal," Washington, D.C., November 1964; 39 pages; publication No. 1246.

many cities to construct elaborate and costly plants for the treatment and purification of domestic and industrial sewage wastes. Where untreated wastes are an integral part of storm water, as in the case of wastes carried through systems of combined sewers, it becomes economically prohibitive to expend the large sums of capital required for the construction of treatment plants of the capacities needed to satisfactorily treat the total flows. In such cases, operating costs would also be extremely high. As a consequence, treatment plants serving areas with combined sewers have almost invariably been constructed of a capacity adequate to treat the sanitary waste and a fraction of the runoff only. During periods when main sewers are carrying flows greater than treatment capacity, combined sewers divert the excess flow into drainage canals, lakes, or natural bodies of water. This flow carries untreated domestic and industrial wastes into our lakes and streams, and often pollutes one of our most precious resources.

Although a few areas continue to construct combined sewers, many urban areas, and most suburban areas, have ceased constructing such sewers, and some areas have begun a program of converting combined sewers into separate systems. Complete conversion is very costly. The District of Columbia began its program of separation in 1954, with plans for completion by the year 2000. The cost for complete separation is estimated to be $300 million. A major research program to determine the feasibility of a rational method of separation of combined sewer systems or at least to minimize pollution from such systems, was commenced in the year 1966. It is hoped that methods will be developed, through research efforts, which will make separation feasible from an economic standpoint. The city of Chicago does not have plans at present for a sewer separation program. It has been estimated that the total cost of such a program in Chicago alone would total $2.3 billion. A remedial plan being studied for Chicago, which appears less costly and which should surpass separation insofar as pollution abatement is concerned, involves the construction of huge tunnels carved in the limestone strata more than 700 feet below ground surface. During periods of overflow, the wastes from the combined sewers would be dropped through vertical spillways into these tunnels which constitute a large temporary detention reservoir. The wastes would later be pumped to the surface, treated at treatment plants, and/or chlorinated and upgraded in temporary retention ponds, and then released to the natural watercourses at controlled rates. Such a system would prevent pollution of water bodies and would eliminate the excessive damages and inconveniences being suffered by citizens during periods of heavy precipitation.

One of the economies being effected in suburban residential areas and parkways results from the construction of open, paved channels, in lieu of underground conduits. Such open channels result in the loss of otherwise usable ground surface, are sometimes hazardous, and are sometimes aesthetically undesirable; they do, however, perform adequately when properly incorporated into a separate storm sewer system. Open channels are frequently improved or constructed through urban areas to serve as major collectors of runoff, and also waters containing a portion of the area's untreated wastes during periods of rainfall. The contamination of receiving waters, from the latter case, is objectionable. In other areas, such major channels carry only runoff, and are usually acceptable.

Surface drainage systems serving State highways and county roads in rural areas are simply constructed. These systems include inlets, short stretches of conduit, paved or sodded ditches, and hillside gutters. Culverts and culvert pipes serve to carry surface drainage beneath the roadway to the opposite side. The drainage from such systems is discharged into existing ditches, creeks, and rivers and sometimes into ponds, lakes, and bays. Storm systems serving urban highways and roads are generally made a part of the urban storm sewer system. Costs are often shared by the local public agency and the highway agency, based upon a formulated costs-benefits agreement. In some areas such costs are the total burden of the municipality. The funds necessary for such facilities are usually obtained from highway appropriations.

(b) *Distribution*

Unlike many other capital investments, systems of sewers are very difficult to measure and evaluate in terms of total capital investment. The reasons for this can primarily be attributed to the general lack of maintaining uniform records of such facilities by the various public and private agencies who were responsible for their construction. Another important factor is that it is difficult for a survey team to make an accounting of existing facilities. Several factors contribute to this; the most important factor is that sewers are generally buried and out of sight. It is often difficult, for survey teams, to determine the conduit sizes involved, the materials of construction, and the total lengths of systems. If such data were generally available from public agencies, and readily accessible upon request, it would be possible to make reasonably accurate summaries of existing storm sewer systems in the United States, on both quantitative and replacement-cost bases. Considerable costly time and effort would be required, however.

As an approach to making an approximate determination of existing storm sewer facilities and future needs in the United States, the American Public Works Association distributed a storm drainage questionnaire in 1965 to all urbanized places in the country with a population in excess of 10,000 persons. Replies were received from 627 of these. In addition, a storm sewer questionnaire was distributed by APWA in early 1966 to the central city of each of the 216 standard metropolitan statistical areas of the United States. Eighty replies were received. A third APWA questionnaire on storm sewers was sent in early 1966 to the regional planning commissions of these same metropolitan areas. Where a regional planning commission did not exist, the questionnaire was directed to the planning department of the central city within the metropolitan area. Seventy-nine replies were received.

As a result of the three surveys made by APWA, as described above, it is estimated that based on 1965 costs the total capital investment in storm sewer systems in this country is more than $22 billion. This estimate includes an appropriate allowance for the investments in combined sewers. The distribution of the capital investment in such facilities by States is given in table I. Totals by geographical regions can also be made. These estimates of capital investments in storm sewer systems, when divided by the corresponding unit construction costs (dollars in millions per square mile), result in an approximation to the square miles of sewered area. In the table expressing capital

investment, all construction cost items are included and the only exceptions are construction costs of such items and structures as would be properly considered to be a part of major flood control facilities. Therefore, dams, floodwalls, and similar construction are excluded.

TABLE I.—*Capital investment in urban drainage improvements in the United States, by region and State, 1965*

Region and State	1960 urban population (thousands)	Estimated value of improvements [1]		Square miles of improvements
		Per State (dollars in millions)	Dollars per capita [2] (urban)	
New England:				
Maine	497	40	80	30
New Hampshire	354	45	130	40
Vermont	150	15	100	20
Massachusetts	4,303	380	90	320
Rhode Island	743	150	200	100
Connecticut	1,986	190	100	190
Middle Atlantic:				
New York	14,332	3,480	240	1,800
New Jersey	5,374	1,760	330	1,000
Pennsylvania	8,102	1,500	185	850
East-North Central:				
Ohio	7,123	1,300	180	770
Indiana	2,910	400	140	370
Illinois	8,140	1,450	180	850
Michigan	5,739	1,100	190	550
Wisconsin	2,522	390	155	330
West-North Central:				
Minnesota	2,123	230	110	190
Iowa	1,463	170	120	140
Missouri	2,877	1,000	350	500
North Dakota	223	50	225	45
South Dakota	267	30	110	30
Nebraska	766	50	65	60
Kansas	1,329	200	150	170
South Atlantic:				
Delaware	293	75	255	25
Maryland	2,254	300	135	200
District of Columbia	764	150	195	60
Virginia	2,205	700	320	500
West Virginia	711	200	280	100
North Carolina	1,802	140	80	140
South Carolina	981	30	30	30
Georgia	2,180	90	40	90
Florida	3,661	1,700	465	800
East-South Central:				
Kentucky	1,353	250	185	250
Tennessee	1,865	200	110	200
Alabama	1,792	80	45	80
Mississippi	821	40	50	40
West-South Central:				
Arkansas	765	300	390	200
Louisiana	2,060	200	100	200
Oklahoma	1,465	150	100	130
Texas	7,187	700	100	500
Mountain:				
Montana	338	35	105	45
Idaho	317	20	65	30
Wyoming	188	20	105	25
Colorado	1,293	260	200	260
New Mexico	626	40	65	50
Arizona	971	200	205	200
Utah	667	15	20	20
Nevada	201	5	25	10
Pacific:				
Washington	1,943	90	45	60
Oregon	1,100	400	365	270
California	13,573	1,430	105	1,000
Alaska	86	10	115	10
Hawaii	485	200	410	150
Total, United States	125,120	21,960	[3] 160	14,160

[1] Replacement value as of mid-1965.
[2] Based on estimated 1965 population.
[3] Average.

Source: Questionnaire survey by the American Public Works Association, 1965.

A breakdown of the total capital investment in storm sewer systems by population groups is presented in table II. These data were analyzed further to arrive at various averages, such as dollars per capita, et cetera. Table III presents these averages.

TABLE II.—*Capital investment in urban drainage improvements in the United States, by population groups of cities, 1965*

Population group (thousands)	Number of cities	Population 1965 estimated (thousands)	Capital investment (millions)	Square miles of improvement
500 or more	28	30,000	$5,900	2,800
100 to 500	109	24,000	4,500	2,400
50 to 100	180	13,000	1,400	900
10 to 50	1,344	30,000	4,500	3,500
2.5 to 10	3,000	16,000	2,700	2,100
Less than 2.5	13,000	9,000	1,300	1,000
Other urban places	1,700	12,000	1,700	1,300
Totals	19,361	134,000	22,000	14,000

TABLE III.—*Capital investment in urban drainage improvements cities of the United States (averages for cities, by population groups), 1965*

Population group (thousands)	Capital investment [1]			
	Per city (millions)	Per capita [2]	Percent of market value of taxable property	Per square mile city area
500 or more	$210	$195	3.7	$270,000
100 to 500	40	185	4.3	225,000
50 to 100	8	110	2.2	105,000
10 to 50	3	150	2.5	385,000
2.5 to 10	.9	170	----------	----------
Less than 2.5	.2	145	----------	----------

[1] Replacement value as of mid-1965.
[2] Based on 1965 population.

NOTE.—Estimates for population groups under 10,000 are rough approximations.

Source: Questionnaire survey by the American Public Works Association, 1965.

(c) *Ages of Sewer Systems*

The ages of the country's sewers are variable and difficult to determine. Again, the lack of available records of installations and replacements makes age determinations difficult in many areas, particularly the older urbanized areas. In general, it may be stated that most existing underground urban storm sewer laterals (sewer conduits serving areas in which they are located) were constructed along with the development of property and the construction of buildings in these areas. The construction of main and trunk sewers cannot be traced accurately with population growth as they are generally constructed to serve anticipated urbanization and are often constructed through relatively unpopulated areas to points of discharge.

With good planning, in progressive and economically sound communities, main and truck sewer construction generally precedes population expansion. In areas where backlogs of sewer requirements have developed, the construction of these larger sewers often lags behind urban growth. In some areas storm sewers were installed after urbanization and in these areas the ages of the sewers are not

related to the era of community development. Such installations are not prevalent, however. A preliminary investigation of existing storm sewers reveals that deterioration is not usually a problem. Many old brick sewers, and some wooden sewers, are in service today and many are in good condition. Most replacements of original installations generally can be attributed to insufficient capacity, improper elevations or other factors related to changes or redevelopment within the urban areas. Figure 1 depicts the estimated ages of storm sewers based on the above.

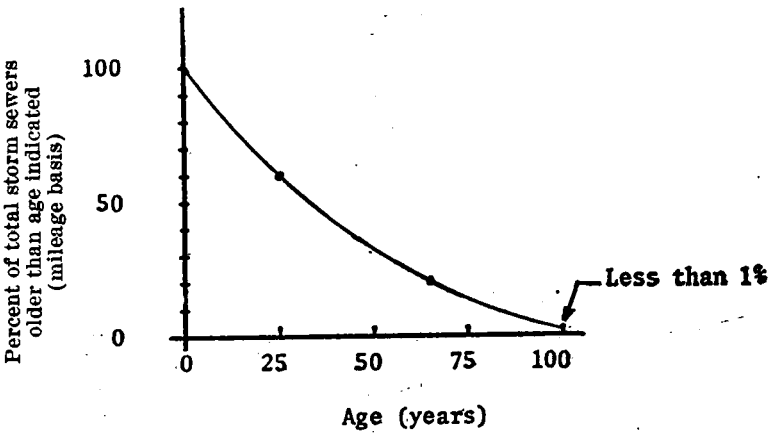


FIGURE 1.—Age of storm sewers in the United States, as of mid-1965.

Source: Prepared by the APWA from information contained in publications of the U.S. Department of Commerce, Business and Defense Services Administration, Water Industries, and Engineering Services Division.

(d) *Ownership of Storm Sewer Systems*

The ownership of underground systems of urban storm and combined sewers in the United States lies almost totally with local public agencies. These include the following: cities, towns, and villages; counties; and sewer districts or authorities. Although such sewers are constructed in urban areas by private land developers and by State highway departments, the ownership of such facilities is usually transferred to local public agencies upon completion and approval of construction.

A survey of storm sewer facilities made in 1966 by the APWA resulted in responses, regarding ownership, from urban areas having a total of 27,461 miles of underground storm sewers, both separate and combined. This mileage represents approximately 15 percent of the total mileage of underground storm and combined sewers in the urban areas of the country. The responses regarding ownership are tabulated in table IV. This indicates that 84 percent of storm sewer facilities are municipally owned, 11 percent county owned, and 5 percent are owned by public sewer districts or authorities.

The same survey indicates that aboveground (open channel) storm sewer systems are also totally owned by local public agencies, although there are some few exceptions. The responses, shown in table IV, indicate for open channels 58 percent municipal ownership,

8 percent county ownership, and 34 percent ownership by sewer districts and authorities.

The ownership of drainage facilities along State-owned highways in unincorporated areas are naturally owned and maintained by the respective States.

TABLE IV.—*Ownership of underground and open channel urban storm sewer systems.*

Agency claiming ownership	Underground systems		Open channel systems	
	Miles owned	Percent of total reported	Miles owned	Percent of total reported
Municipalities	22,968	84	791	58
Counties	3,019	11	110	8
Sewer districts or authorities	1,474	5	467	34
Total	27,461	100	1,368	100

Source: From responses of 80 units of local government replying to a 1966 questionnaire survey by the American Public Works Association.

B. Costs, Charges, and Benefits

1. CONSTRUCTION COSTS

The construction costs of storm sewer systems can best be expressed, for the purpose of a general overall cost analysis, on the basis of a square mile sewered. Since a sewer system installed in one area may be designed under different criteria and constructed of different size conduits, under different ground conditions and of different materials than a system installed in another area, extreme variations in construction costs are understandable. Current construction costs reported by 41 cities widely scattered over the United States in a 1966 questionnaire survey by the APWA, indicate a general variation from $0.5 to $2.5 million per square mile of area served, with extreme variations from $0.05 to $3.84 million per square mile. A straight average of all responses resulted in a unit construction cost of $990,000 per square mile. The weighted national average is $1.55 million per square mile.

Although some of the variation in constructed cost can be attributed to variations in labor costs, labor productivity, material costs and local economic conditions, the major factors producing cost variations are (1) the nature of the local topography, (2) the surface and subsurface characteristics, (3) the precipitation characteristics of the area served, (4) the design criteria selected, and (5) the type of system. (The type of system is defined by whether it is primarily a local collecting system, or whether a large percentage of the total length consists of larger sewers, such as mains, trunks, and large open channels and drainage canals.) The first of these factors, the nature of the local topography, can account for construction costs in rather level areas being higher than costs in hilly areas by a factor of two, three, or even more. The underlying reason for this is that although runoff is greater in hilly areas, much larger pipe sizes are required in flat areas to handle a given flow, since the flow velocities are relatively slow in pipes laid on slight grades. Surface and subsurface conditions also contribute to wide cost differences.

Some of these cities were reporting on the costs of combined systems and others on separate storm sewer systems. This is not a factor in the costs analysis since the cost of constructing a storm sewer system, assuming that additions or enlargements of the sanitary sewer system are not included, is the same as the cost of a combined system. This is due to the fact that the size of a satisfactorily designed combined sewer is normally determined by the maximum stormflow, the added sanitary wastes usually not requiring an increase in the size of pipe.

Although "areawide" average cost figures cannot be used to estimate the construction cost of a specific project, they are useful in making projections of capital costs that will be incurred for needed storm sewer systems in various areas of the country where cost-influencing factors are similar. These average reported current construction costs, adjusted downward to account for lower costs in previous years, were used in tables I and II, together with reported figures of capital investments to obtain estimates for the number of square miles of area sewered in the various States and cities.

As stated at the outset of this report, complete economic analyses of storm sewer systems must include the cost of the space occupied by storm water transported by such a system. This concept is relatively new to the field of storm drainage economics, and warrants thoughtful consideration by engineers and others who make decisions in that field.

2. USER CHARGES

Data supplied, in response to a questionnaire distributed in early 1961, by 170 local governments relating to sewer service charges were published [3] by the Municipal Finance Officers' Association. User charges vary widely in amount but are seldom employed by cities, sewer districts or others to defray maintenance and operation costs. Such costs are normally provided for by general tax revenues, motor fuel tax funds, and vehicle registration funds.

It is difficult to separate operating costs from maintenance costs in many cities, since few cities have records available. From answers provided in the APWA survey, annual maintenance and operating costs, combined, were noted to range, generally, from $1,000 to $30,000 per square mile. The extreme variations may be accounted for by the great variation in the maintenance services provided in different areas, the age as well as the type of sewer system, and the effectiveness of street cleaning operations. Most typical large urban areas would probably be found to expend, for maintenance alone (including cleaning operations), from $5,000 to $15,000 annually per square mile of sewered area.

3. BENEFITS

Storm sewer systems enhance the usefulness and hence the value of the areas which they drain. This is the historic economic basis for constructing them. Additional benefits accrue when these systems are designed to serve more than one purpose and when such designs involve the protection of downstream neighbors. An example would be the design of a highway embankment and culvert to serve as a

[3] Moak, Lennox L. "A Survey of the Use and Nonuse of Sewer Service Charges in 339 Local Governments in the United States and Canada." Municipal Finance Officers' Association of the United States and Canada, 1313 East 60th Street, Chicago, Ill. 60637, 1962. 66 pages.

dam and spillway, producing an impoundment upstream from the highway. It is possible that the additional land cost could be offset by the savings in construction cost and the benefits resulting, which would include flood control and recreation facilities.

C. Trends of Capital Outlay

1. EXPENDITURES, 1946–1965

(a) *Trends*

Information regarding expenditures for storm sewer construction in the United States during the 20-year postwar period was submitted by respondents to the 1965 and 1966 APWA storm sewer questionnaires. On the basis of these responses, it is estimated that the total present-day replacement cost of existing urban storm sewer systems in the United States, owned by public agencies, is more than $22 billion including an appropriate allowance for combined sewers. This estimate was made by multiplying the expenditures reported by a factor, the factor being the ratio of total urban population to population encompassed in areas reporting.

It was further indicated by the survey respondents that approximately 49 percent of the total of all capital investments was incurred prior to 1946, and that 18 percent and 33 percent were expended in the decades 1946–55 and 1956–65, respectively. Data published by the Bureau of the Census verify these figures very closely (see table V). These figures show a decided increase during successive time periods. In part, this can be accounted for by the acceleration of urban growth in recent years, higher construction costs, and higher standards of living.

Data published by the Bureau of Census was used in the preparation of table V which is a tabulation of expenditures by cities and counties for urban drainage improvements. From this table it is seen that the expenditures of all urban cities and counties in the United States during the 20-year period (1946–65) are estimated to have totaled $3.85 billion. It is estimated that cities alone expended $2.82 billion in the same period. Based on these estimates, city expenditures were 73 percent of the total expenditures by local governments in urban areas. This percentage was somewhat higher in the decade (1946–55) and slightly lower in the decade (1956–75). Future expenditures could reasonably be expected to follow this same trend, indicating that city expenditures will be approximately 70 percent of all local government expenditures during the next decade (1966–75). Information on annual expenditures made by private land developers is not available; however, it is estimated that the current total expenditures by all private developers approximates $0.72 billion, annually. This annual expenditure is expected to increase during the next decade.

TABLE V.—*Capital expenditures for urban drainage improvements* [1] *in the United States, by year and decade, 1946–65, by public agencies*

[Dollars in millions]

Year	Cities and counties	Cities only	Year	Cities and counties	Cities only
1965	$417	$280	1953	$137	$103
1964	377	255	1952	129	97
1963	352	231	1951	122	92
1962	290	195	1950	118	89
1961	242	182	1949	83	62
1960	256	178	1948	74	56
1959	236	186	1947	67	50
1958	216	174	1946	53	44
1957	197	153			
1956	177	141	Total, 1946–55	1,095	842
Total, 1956–65	2,759	1,975	20-year total expenditures, 1946–65	3,854	2,817
1955	160	128			
1954	152	121			

[1] Values tabulated in this table have been computed from published Bureau of Census data (representing expenditures for sewerage and sewage disposal) by assuming that one-third of all such expenditures represent capital costs of urban drainage improvements.

Source: Department of Commerce, Bureau of the Census.

A publication of the U.S. Department of Commerce,[4] dated February 1966, summarizes the total amount of sewer pipe installed in the conterminous United States during the period from 1940 to 1966, and projects estimated future requirements to the year 1980. This information is presented by category of use and by pipe-size class. Figure 2 presents reproductions from this publication and graphically illustrates the estimated annual installations of sewer pipe (measured in millions of lineal feet), in the size classes indicated. The estimates include pipe used for new construction, improvements, and maintenance and repair of all sanitary and storm sewers and one-half of pipe required in combined sewers. The same publication attributes approximately 10 percent of all usage of pipe in public sewer systems to storm sewer construction. This percentage is less for the smaller pipe sizes and more for the larger pipe. It is then reasonable to assume that the trend in storm sewer construction since 1940 is represented by figure 2, and that the footage of pipe used annually for storm sewers is approximately 10 percent of these estimated usages.

From figure 2 it is seen that the installation of sewer pipe was increasing at a rapid rate during the period 1946–65. The rate of increase was somewhat variable during the period 1946–55; however, it was uniform during the period 1956–65. The total increase in annual usage during this latter decade was less than that during the previous 10 years. The rapid postwar construction rate can be explained by two facts: (1) sewer construction was accelerated to overcome the backlog created by the curtailment of nonessential construction during the war years, and (2) residential construction during these years was progressing at a rapid rate to satisfy the postwar demands. These factors demanded an accelerated sewer construction program, although the shortage of materials and the rapid rise of prices was a temporary deterrent to construction im-

[4] U.S. Business and Defense Services Administration. "Regional Requirements for Sewer Pipe in Sewerage utilities," prepared by K. L. Kollar and A. F. Volonte. Government Printing Office, Washington, D.C. 20402. February 1966. 20 pp.

mediately following World War II. The Korean emergency also slowed construction projects for a few years, beginning in 1950. After about 1955 much of the backlog was fairly well diminished and the rate of increase of total building construction lessened and became somewhat uniform. The rate of progress of sewer construction naturally followed this same trend.

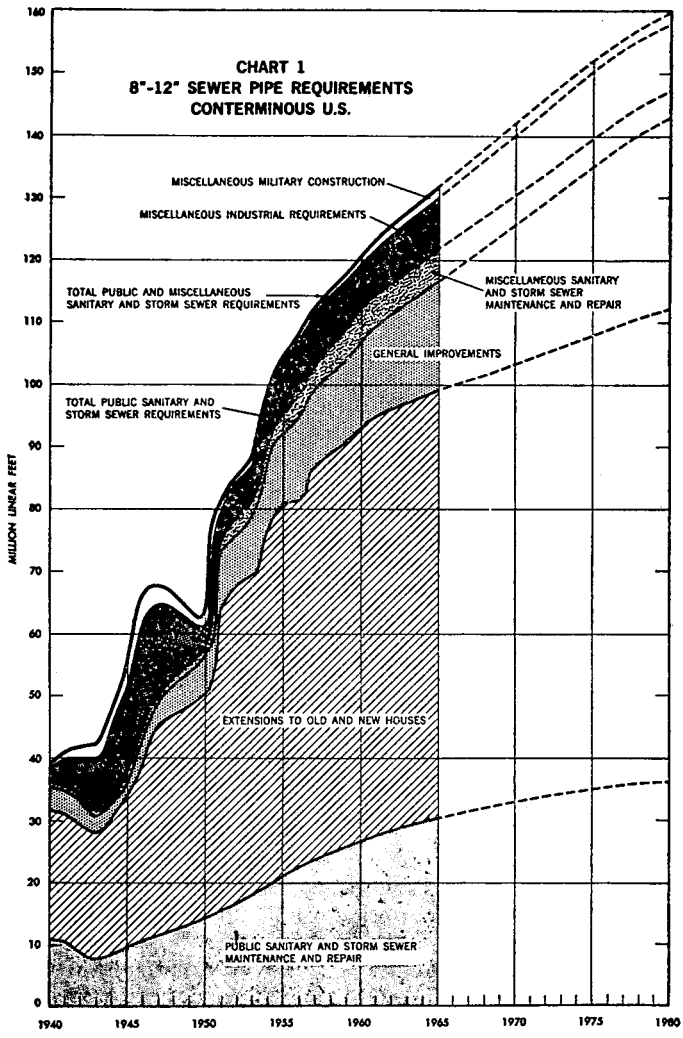
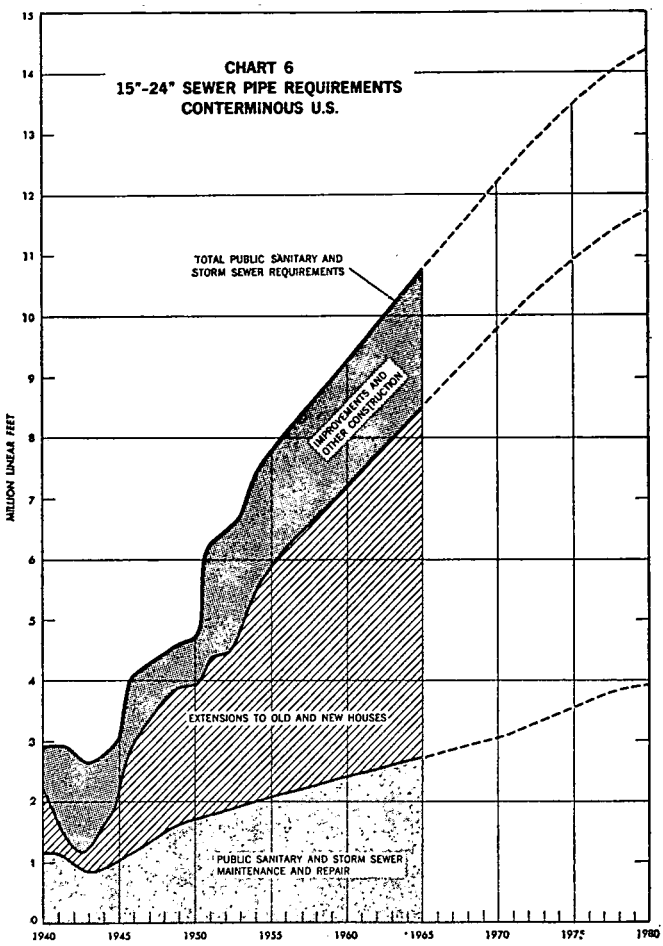


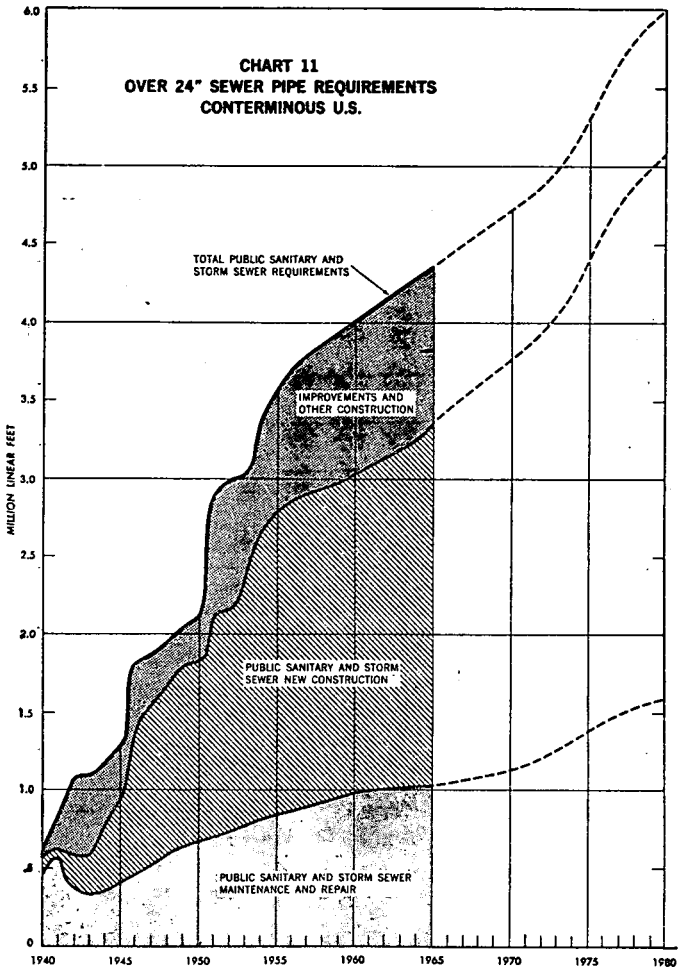
FIGURE 2.—Annual sewer pipe requirements.

[Charts 1, 6, and 11 reprinted from "Regional Requirements for Sewer Pipe in Sewerage Utilities," February 1966; U.S. Department of Commerce; Business and Defense Services Administration.]



(b) *Expenditures by source, 1946–65*

(1) *Private land developers.*—The respondents to the 1966 APWA storm sewer survey, in answer to a question regarding capital expenditures in urban areas, attributed a very large share of such current expenditures to private land developers. In the case of residential, commercial, and industrial land development, most cities reported that the developers must install or pay for storm sewers, where sewers are required by subdivision regulations or ordinances. This trend has been increasing in recent years. A successful land developer necessarily includes such costs in sales prices of land improvements; thus, the buyers or lessees ultimately bear the costs. Many cities surveyed answered that 100 percent of all storm sewer requirements in newly developing areas are paid for by the developer. A few cities reported that the developers shoulder only a portion of these costs, varying from 10 to 90 percent. The majority of cities reported the higher percentages.



It appears that private land developers are currently making a total annual investment of approximately $720 million in storm sewer construction. This estimate is based upon the following assumptions: (1) urbanization is presently producing 1,000 square miles of newly developed land area annually, (2) 60 percent of such land area requires storm sewers, (3) the private developer pays 75 percent of storm sewer costs, and (4) the current average unit construction cost is $1.6 million per square mile. This estimated annual expenditure by land developers will be shown to be double the estimated annual capital investment in storm sewers in urban areas by all units of local government.

(2) *Public agencies.*—Public agencies are responsible for the construction of main and trunk sewers and drainage canals. The capital expenditures in urban areas for all such facilities are made by local units of government. The funds for such expenditures sometimes

include considerable Federal aid. A Government publication [4] attributes to storm sewer construction about 10 percent of the length of all pipe used for sewers. Since the pipe sizes required for storm sewers are usually larger than the sizes required for sanitary sewers, the costs of constructing storm sewers is greater than for sanitary sewers. Although available statistical information is not complete, analysis of Government reports [5] shows that capital outlays by all units of local government in the United States for all types of sewerage, including sewage treatment plants, are expended. Seventy-three percent by cities and 27 percent by all other units of local government.

State and local governments and agencies also expend a large amount of funds in urban and rural areas for drainage facilities required for arterial streets and highways. The funds for such construction, however, are usually obtained from highway appropriations and, therefore, are considered to be a part of the cost of highway and street construction, rather than a cost of sewer construction. Approximately 7½ percent of such capital expenditures is attributed to drainage requirements other than bridges.[6] These will be State, county, and city expenditures provided largely from State and Federal highway funds, supplemented with local government funds.

Local governments and agencies also expend funds for the construction of airport drainage facilities. Although such expenditures are appreciable, such drainage facilities are generally provided by funds appropriated for airport construction, or are provided by revenues from airport operations. Therefore, these are not considered here as a part of storm sewer expenditures.

2. SOURCES OF FINANCING

Federal aid grant assistance has certainly been a substantial source of funds in the financing of urban storm sewers. However, the bulk of the funds has been from local sources. Such local financing has been accomplished, primarily, through tax exempt municipal bonds, special assessments, and appropriations from general tax resources. Therefore, the sufficiency of available funds from each of these sources in a specific local governmental unit is not only dependent upon the tax rate but also upon the level of assessment of property within the jurisdictional boundaries. Government publications report that about 45 percent of all municipal revenue in the United States is obtained from property taxes.

Responses from 627 units of local government regarding the financing of capital storm sewer improvement reveal that the major financing sources are as indicated in table VI. Although this table shows the number and percentage of respondent agencies which use the specified methods of financing, this is not necessarily an indication of the dollar amounts provided from these sources. It is improbable that the larger areawide projects are financed through appropriations from the general tax fund; such projects would most often be dependent upon

[4] U.S. Business and Defense Services Administration. "Regional Requirements for Sewer Pipe in Sewerage utilities," prepared by K. L. Kollar and A. F. Volonte. Government Printing Office, Washington, D.C. 20402, February 1966. 20 pp.

[5] U.S. Bureau of the Census. "Government Finances in 1963-64." Government Printing Office, Washington, D.C. 20402, 1965. 58 pages. Series G-GF 64, No. 1.

[6] Herr, Lester A. "The Place of Hydraulics in Highway Engineering"; presented at the Fifth Annual Highway and Street Conference, Stillwater, Okla., Feb. 22-24, 1966. 13 pages. Apply to: Author, Chief Hydraulics Branch, U.S. Bureau of Public Roads, Washington, D.C.

bond issues and aid funds. Private land developers generally secure funds by borrowing from private financial institutions.

TABLE VI.—*Sources of financing for urban drainage improvements in the United States; current and past sources of funds*

[Agencies using this source and possibly one or more other sources]

Sources of funds	Number	Percent of total respondents
(a) Appropriations from tax resources	457	73
(b) Bequests	(1)	(1)
(c) Federal Government grant assistance	161	26
(d) State grants-in-aid	57	9
(e) Tax-exempt bonds (including municipal bonds and bonds of sewer districts and authorities)	360	57
(f) Capital flotations in other security markets (private corporations and organizations) by land developers	(2)	(2)
(g) Borrowing from Federal Government	(2)	(2)

[1] No information, but probably negligible in amount.
[2] No information, but appreciable.

Source: Data from 627 respondents to a questionnaire survey of the American Public Works Association, 1965.

D. NEEDS AND PROSPECTIVE CAPITAL OUTLAYS, 1966–75

1. ESTIMATED CAPITAL REQUIREMENTS

The capital required to finance the storm sewer facilities needed in new and expanding urban areas and to overcome deficiencies in present urban areas during the decade 1966–75 has been estimated by the American Public Works Association to total $25 billion. This projection is based upon data supplied by respondents to three APWA questionnaire surveys mentioned previously. The estimate includes $13 billion for present needs and $12 billion to provide storm sewer facilities in all new and expanding urban areas. The above figures include both public and private expenditures in growth areas. However, expenditures to correct present deficiencies will involve public funds only. Funds required for the construction of drainage facilities at airports and along highways, roads, and most arterial streets are not included.

(a) *By Local Public Agencies*

Data used in making the above estimates were supplied, in one survey, by units of local government representing a total population of 78 million. This questionnaire was distributed in 1965 by the APWA Urban Drainage Committee. In another survey, conducted in 1966 by the APWA Research Foundation, data was received from metropolitan planning commissions representing a total population of 33 million. In another questionnaire survey made by the APWA Research Foundation in 1966, data was received from the public works departments of the central cities of many metropolitan areas, the data supplied being representative of 28 million persons. Projections of this data were then made by multiplying reported figures by a factor, being the ratio of the total U.S. urban population to the population represented by those responding to requests for information as indicated above.

The $13 billion estimate of funds required for "present" needs would be expended entirely by local public agencies. The funds

required include requirements for: (1) construction of storm sewers in presently developed areas lacking either storm or combined sewer systems, (2) extensions of existing storm or combined sewer systems into such portions of presently developed areas as are not currently served by these existing systems, and (3) for increasing the capacity of existing storm and combined sewers. Funds required for converting existing combined sewers to separate storm sewer systems, in urban areas which currently have such work underway or committed, are included in the $13 billion estimate for "present" needs. However, since most localities having combined sewers have not taken a definite stand in sewer separation programs, only a small portion of the total national requirements for combined sewer separation is included in this estimate of "present needs."

A 1964 publication of the U.S. Department of Health, Education, and Welfare,[2] based upon a Public Health Service survey, states that the total cost for the separation of all existing combined sewer systems in the United States could amount to "$25 to $30 billion, or even more." This estimate was based on data obtained in surveying 15 U.S. cities, of various sizes and geographical locations, representing sewered populations totaling approximately 21 million (about one-third of the U.S. population served by combined sewers). The estimate indicates an average per capita cost of $465 for each of the 59 million persons presently served by combined sewers. It is also stated in this publication [2] that the estimate of cost is probably too small, since many of the component cost data were based on cost figures prevailing in years prior to 1964.

Local public agencies will also be responsible for a portion of the capital expenditures for storm sewer construction in newly developed urban areas. A portion (in some cases all) of the total cost of major drainage facilities such as sewer mains, trunks, and drainage canals is normally assumed by the local public agency having jurisdiction. The assumption of a portion of such costs by local government is reasonable since storm sewer systems convey runoff from publicly owned lands. A 1955 publication of the Harvard University Press [7] reports that approximately 50 percent of land in urban areas is used for streets, parks, and other public purposes. Assuming that 25 percent of all such costs are to be borne by local public agencies, then $3 billion (25 percent of $12 billion) is the estimated capital need of local government for the construction of storm sewers in urban growth areas.

The total requirements of all local public agencies of the United States for storm sewer construction during the decade (1966–75) is, therefore, estimated to be $16 billion.

(b) *By Private Land Developers*

Approvimately $9 billion is the estimated need of private land developers for the construction of storm sewers during the decade (1966–75). This amount represents the balance of the $12 billion need for sewer construction in urban growth areas, not attributed to local public agencies.

[2] U.S. Public Health Service, Division of Water Supply and Pollution Control, "Pollutional Effects of Stormwater and Overflows From Combined Sewer Systems—A Preliminary Appraisal," Washington, D.C., November 1964; 39 pages; publication No. 1246.

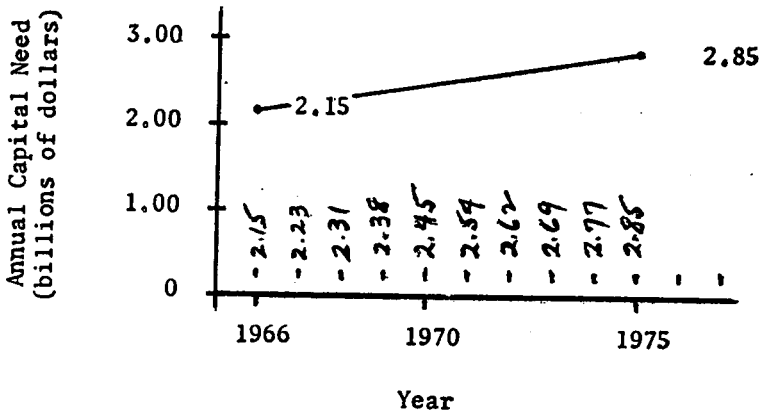
[7] Bartholomew, Harland, "Land Uses in American Cities." Harvard Planning Series, vol. XV, Harvard University Press, 1955.

(c) *Annual Capital Needs*

According to a Department of Commerce publication [4] previously referred to, the requirements for sewer pipe in the United States by the year 1975 will be approximately 25 percent greater than in 1966 (fig. 2). If the total capital needs for urban storm sewers approximates $25 billion, the annual urban need for storm sewers during the decade will probably range from $2.15 billion in 1966 to $2.85 billion in 1975. Whether or not expenditures of this magnitude become a reality is, of course, dependent upon problems which may be encountered in funding these needs. Figure 3 presents the annual needs, graphically.

(d) *Distribution of Capital Needs by Population Groups*

The $25 billion capital needs distributed by population groups of urban areas, in accordance with needs as indicated by respondents to the APWA questionnaires, is shown in table VII. This table also distributes the $22 billion investment in existing storm sewer facilities according to population groups, based upon data supplied by questionnaire respondents.



Source: Estimates of the American Public Works Association.

FIGURE 3.—Capital needs for urban drainage improvements in the United States; Annually, 1966–75

(e) *Expenditures of Funds*

The proportions of the $25 billion of capital needs to be expended by various categories of government agencies and private groups is difficult to forecast. An attempt to roughly approximate such expenditures for the decade 1966–75 is made as follows:

	[In billions]	*Expenditures*
(1)	State governments and State agencies	None
(2)	Cities, counties, towns, special districts, public authorities, and other local bodies	$16
(3)	Private, nonprofit organizations and cooperatives	None
(4)	Proprietary or profitmaking organizations (includes land developers)	9
	Total (1966–75)	25

TABLE VII.—*Capital needs for urban drainage improvements, 1966–75 in the United States, by population groups*

Population group (thousands)	Existing facilities		Capital needs	
	Amount (millions)	Percent of total	Amount (millions)	Percent of total
500 or more	$5,900	27	$7,550	30
100 to 500	4,500	20	5,010	20
50 to 100	1,400	7	2,370	9
10 to 50	4,500	20	7,450	30
2.5 to 10	2,700	12	1,320	5
Less than 2.5 [1]	1,300	6	650	3
Other urban places [1]	1,700	8	650	3
Total	22,000	100	25,000	100
SUMMARY INTO BROADER POPULATION GROUPS				
Above 50	11,800	54	14,930	60
2.5 to 50	7,200	33	8,770	35
Below 2.5 [1]	3,000	13	1,300	5

[1] Estimates for population groups under 10,000 are rough approximations.

Source: Estimates made by the American Public Works Association, based upon data from 527 responses to a 1965 APWA questionnaire survey.

2. SOURCES OF FUNDS

Statistics regarding the financing of storm sewer systems in previous years are not available in publications. It is therefore difficult to estimate the proportions of the total needs to be supplied by various possible financing sources. Data received, through a 1966 APWA storm sewer survey, indicates that the major sources of financing public storm sewer capital improvements in urban areas would include: (1) general tax resources, (2) tax-exempt municipal bonds, (3) grants from the Federal and State Governments, and (4) borrowing from the Federal Government. These are listed in a descending order of apparent dollar magnitude. Sewers constructed by land developers would normally be financed by private financial institutions.

The majority of respondents to the APWA questionnaire stated that capital needs would exceed the amounts available from all presently known sources of funds. The survey indicated that, of the $16 billion required by local public agencies during the decade (1966–75) for financing the construction of storm sewers, it appears that approximately 60 percent can be obtained from sources presently available to local government. The information was supplied by local governments representing 15.6 million persons. Therefore, 40 percent of the total need (approximately $6.5 billion) must be obtained from other sources or through adjustments of present methods of producing revenue. Some increases of the usual allocations of funds to capital expenditure programs may be feasible within certain units of government.

In response to a question inquiring how the cities propose to bridge this gap, the respondents replied with the following answers:

(*a*) Increase the general property tax rate. (This increase may conceivably be applied to all property within the jurisdiction, or only to property benefited by the sewer construction program.)

(*b*) Enact legislation to permit the issuance of additional municipal bonds. (This may or may not result in the need for an increased sales or property tax, depending upon what schedules are followed in the retirement and issuance.)

(*c*) Enact special assessments against property benefited and build sewers as the area benefited is willing and able to pay (the local unit of government may provide a share of the funds.)

(*d*) Request funds from the Federal Government on a grant basis (in which case payment is not required), or on a cost-sharing basis (which may require partial payment).

(*e*) Request State grants and cost-sharing funds.

(*f*) Utilize a policy of charging a part of the cost of main, submain, and trunk sewers to land developers, where such sewer construction benefits the land being developed.

(*g*) Enact local sales tax legislation, where permitted by State law.

It is important that there be an appreciation of the role that storm sewer systems have in producing safe, healthful, and attractive environments. This appreciation is a necessary adjunct to successful financing as it is also important to understand that, regardless of form, expenditures will be made, one way or another. If the citizens do not support expenditures for construction and improvement programs in areas where sewers are needed, they will incur equivalent costs in the form of property damages and economic losses and will remain burdened with the same unsatisfactory environments.

CHAPTER 6

Waste Water Treatment Plants*

A. NATURE AND COMPOSITION OF PUBLIC WORK OR FACILITY

1. DESCRIPTION OF FACILITY

(a) *Physical Characteristics*

Waste water treatment plants are more commonly referred to as sewage treatment plants. These are facilities built by municipal and other local governments for the treatment of sewage and other waterborne wastes prior to discharge to a watercourse. Treatment is necessary to protect the public health from waterborne disease, to prevent nuisances, and to prevent or abate pollution of the public watercourses.

The treatment facilities serve the entire community. That is, the service is provided for households; commercial enterprises such as hotels, restaurants, and laundries; and industrial firms such as breweries, slaughterhouses, and other food processors and manufacturers. Each user of the service is reached through a collection system of lateral and trunk sewers. The service is essential from a physical standpoint as well as for health and nuisance reasons, for large quantities of water cannot be used without some means of disposal after use. The term "waste water" arises from this necessity.

Treatment facilities are usually built with excess capacity to take care of future growth. Facilities require daily care, oftentimes, with a considerable staff, depending on the scale of the operation and the complexity of the treatment process. Trained operators are necessary in all instances. In large facilities, the staff may consist of sanitary engineers, chemists, biologists, and other professional personnel. Treatment facilities have considerable durability, often lasting as long as 20 years. Still, they require regular maintenance, particularly of pumps, filters, and tanks. Large-scale operations include laboratories for analysis of the wastes at various points during the treatment process. Office space, equipment storage, vehicle space, and considerable grounds requiring landscaping, fencing, and care are also involved.

(b) *Standards of Performance*

The treatment of sewage can be accomplished in a variety of ways. The type of treatment selected depends on a number of factors such as the volume and composition of the wastes and the nature of the watercourse into which the treated effluent will be discharged. In some instances, treatment is provided with a minimum of structure in large lagoons or oxidation ponds. Therefore, the term "facility" is more appropriate and inclusive. Usually, however, there is a definite structure or plant consisting of various arrangements of pipes, screens, chambers or tanks, pumps, filters, basins, and sludge drying beds.

*Prepared by the Federal Water Pollution Control Administration, U.S. Department of the Interior, with minor editing by Committee staff.

The objective is to reduce a given waste material to a condition that is acceptable for discharge to a watercourse without harm to health, esthetics, and the uses for which the particular watercourse is intended. The waste reduction process may include mechanical, biological, and chemical means.

The common references to primary and secondary treatment are not precise distinctions in either process or structure. Usually primary treatment involves the removal of settleable, suspended, and floatable solids. Secondary treatment generally goes beyond this stage to remove or reduce dissolved and colloidal materials not amenable to separation through mechanical means.

Facilities are designed for the particular needs of the community. That is, its scale, treatment process, and management reflect the size of the community, its expected growth rate, the composition and volume of its wastes, and the water quality requirements established for the watercourse into which the wastes are to be discharged. As the result of public insistence now manifested in the administration of the Federal Water Pollution Control Act and in the State programs, more stringent water quality requirements are being established. These requirements will have a subsequent effect both on the design and operation of municipal waste treatment facilities.

2. EXISTING CAPITAL PLANT IN THE UNITED STATES

(a) The latest data on the number of municipal waste treatment facilities (also commonly referred to as sewage treatment plants) in existence in the United States is as of January 1, 1962. These data are published in the "Statistical Summary of Municipal Waste Facilities in United States," Public Health Service Publication No. 1165, 1964. The number of treatment plants as of that date was 9,378.

(b) The distribution of these treatment plants by States is shown in the table below:

State	*Number*	*State*	*Number*
Alabama	112	Montana	106
Alaska	1	Nebraska	221
Arizona	60	Nevada	32
Arkansas	125	New Hampshire	15
California	519	New Jersey	281
Colorado	144	New Mexico	65
Connecticut	62	New York	356
Delaware	20	North Carolina	194
District of Columbia	1	North Dakota	170
Florida	253	Ohio	403
Georgia	156	Oklahoma	259
Hawaii	9	Oregon	132
Idaho	63	Pennsylvania	554
Illinois	519	Puerto Rico	60
Indiana	167	Rhode Island	20
Iowa	357	South Carolina	120
Kansas	310	South Dakota	159
Kentucky	115	Tennessee	110
Louisiana	95	Texas	659
Maine	12	Utah	69
Maryland	98	Vermont	10
Massachusetts	120	Virginia	150
Michigan	265	Washington	173
Minnesota	371	West Virginia	44
Mississippi	89	Wisconsin	414
Missouri	291	Wyoming	61

(c) The distribution of the treatment plants by population size is shown in this table below:

State	Number	State	Number
Under 500	1, 253	10,000 to 24,999	1, 157
500 to 999	1, 830	25,000 to 49,999	420
1,000 to 4,999	5, 015	50,000 to 99,999	200
5,000 to 9,999	1, 409	Over 100,000	136

(d) There are no data on the age distribution of these plants. It is reasonable to say, however, that few of the present-day plants were in existence prior to 1920. A large number of plants still operating were built during the mid-1930's with the assistance of various Federal public works construction programs. Many of these plants have been improved and expanded, though the number is unknown. Construction was deferred during World War II and again during the Korean war. Since 1957, at least 6,789 projects involving waste treatment facilities were constructed.

(e) Virtually all of these waste water treatment plants are owned by local governments. Data on ownership by other entities are not available. The Federal Government owns treatment plants at various Federal installations, particularly at military posts. There are also State-owned treatment plants at State institutions. These Federal and State plants are not included in the 1962 inventory data presented here.

(f) The estimated current value of the water waste treatment plants is $3.55 billion as of January 1, 1965.

B. Costs and User Charges

1. CONSTRUCTION COSTS AND OPERATING COSTS

(a) The construction costs presented are based on three measures: per capita, per population equivalent, and per unit of flow. These data were developed from analysis of 1,504 local government projects built with Federal financial assistance from 1956 through 1963. The data show a range of per capita costs, depending on the design size and type of treatment. For instance, for plants designed to serve a population of 10,000, the per capita costs (1957–59 dollars) range from $14.13 to $34.70, with the variance reflecting different treatment processes. For plants designed for a population of 100,000, the per capita costs range from $4.38 to $18.29 for the same treatment processes shown in the 10,000 population design group. More complete data on this subject is shown in PHS Publication No. 1229, Modern Sewage Treatment Plants, How Much Do They Cost? (U.S. GPO 1964).

(b) Typical annual maintenance and operation expenses for treatment plants designed to serve a population of 10,000 are $1.36 per capita. For plants designed to serve a population of 100,000, the per capita costs are $0.73.

2. USER CHARGES

(a) User charges are utilized extensively in the financing of treatment plants, particularly in regard to new plants. However, there are no precise figures on this subject. It is known that a considerable number of communities, including several large cities, cover all

or part of the costs through the property tax. The extent of user charge financing is indicated by the fact that about 25 percent of the dollar volume of municipal borrowings for treatment plants is through revenue bonds. Recent experience shows that communities are combining the financing of waste treatment plants with waterworks financing. That is, the revenues of each are pooled to support the bond issues.

(b) There are no systematic data on the extent to which user charges cover all operation and maintenance and annual debt service costs.

(c) Undoubtedly, a large portion of municipal sewage treatment plant costs are met through general taxation. A reasonable estimate cannot be proven. It is well to note that borrowing through general obligation bonds does not necessarily mean that the repayment is solely through general property taxation. Oftentimes, user charges, special benefit assessments, connecting charges, and other means are used in conjunction with property taxes to repay borrowings.

C. Trend of Capital Outlays

1. Complete data on annual expenditures for municipal sewage treatment plants date from the year 1957, the year the current program of financial assistance under the Federal Water Pollution Control Act got underway. From 1952 through 1956, the annual average was $272 million. Prior to 1952, no data are available. For the period 1957–65, the figures are as follows:

Annual expenditures for municipal sewage treatment plants

[In millions]

Year	Total expenditures	Total entirely by State and local funds	Total with Federal, State, and local funds
1957	421	278	143
1958	466	258	208
1959	419	228	191
1960	431	223	208
1961	538	281	257
1962	654	369	285
1963	815	375	440
1964	612	200	412
1965	625	225	400

The trend reflects the effect of both Federal financial assistance and the stepped-up Federal-State and interstate programs of pollution control. The high year of 1963 reflects the impact of the Federal accelerated public works program which has now expired.

2. The proportionate annual Federal, State, and local governments expenditures are indicated in the immediately previous table. The Federal share of the projects with Federal financial assistance has been averaging about 20 percent. This percentage is expected to increase as new and expanded Federal programs take effect. Only a minor portion is attributable to State financing, probably less than 2 percent. Local governments, chiefly municipalities and special districts, provide the bulk of the non-Federal funds.

3. The sources of financing have been chiefly public borrowings through the municipal bond market. Because many public works

bond issues are for multiple-purposes and often include storm and waste collection sewers as well as combine waterworks with sewage treatment plants, it is not possible to present precise data on borrowing for sewage treatment facilities exclusively.

There are several financial assistance programs of the Federal Government that include aid for the construction of municipal waste water treatment facilities. The major program is administered by the Federal Water Pollution Control Administration under the authority of the Federal Water Pollution Control Act. The act authorizes $150 million for fiscal years 1966 and 1967 for grants to State, municipal, intermunicipal, and interstate agencies for the construction of waste treatment facilities. The maximum allowable grant is 30 percent of the eligible cost of a project or $1,200,000 whichever is smaller. In the case of a project which will serve more than one municipality, the grant may be increased to a maximum of $4,800,000. The $1,200,000 or $4,800,000 limitation does not apply if the State agrees to match equally all grants made from allocations any appropriations in excess of $100 million. A grant may be increased 10 percent if a project is certified as being in conformity with a comprehensive metropolitan plan developed by an official State, metropolitan, or interstate planning agency.

The Department of Housing and Urban Development has several financial assistance programs. The first is the program of interest-free advances to municipalities to finance the planning of public works. These advances can be used to pay for engineering and architectural services to develop plans and specifications, including the necessary surveys or other fieldwork. These advances are repayable when construction work begins. The second is a program of grants to State and local governments for comprehensive urban planning in metropolitan areas. These grants may not exceed two-thirds of the planning cost. The third is a program of low interest loans to small communities that are unable to obtain loans on reasonable terms elsewhere to finance needed public works.

The Farmers Home Administration, Department of Agriculture, also has a program (Public Law 89–240), providing grants of up to 50 percent of cost, to help finance water supply and waste collection, treatment and disposal systems in rural areas. The law defines a rural area as any area which does not include a city or town of more than 5,500 population. Grants may be made only for projects approved by the State water pollution control agency.

In 1962 and 1963, a number of municipalities benefited from the Accelerated Public Works Act. Funds under this act have been exhausted for some time, but Congress enacted similar legislation last year entitled the Public Works and Economic Development Act of 1965 (Public Law 89–136), administered by the Economic Development Administration of the Department of Commerce. Basic grants of up to 50 percent for public works and development facilities are available for those areas that have been designated as areas of substantial and persistent unemployment. Prior to grant approval, the Secretary of Commerce must make certain findings concerning the project's contribution to economic development. Supplementary grants may also be made which would permit States, or political subdivisions thereof, Indian tribes, or private or public nonprofit organizations and associations to take maximum advantage of Federal

grant-in-aid programs for public works projects. The supplementary grants are regulated by the Secretary of Commerce and may go as high as 80 percent of the project cost when the State or other entity is unable to meet the required local share in other grant-in-aid programs.

Funds are also available in particular instances under the Appalachian Regional Development Act of 1965, Public Law 89–4. Section 212 authorizes $6 million for sewage treatment works through fiscal year 1967. These funds may also be supplemented under the provisions of section 214 of the act.

Several States have legislative authority to provide financial assistance of various kinds for municipal sewage treatment plants. California provides loans at 2 percent interest from a fund of $1 million. Delaware provides 40 percent of the original construction cost or $100,000 whichever is smaller. Georgia has a provision for 30 percent of costsi or $250,000 whichever is smaller. Georgia's program, however, has never been funded. Indiana provides for loans for plans and surveys. Maine provides for amounts equal to the Federal contribution and also provides for 50 percent or $2,500 whichever is less for the cost of surveys. Maryland provides for matching the Federal grant, but the total of State and Federal grants may not exceed 50 percent, and also for construction loans and for planning assistance. New Hampshire guarantees the bonds of local governments for sewage treatment works and pays annually 40 percent of the amortization charges on construction costs. New Jersey provides for planning grants and for loans for drawing engineering specifications. New Mexico provides for grants to associations formed in rural and unincorporated areas for treatment facilities. Communities must be in existence more than 25 years and not be adjacent to incorporated places. New York provides for planning assistance and for grants for construction. The grants will cover 30 percent of construction costs and as much as 60 percent until the Federal share is made available. New York also provides for assistance for operation and maintenance costs up to one-third of such costs. Ohio provides for planning advances for villages which do not have a treatment facility. Oregon provides for the purchase of local community bonds when such communities are unable to meet private market requirements. Pennsylvania provides for 2 percent annually of the construction costs. Assistance up to 50 percent of planning costs is also provided. Vermont provides for assistance up to 20 percent of construction costs. Additional assistance is provided for communities with "limited economic base" who are required by the water resources board to construct treatment facilities. Total aid from all sources shall not exceed 75 percent of construction costs.

D. Needs and Prospective Capital Outlays

1. CAPITAL REQUIREMENTS

(*a*) Annual surveys of municipal waste treatment needs are conducted by the Conference of State Sanitary Engineers in cooperation with the Public Health Service. The 1966 survey reports that 1,285 communities presently discharging raw sewage require new plants for the treatment of wastes from a population of 6.7 million. An addi-

tional 1,694 cities and towns with existing treatment plants require new or enlarged facilities because of obsolescence, insufficient treatment or capacity. These communities presently discharge inadequately treated wastes from a population of 24.6 million.

While unsewered towns are not usually major sources of pollution, they frequently experience serious ground water pollution and other public health problems because of individual disposal of sewage. The conference reports 2,661 unsewered communities which require sewer systems and sewage treatment plants for a population of 6.1 million.

The estimated cost of the present backlog of 5,640 needed projects is $2.6 billion for treatment plants, interceptors, outfall sewers, and other ancillary works. This survey includes only those municipalities with treatment needs on January 1, 1966. This survey does not anticipate the upgrading of treatment that may be required at any future date. It should also be noted that there are a number of other municipalities that already have adequate treatment but need to extend their interceptors to serve new areas. This additional group will increase the size of the backlog, but we do not have accurate estimates of the magnitude of this need. It is generally agreed that this study of the backlog of needed facilities is very conservative and that it represents the minimum need. There are no firm figures, however, to indicate the size of the full need.

The population served by sewer systems in the United States increased from 98.4 million in 1956 to 122.4 million in 1962—a 24-percent increase in 6 years. The urban population increased from 96.5 million in 1950 to 125.3 million in 1960—an increase of 30 percent for 10 years. Municipal waste treatment needs for the expanding population have been estimated by the extension of the present (1966) sewered population of 138 million through 1980 using the series B population growth estimate of the Bureau of the Census. Future estimates of population served by sewer systems are as follows:

1970	154, 000, 000
1975	171, 000, 000
1980	190, 000, 000

The cost of providing the waste treatment works needed to serve the increasing population has been estimated on the basis of these population projections and a per capita construction cost of $39.69 for secondary treatment.

The municipal waste treatment works currently in operation will eventually have to be replaced because of obsolescence. For the purpose of estimating annual replacement needs, we have assumed an average effective life of 25 years for treatment plants and 50 years for interceptor and outfall sewers. The cost of replacing the treatment plants reported in the 1962 inventory has been estimated at $3 billion and related ancillary works at $2.6 billion. Annual needs to replace obsolete treatment plants has been estimated at 4 percent of the replacement value of treatment plants and 2 percent of ancillary works.

Annual construction rates required to eliminate the backlog of needed municipal waste treatment works and provide for continuing obsolescence and population growth within specified periods of time have been estimated in terms of today's construction cost. The

actual costs, however, will be higher because of the steady upward trend of construction cost. Our sewage treatment plant construction cost index shows an average annual increase of about 2.3 percent of the 1957–59 base of 100 over the period 1930 to 1963. The index has varied considerably from time to time because of war and the fluctuating economy. Estimates of future trends are risky at best, but projections are necessary and we have estimated an average annual increase of 2.5 percent through 1980. This is less than the 4.6 percent experienced from 1947 through 1957 and higher than the 1.6 percent of the past 5 years.

The application of this data and the estimates indicate that we shall need to spend $341 million annually through 1975 to replace facilities which become obsolescent because of age, technical advancement, or population relocation. An additional $262 million will be necessary to provide for population growth. Thus, we see that an annual expenditure of $603 million will be necessary to maintain the status quo.

If we desire to eliminate the backlog by 1975, we shall be required to spend an additional $264 million annually.

Therefore, elimination of the backlog, replacement of obsolete treatment works, and provision for the continuing population growth in our urban areas, will require an average annual expenditure of over $867 million for municipal waste treatment works through 1975. This, however, is in terms of 1964 dollars and does not account for constantly rising construction costs. When we allow for this factor, the average annual cost increases to $983 million to eliminate the backlog and to remain current on the needs resulting from growth and obsolescence.

(*b*) The estimates contained in (*a*) above assume that equal amounts of the backlog are eliminated each year while keeping current on needs developed by growth and obsolescence. Each year, that construction is postponed, will add to the ultimate cost because of the annual increase in the cost of construction.

(*c*) An analysis of the January 1, 1966 study by the Conference of State Sanitary Engineers shows that the backlog of need falls into the following population size group:

Total backlog: Municipal waste treatment needs—1966

	Number	Population served	Estimated cost in thousands
Population size group:			
Under $500	1,460	419,848	$93,296
$500 to $1,000	1,287	897,510	158,954
$1,000 to $5,000	2,087	4,288,538	715,050
$5,000 to $10,000	350	2,395,813	243,058
$10,000 to $25,000	251	3,826,157	273,764
$25,000 to $50,000	88	3,207,613	198,524
$50,000 to $100,000	58	4,327,534	236,237
Over $100,000	59	18,034,761	724,600
Total	5,640	37,397,774	2,643,483

(*d*) The extent to which various levels of Government will participate in the estimated capital outlays is very difficult to predict at the present time. State programs vary widely as indicated in paragraph C(3) above, and others are considering legislative proposals in this field. For the immediate future, the cities, towns, counties, and special districts will find it necessary to provide most of the capital outlays.

2. FINANCING METHODS

(*a*) No change is expected in the methods used by local communities to finance their share of the cost of constructing waste treatment facilities (see C(3) above). No estimate can be made concerning the Federal role at this time. The present program expires at the end of fiscal year 1967, but Congress is presently considering legislation which would continue the program.

(*b*) The present methods of financing should yield adequate capital to accomplish the objectives. The principal problem is to predict the likelihood of municipalities responding fully to meet their needs within the time indicated. Except in those cases where the States act to assist with the cost of a project, the municipalities must finance 70 percent of the cost of projects. Much has been said in the past concerning the financial problems of municipalities and the competition for the municipal dollar. This competition for the municipal dollar will play a significant role in the response of municipalities to this program.

CHAPTER 7

Solid Wastes Collection and Disposal Facilities*

Information on the generation and disposal of solid wastes is badly lacking in the United States. The parameters for solid wastes are known only partially and at best only on a sporadic basis for an extremely small number of the communities in the Nation.

A. Nature and Composition of Solid Wastes Collection and Disposal Facilities

Technologically the state of the art of solid waste collection and disposal appears to be rather rudimentary, yet there are considerable variations in handling practices among U.S. communities. Most communities do not collect all the solid wastes produced within their boundaries because of either voluntary or mandatory self-disposal by the producers themselves. Furthermore, the amount of refuse produced and collected varies according to the nature of a community's economic functions (industrial, commercial, residential), according to the habits and styles of living of the residents, income levels, climate, season of the year, and the frequency of collection.

1. DESCRIPTION OF GENERAL PHYSICAL CHARACTERISTICS AND SERVICES RENDERED

(a) *Terminology and Definition*

The unwanted and discarded material of a community can be gaseous, liquid, or solid. Refuse is the term commonly applied to solid wastes, which are neither waterborne nor airborne.

Refuse is subclassed into garbage, rubbish, ashes and special wastes. These subclasses frequently are defined as follows:

Garbage refers to putrescible wastes derived from the preparation, cooking, serving, handling, storing, selling, and processing of foods.

Rubbish comprises the nonputrescible wastes of a combustible as well as noncombustible character normally produced by a community. Examples include paper, wood, cloth products, rubber, garden wastes, synthetics, metals, plastics, glass, ceramics, stones and dirt.

Ashes are defined as the residue from burning solid fuels and the incineration of refuse.

Special wastes include street refuse, demolition and construction wastes, dead animals, outsize objects such as abandoned vehicles, furniture, stoves, refrigerators and trees, sewage treatment residue, medical and industrial wastes.

According to origin refuse comes either from domestic, municipal, institutional, commercial, industrial or agricultural sources.

The collection of solid wastes involves storage at the place of origin and transportation to the point of disposal. The method of

*Prepared by the American Public Works Association, by Dr. Karl W. Wolf, consultant, with minor editing by committee staff.

collection of refuse is related to the method of disposal. Separate garbage collection is essential if hog feeding of cooked garbage or other salvage operations are included in the methods of disposal. Combined collection of mixed refuse, including garbage, is made if the disposal is done by sanitary landfill or incinerator. Combined collection, of course, permits combined storage.

At the point of origin refuse is stored in a great variety of containers ranging from the familiar metal or plastic garbage can to paper boxes and paper or plastic bags, and from specialized containers at commercial or industrial establishments to open refuse "vaults." The storage of refuse at the source frequently leaves much to be desired.

The hauling of refuse to the disposal site is done in all kinds of vehicles. These include the private car and open trucks as well as specially designed equipment which has an enclosed liquid-tight storage body and provides for some compaction of the collected materials. Regular collection and hauling services usually are performed at least once a week where these activities are organized.

The final disposal of most of the solid wastes is still accomplished in four basic ways: open dump, sanitary landfill, incineration, and by salvage which includes composting and hog feeding. In addition, some of the garbage ground at the points of origin is disposed of through the sewage system.

The severity of the refuse disposal problem is directly related to the density in population settlement patterns. It can be solved more readily by the producer in rural areas where there is ample room for composting, burying, or burning of unwanted materials. The solution is much more difficult in urban areas.

Open dumps are smoldering, smelly places where solid wastes are just deposited—without any regulation or organization. Open dumps frequently are found at the outskirts of both rural and urban communities. To reduce the volume and to control rats, deposited wastes are sometimes burned thus causing considerable air pollution. Open dumps vary in their levels of offensiveness. Some open dumps are worked at irregular intervals with bulldozers to level and compact the refuse. This makes them slightly more tolerable than those open dumps which are not so worked and/or "cleaned up" periodically. Open dumps that are worked, are sometimes called "modified" landfills or "modified" open dumps.

The sanitary landfill method of refuse disposal requires that (1) the wastes be reduced in volume on the disposal site by compacting and/or other means, and (2) that the deposited materials be covered with a layer of earth or other inert material at the conclusion of *each day's* operation. Properly located and operated sanitary landfills produce minimal ground or surface water pollution, prevent the breeding and harborage of insects and rodents, and there is no burning of refuse.

The volume of compacted refuse or disposal capacity of each disposal site is often measured in "acre-feet." One acre foot of refuse is the equivalent of 1 acre filled to a depth of 1 foot with compacted refuse. Once completed, sanitary landfill areas can be used almost immediately for recreational purposes and parking. Depending upon the location and fill-depths, the settlement may continue for a decade or more. However, with proper compaction, and in some cases, foundation piling, the sites may be made usable for commercial and light industrial establishments.

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Incineration reduces the volume of combustible solid wastes by burning at minimum temperatures, generally between 1,250 to 1,800° F. Burning eliminates putrescibles so that the residue from the incineration process may be disposed of in the same manner as any other clean, inert fill material. To minimize air pollution effectively, it is necessary that incinerators be equipped with a variety of air pollution control devices. Incinerators are built in many types and capacities starting from devices akin to backyard burners and in-house units for residences, apartment buildings, hospitals and institutions, to large plants having capacities of more than 2,000 tons per 24-hour period. The newer incinerators are architecturally pleasing and can readily handle mixed refuse.

The disposal of solid wastes in a community is handled in various ways. Excluding disposal by the producers themselves, sometimes public agencies perform the complete task with public employees; in other cases public agencies contract with one or more private, profitmaking organizations; in still other instances, all waste disposal is done through agreements between the individual producer and private enterprise or through various combinations of the above three methods. A 1964 survey of 995 communities with 5,000 or more inhabitants shows the following structure of refuse collection practices:

TABLE I.—*Breakdown of refuse collection practices*

[By type of collection organization 1964]

Collection organization:	*Percent share of total number of communities*
Municipal	44. 3
Contract	17. 6
Private	13. 1
Municipal and contract	3. 3
Municipal and private	15. 2
Municipal, contract, and private	1. 6
Contract and private	4. 4
Unknown	. 5

Source: American Public Works Association in cooperation with the U.S. Public Health Service.

The above data indicate that in 65.2 percent of the communities the control of solid waste collection was vested completely in public authorities through either municipally owned or contractually arranged operations. These data tend to correlate with data from a 1966 APWA survey, according to which in terms of tonnage, 62 percent of the collections were handled by public agencies and 38 percent by private organizations. However, it must be kept in mind that these data do not cover the practices of smaller communities and unincorporated areas for which published data are not available. It is estimated that in the majority of small communities with less than 5,000 population, the disposal is handled by private companies or the producers of the wastes.

Data on the public-private relationship in the ownership of disposal facilities are much more difficult to obtain. The 1965 APWA survey on collection practices indicates that 10.3 percent of the contractors and 13.4 percent of the private collection organizations do not use disposal facilities operated or provided for by public agencies.

Finally, a limited 1966 APWA survey indicates that about 15 percent of the solid wastes in communities of more than 10,000 population are disposed of in open dumps, about 65 percent in sanitary landfills,

about 18 percent through incineration, and about 2 percent by other methods. However, it must be recognized that many sanitary landfills are sanitary in name only and do not meet the requirements of a location, and at least daily coverage of the deposited wastes with suitable materials. Field surveys in some regions indicate that only about 10 percent of the so-called sanitary fills apply cover material on a daily basis. Thus, about 90 percent of the "sanitary landfills" might actually be classified as open dumps, including modified landfills or modified open dumps.

(b) *Qualitative and Quantitative Standards of Performance*

Refuse collection and disposal are generally regulated at the county and municipal levels, although in certain cases State regulations also apply.

According to the APWA Institute for Solid Wastes and the U.S. Public Health Service, the development of comprehensive survey procedures and the establishment of standards and criteria for the handling of solid wastes are sorely needed. At the present time there are significant differences of opinion as to the character and adequacy of disposal services that should be provided. Much depends upon the attitude, tradition, and the economic position of the residents in a particular community.

Qualitatively, the entire process of solid waste collection and disposal should be carried out in such a manner that the public health and safety of the community is protected, that the extent and characteristics of the service are in accord with the desire of the people, and that the operation is conducted effectively and economically. To be entirely free from nuisances and menace to public health, the waste materials must be handled so that odors cannot escape, so that insects and animals cannot have access to the material, so that wastes and dust are not thrown about, and so that the air and the surface and subsurface waters are not polluted.

The varying desires, attitudes, and opinions of the people currently make the problem of refuse collection and disposal somewhat different for each community. The residents of some places insist on healthful and attractive conditions and demand prompt and complete refuse disposal. In other communities, the citizens apparently place a much lower value on sanitation and orderliness. The attitudes, plus the economic capability of a community, determine the division of work between the householder or waste producer and the collection and disposal forces.

2. THE EXISTING CAPITAL PLANT IN THE UNITED STATES

(a) *The Number of Facilities in Operation*

As of mid-1965, it is estimated that there were 280 to 345 noncaptive incinerators, 1,000 to 1,250 noncaptive sanitary landfills, and 17,500 to 21,300 noncaptive open dumps in the United States. Noncaptive installations are those that are not operated for the disposal of the owner's refuse exclusively.

Most open dumps are found in the small rural places having a population of less than 2,500 people. Such places are estimated to account for 12,250 to 15,000 of the open dumps and for 125 to 150 of the sanitary landfills. Urban areas are estimated to account for 5,200 to 6,300 open dumps and 850 to 1,100 sanitary landfills.

A detailed breakdown of the estimates on the number of incinerators is given in table II.

TABLE II.—*Estimated distribution of the number of incinerators by community size, 1965*

Community population (in thousands)	Number of communities in United States, 1960	Percentage of communities with incinerators	Average number of incinerators per community	Distribution of incinerators by community size	
				Number	Percent
1,000 or over	5	80.0	4	16	5.1
500 to 999.9	16	75.0	2	24	7.6
250 to 499.9	30	50.0	1.5	22	7.0
100 to 249.9	81	30.0	1	24	7.6
50 to 99.9	201	25.0	1	50	15.9
25 to 49.9	432	10.0	1	43	13.7
10 to 24.9	1,134	7.0	1	79	25.2
5 to 9.9	1,394	4.0	1	56	17.9
Total	3,293			314	100.0

Source: APWA estimates and calculations.

Using several sources of data and methods of calculation and allowing for a margin of error of 10 percent either way, the number of incinerators in the United States is estimated to range between 280 and 345 units. This excludes privately owned incinerators used exclusively by the owner.

The estimated 1965 distribution of the number of open dumps and sanitary landfills is given in table III on the following page. Again, a margin of error of 10 percent either way should be allowed.

In evaluating surveys on the use of open dumps, modified landfills, and sanitary landfills, one finds that the inventories made by private consultants account for a much higher share of open dumps in the total disposal capacity than shown on questionnaire surveys.

TABLE III.—*Estimated distribution of the number of open dumps and sanitary landfills, by community size, 1965*

Community population	Number of places in United States, 1960	Average number of open dumps and/or sanitary landfills per community	Ratio of open dumps to sanitary landfills (percent)	Distribution by community size			
				Number		Percent	
				Open dumps	Sanitary fills	Open dumps	Sanitary fills
Urban (1,000's):							
1,000 or over	5	4.0	25:75	5	15	----------	1.4
500 to 999.9	16	3.5	34:66	19	37	0.1	3.5
250 to 499.9	30	3.0	50:50	45	45	0.2	4.2
100 to 249.9	81	2.5	60?40	120	82	0.6	7.7
50 to 99.9	201	2.0	70:30	281	121	1.4	11.2
25 to 49.9	432	1.5	75:25	485	163	2.5	15.2
10 to 24.9	1,134	1.0	80:20	910	224	4.7	21.0
5 to 9.9	1,394	1.0	90:10	1,255	139	6.6	13.0
2.5 to 4.9	2,152	1.0	95:5	2,050	102	10.6	9.4
Under 2.5 [1]	596	1.0	99:1	590	6	3.1	0.6
Subtotal urban	6,041	----------	86:14	5,760	934	29.8	87.2
Rural:							
1,000 to 2,550	4,151	1.0	99:1	4,110	41	21.2	3.8
Under 1,000	9,598	1.0	99:1	9,502	96	49.0	9.0
Total	19,790	----------	94:6	19,372	1,071	100.0	100.0

[1] Places with less than 2,500 population located in urbanized areas including the standard metropolitan statistical areas.

Source: APWA—Estimates and calculations.

Estimates of the number of collection vehicles in use are extremely hard to determine. All kinds of vehicles are used and many of the vehicles used serve other purposes as well. Based on a survey of 47 communities, with a total population of 15.5 million people, it is estimated that currently about 30,000 to 40,000 vehicles are more or less exclusively used for the collection of solid wastes. These data also are supported by a 1964 APWA–USPHS survey on refuse collection practices covering a total of 995 communities. Of the Government-owned collection vehicles 68.5 percent are estimated to be compactor trucks, 8.3 percent enclosed noncompactor trucks, and 23.2 percent open dump trucks.

(b) *Distribution of Facilities by State*

According to data from the 1962 U.S. Census of Governments, five States (California, Illinois, New York, Ohio, and Pennsylvania) account for almost 50 percent of the total U.S. governmental expenditures for sanitation other than sewerage. These expenditures cover the collection and disposal of solid wastes but they exclude any debt retirement or interest payments. The State of New York leads the list with 21.9 percent. Another five States (Florida, Michigan, Massachusetts, New Jersey, and Texas) account for more than another 20 percent of the total U.S. expenditures on sanitation other than sewerage. Therefore, 10 States spend more than 70 percent of the total of all such U.S. governmental expenditures excluding the respective debt service payments.

A detailed analysis of the distribution of governmental expenditures on sanitation other than sewerage by State and type of government, is presented in table IV on the following page. Although the data refer to 1962, it is reasonable to assume that the distribution pattern roughly remains valid today. The table furthermore indicates that all sanitation other than sewerage expenditures of governmental units, according to the U.S. census, are made by governments below the State level. On a nationwide basis, 91 percent of these local government expenditures are spent by municipalities, 5.2 by townships, 2.8 percent by counties, and 1 percent by special districts. The table excludes expenditures by private disposal organizations or self-service operations which are believed to be substantial. Unfortunately, no suitable data are available on the geographical distribution of the private disposal effort.

TABLE IV.—*Breakdown of expenditures in local governments on sanitation other than sewerage, 1962, by State*

[Dollar amounts in millions]

State	General expenditure of State and local governments (A)	Percent of general expenditure on sanitation other than sewerage (B)	Percent distribution of total U.S. expenditures for sanitation other than sewerage by State (C)	Percent of total expenditure for sanitation other than sewerage expended in SMSA's,[1] 1962 (D)	Percent of total population living in SMSA's, 1962 (E)	Percentage of total State expenditures for sanitation other than sewerage expended by—				
						Total (F)	Counties (G)	Municipalities (H)	Special districts (I)	Townships (J)
Total, United States	$60,205.5	1.1	100.0	79.0	63.0	100	2.8	91.0	1.0	5.2
Alabama	810.9	.8	.9	65.9	45.6	100	.1	99.9		
Alaska	134.0	.5	(2)			100		100.0		
Arizona	528.4	1.4	1.1	90.5	71.4	100	1.2	98.8		
Arkansas	406.0	.5	.3	39.5	19.1	100		100.0		
California	7,437.1	.8	8.9	93.3	86.5	100	9.0	87.8	3.1	
Colorado	682.4	.6	.6	78.2	68.0	100	.7	99.3		
Connecticut	948.1	1.0	1.4	91.9	77.6	100		71.6	.9	27.4
Delaware	156.3	.7	.1	81.1	68.9	100		100.0		
District of Columbia	330.9	2.4	1.2	100.0	100.0	100		100.0		
Florida	1,548.0	1.7	3.9	80.1	65.6	100	10.1	89.9		
Georgia	1,046.2	1.3	2.0	74.4	46.0	100	13.8	86.2		
Hawaii	295.8	1.3	.5	90.0	79.1	100	10.0	90.0		
Idaho	222.1	.6	.2			100	1.5	98.4		
Illinois	3,246.5	1.5	7.3	96.3	76.9	100	.1	99.9		
Indiana	1,379.7	.7	1.4	70.5	48.1	100	.3	99.7		
Iowa	889.9	.6	.8	62.1	33.2	100	.3	99.7		
Kansas	722.9	.6	.6	47.6	37.4	100		100.0		
Kentucky	899.2	.6	.8	72.7	34.1	100		100.0		

Louisiana	1,135.3	1.0	.1	75.8	50.0	100	10.5	89.5		
Maine	284.3	.4	.1	38.2	19.7	100		65.4		34.7
Maryland	1,037.0	1.2	1.8	90.8	78.2	100	19.7	63.3	17.0	
Massachusetts	1,782.7	1.3	3.4	92.6	85.2	100		73.6		26.4
Michigan	2,778.0	1.1	4.5	93.0	73.1	100		95.4	1.3	3.3
Minnesota	1,261.0	.5	.9	77.4	51.3	100	.6	99.4		
Mississippi	570.8	.6	.5	24.1	8.6	100	.8	99.2		
Missouri	1,166.0	.6	1.0	88.9	57.9	100		100.0		
Montana	245.3	.7	.2	48.2	22.6	100	3.8	96.2		
Nebraska	417.7	.6	.4	69.4	37.6	100		96.7	3.3	
Nevada	167.8	.2	[2]	68.8	74.2	100	13.5	86.5		
New Hampshire	187.7	.9	.2	31.2	17.7	100		84.7	.5	14.7
New Jersey	1,968.1	1.5	4.2	81.7	78.9	100	.6	77.5	4.9	17.0
New Mexico	323.4	1.2	.6	46.3	27.6	100	.4	99.6		
New York	7,046.5	2.1	21.9	97.2	85.5	100		89.4		10.6
North Carolina	1,083.5	1.0	1.6	47.2	24.6	100	.3	99.7		
North Dakota	238.5	.5	.2	22.7	10.6	100		100.0		
Ohio	2,879.6	1.2	5.1	90.7	69.5	100	.4	99.6		
Oklahoma	731.7	.7	.8	56.0	43.9	100		100.0		
Oregon	700.8	.3	.3	60.7	50.4	100	5.5	94.5		
Pennsylvania	3,185.7	1.3	6.2	93.4	77.9	100	3.3	86.6	.4	9.7
Rhode Island	254.6	1.0	.4	92.7	86.2	100		91.4		8.6
South Carolina	493.7	1.1	.8	45.9	32.2	100	5.0	89.4	5.6	
South Dakota	239.7	.3	[2]	5.2	12.7	100		100.0		
Tennessee	884.1	1.1	1.4	78.2	45.8	100	1.0	97.4	1.6	
Texas	2,706.4	1.2	4.8	79.6	63.4	100		99.9	.1	
Utah	326.2	.5	.2	79.7	67.5	100	20.5	79.5		
Vermont	146.5	.2	[2]			100		60.7		39.3
Virginia	1,066.7	1.1	1.7	77.0	50.9	100	18.2	81.8		
Washington	1,172.4	.7	1.2	72.8	63.1	100	6.8	93.2		
West Virginia	456.5	.6	.4	56.3	30.9	100	.1	99.8		
Wisconsin	1,417.3	1.3	2.7	75.0	46.3	100	.2	98.7		1.1
Wyoming	162.9	.7	.1			100		100.0		

[1] Standard metropolitan statistical area.

[2] Less than 0.1 percent.

Source: U.S. Department of Commerce, Bureau of Census, Census of Governments, 1962.

Moreover, the table shows that the bulk of the expenditures is made in standard metropolitan statistical areas. Again, on a nationwide basis, 79 percent of the sanitation-other-than-sewerage expenditures are accounted for by the standard metropolitan statistical areas though only about 63 percent of the population reside in such areas.

Finally, the distribution pattern in the table is based on dollar expenditures. Because of the great variations in the physical capacities of the various facilities, it is judged that expenditures reflect the disposal and collection effort more genuinely than the mere number of disposal installations.

In analyzing the distribution pattern in the foregoing table, it must be recognized that most of the incinerators are found in the Eastern States. The distribution of incinerators by States is estimated to be as follows:

TABLE V.—*Estimated distribution of incinerators, 1965 by State*

State:	*Percent share of total number*	State—Continued	*Percent share of total number*
Alabama	1. 6	North Carolina	2. 1
Connecticut	4. 3	North Dakota	. 5
District of Columbia	. 2	Ohio	9. 2
Florida	3. 7	Oregon	. 5
Georgia	1. 6	Pennsylvania	7. 6
Hawaii	. 5	Rhode Island	1. 6
Illinois	4. 8	South Carolina	. 5
Indiana	1. 6	Tennessee	1. 0
Iowa	1. 0	Texas	1. 6
Kentucky	2. 1	Virginia	3. 7
Louisiana	2. 1	Washington	. 5
Maryland	2. 1	West Virginia	1. 6
Massachusetts	6. 0	Wisconsin	5. 4
Michigan	2. 7	Total for States with less than 0.1 percent of the U.S. total	. 3
Minnesota	1. 6		
Missouri	. 5		
Nebraska	. 5		
New Jersey	11. 9	Total	100. 0
New York	15. 1		

Source: APWA estimates and calculations.

(c) *The Distribution of Facilities by Population Size of the Community*

As in the data on the distribution by State, the information on the distribution of the sanitation effort by population size is based on expenditures rather than the number of installations. Again, data from the 1962 census of governments form the basis for the distribution patterns presented in table VI. However, care should be exercised in drawing conclusions from these data since per capita costs are distributed over the entire population of the county rather than the urban population only which normally receives refuse collection and disposal service. This gives a distorted picture of the actual cost of the service provided.

Table VI, which appears on the next page, shows that almost 75 percent of the governmental expenditures for sanitation other than sewerage are spent in the densely settled counties with 250,000 or more people.

An explanation for this situation is not hard to find; because of their size, large communities have to make self-disposal and backyard burning of refuse illegal. In addition, the population in large communities

is wealthier, on the average, than that of smaller communities and most likely discards larger quantities of waste.

In evaluating the dollar expenditures in this table, it must be remembered that the setup of the original cost data in local governments is not particularly suited for statistical purposes or comparisons. It is particularly doubtful that all costs are accurately reflected in the figures reported by smaller communities.

TABLE VI.—*Governmental expenditures for sanitation, other than sewerage, 1962, by size of population on a county area basis*

County area population (thousands) [1]	Expenditures			U.S. population 1960 [2] (thousands)	U.S. population distribution (percent)	Number of areas	
	In millions	Percent of total	Per capita			County areas United States [3]	U.S. distribution (percent)
Total	$686	100.0	[4] $3.83	179,323	100.0	3,124	100.0
250 and over	513	74.8	5.87	87,432	48.9	123	3.9
100 to 249.9	78	11.4	2.84	27,566	15.4	176	5.6
50 to 99.9	43	6.3	2.12	20,319	11.4	293	9.4
25 to 49.9	32	4.6	1.52	20,890	11.6	588	18.8
10 to 24.9	16	2.4	.90	18,028	10.0	1,096	35.0
Under 10	4	.5	.73	509	.2	848	27.3
				4,579	[5] 2.5		

[1] Refers to county area as used in the 1962 Census of Governments.
[2] Refers to the areas covered in the 1962 Census of Governments.
[3] Includes areas corresponding to counties but having no organized county government.
[4] It should be noted that this figure is based on the entire U.S. population including rural areas receiving no service. Per capita costs in urban areas are thus higher.
[5] Population not covered in the 1962 U.S. Census of Governments survey.

Source: U.S. Department of Commerce, Bureau of Census, data revised October 1964.

The 1962 U.S. Census of Governments contains a first attempt to measure the expenditures for sanitation, other than sewerage, separately. It excludes any applicable debt service payments which are estimated to add about $80 to $120 million to the operating, maintenance, and capital investments as indicated. Furthermore, local governments frequently omit the 15 to 20 percent of worker fringe benefit cost as well as any applicable overhead in reporting expenditures by function. In addition, some communities operate their repair and maintenance facilities on a centralized basis while others do not. Personnel and equipment frequently are utilized for more than one function and costs are not uniformly allocated among local units of government. Comprehensive in-depth studies conducted by the APWA of actual expenditures in selected cities suggest that the total annual cost of collecting and disposing of solid wastes might range from $1.2 to $1.5 billion for the governmental sector alone.

The foregoing table, of course, excludes the cost of private refuse disposal service which, including all small communities and unincorporated areas, is frequently estimated to amount from 80 to 100 percent of the total public collection and disposal expenditures. In addition, substantial sums of money are spent on refuse containers, garbage grinders and on-site incinerators by the tax-paying public. Thus, it is reasonable to conclude that the total U.S. refuse collection and disposal expenditures probably exceed $2.2 billion and may range as high as $3 billion per year. Previous studies made by APWA as well as others support estimates of larger expenditures in this field.

The census data are used in this report since they represent a first attempt to obtain the needed information on a nationwide basis. More accurate data undoubtedly will be forthcoming in future years, as uniform accounting and reporting procedures are more widely adopted.

(d) *Age Distribution of Facilities*

Based on two surveys made in the late 1950's and the estimated incinerator building activity since then, it is estimated that 28 percent of the incinerators were built prior to 1941, about 59 percent during 1941–60, and about 13 percent since 1961.

The ages of open dumps and sanitary landfills are difficult to estimate. The service life of these installations varies greatly, depending mainly upon fill-depth, degree of compaction, and size of the area.

(e) *Ownership of the Facilities Now In Operation*

Noncaptive refuse collection and disposal facilities are generally owned by local governments or private profitmaking organizations or individuals. None are known to be owned by State governments, State agencies, the Federal Government, or by private, nonprofit organizations and cooperatives. The ownership relationship between local governments (municipalities, townships, counties, and special districts) and proprietary profitmaking organizations is estimated to be as follows:

TABLE VII.—*Estimated distribution of ownership of refuse collection-and-disposal equipment and installations, 1965*

Type of refuse collection-and-disposal equipment and installations	Percent owned by—	
	Local government	Private, for profit organizations
Collection vehicles	55	45
Garage and maintenance facilities	75	25
Incinerators	99	1
Open dumps:		
Urban areas	50	50
Rural areas	75	25
Sanitary landfills:		
Urban areas	60	40
Rural areas	90	10

Source: APWA estimates, 1964 APWA-USPHS survey of refuse collection practices.

(f) *The Estimated Current Value of Refuse Collection and Disposal Facilities*

In the absence of any data on the current value of refuse disposal investments it was decided to use past replacement values taking into account the past conditions in the state of the art of the disposal equipment technology. Local governments do not tend to use capital investment accounting methods including depreciation and other value (land value) adjustments. Sanitary landfills, if properly operated and completed, often represent land investments of considerable value.

For the present analysis the value of the incinerators is calculated at $2,500 to $3,000 a ton of installed capacity. The value of the collection facilities is calculated at an average of $10,000 per vehicle plus 12 percent, according to a 1966 APWA survey, for equipment storage

and maintenance facilities. The value per sanitary landfill is calculated at an average size of 15 to 30 acres, the cost per acre being $1,500. Land costs are estimated to represent about 40 to 45 percent of the total sanitary landfill value, including operating equipment. Thus, the past investment value per average sanitary landfill can range from $50,000 to $112,000. Open dumps, finally, are valued at land cost alone. Considering the large number of open dumps in small rural communities and the smaller sizes of open dumps, it is estimated that each open dump represents an investment of about $500. In contrast to open dumps, most sanitary landfills are located in urban areas where the land prices are substantially higher.

In accordance with the foregoing discussion, the value of refuse collection equipment and disposal facilities at actual acquisition costs is estimated as follows:

TABLE VIII.—*Investment value (at cost) of refuse collection equipment and disposal facilities, 1965*

	Millions of dollars
82,000 tons of incinerator capacity	205. 0–246. 0
1,071 sanitary landfills	53. 5–120. 0
19,372 open dumps	9. 5– 9. 5
30,000 to 40,000 collection vehicles	300. 0–400. 0
12 percent equipment storage and maintenance facilities	36. 0– 48. 0
Total	604. 0–823. 5

Source: APWA estimates and calculations.

The foregoing data on sanitary landfills exclude the investment value of completed sanitary landfill areas which are still held as property of the community. In case of a sanitary landfill, the land value usually increases because of land improvements produced by proper sanitary landfill operations. Thus in a strict sense the current value of a sanitary landfill cannot be compared to the current value of an incinerator installation.

B. Cost and User Charges

1. CONSTRUCTION COST AND OPERATING COSTS

(a) *Construction Cost for Facilities of Long-Time Durability*

Construction costs per ton of incinerator capacity have customarily been estimated to range from $3,000 to $6,000. However, a 1966 survey of eight incinerators just completed or still under construction indicates an average construction cost of $4,500 per ton/24-hour daily capacity. Construction cost increases considerably if air pollution control equipment, automated process controls, highly mechanized operations, and adequate storage facilities for the raw refuse are provided. The current construction costs for an incinerator utilizing the improvements available from modern technology are estimated to average $5,000 to $7,000 per ton/24-hour daily capacity. The cost could go as high as $8,000 to $10,000 per ton/24-hour daily capacity for plants incorporating heat recovery systems and buildings suitable for cold climates.

The development "construction" cost for sanitary landfills includes access roads, water, drainage facilities, equipment sheds, fencing, lighting, and site beautification. A 1964 survey of 10 sites in Penn-

sylvania indicates that these costs are approximately $55,000 for a 30-acre site. Of course, these costs can vary considerably depending on the terrain, location, and size. Converted to a 10-acre site, the sanitary landfill development costs are estimated at about $18,000. These cost figures exclude the acquisition cost for land and operating equipment. The equipment costs are estimated to average $35,000 to $40,000 per site, considering all sites in the country.

The current cost for suitable refuse collection equipment is estimated as follows:

Regular compactor trucks: 10 to 20 cubic yards; $10,000 to $13,000 each.

Heavy duty compactor trucks: 24 to 28 cubic yards; $15,000 to $20,000 each.

Trailers: 30 to 80 cubic yards; $25,000 to $30,000 each.

Compactor truck with detachable container and hoisting unit: $15,000 to $30,000.

Trailers are used in connection with transfer stations where the refuse is transferred from the smaller collection trucks to the trailers. Transfer stations reduce hauling costs if the hauling distances are great. However, according to a 1964 APWA survey on refuse collection practices, less than 4 percent of the U.S. refuse collection agencies use transfer stations at the present time.

(b) *Typical Maintenance and Operation Expenses for Collection and Disposal Facilities*

The operation and maintenance costs of incinerators vary widely depending upon the plant capacity, efficiency of operations, local wages, the type of refuse burned, the degree of burning, the number of shifts worked per day, and the type of plant; that is, whether it is mechanized or requires manual stoking. Variations in incinerator operating and maintenance costs are reported to range from $0.50 to more than $7 per ton of refuse burned. Based on data from 60 incinerator operations, it is estimated that, excluding amortization cost, average maintenance and operation costs range from $2.90 to $3.60 per ton of refuse burned. The annual maintenance costs are reported to amount to about 5 percent of the total capital cost or approximately 10 to 15 percent of the total annual cost of incinerator plant operation.

The operation and maintenance costs for sanitary landfills, too, vary widely. They depend mainly upon the soil conditions, availability of cover material, the type of equipment used, local wages, operations efficiency, and the size of the operation. A cost range of $1 to $1.50 per ton of refuse is frequently reported. A survey made for this report on the operating cost of 50 sanitary landfill operations suggests that the average operating and maintenance cost is about $1.10 per ton of compacted refuse deposited. By contrast, the cost of disposal in open dumps/modified landfills ranges from $0.05 to $0.25 per ton. This cost comparison of the various disposal methods indicates why there are so many open dumps in this country and why many supposedly sanitary landfills are not operated as such.

Collection accounts for the bulk of refuse removal costs. Ranging from $5 to $25 per ton, collection costs are commonly estimated to make up 65 to 80 percent of total disposal cost. The transportation

cost, excluding depreciation of equipment, of a typical 18- to 22-cubic-yard-packer truck carrying from 3 to 4 tons of compacted refuse, is estimated at $0.35 to $0.40 per mile. The average trip is estimated to be between 10 and 25 miles in distance.

2. USER CHARGES

(a) *The Extent to Which User Charges Are Employed to Pay for Refuse Collection and Disposal Services*

User charges are not uniformly employed throughout the country to pay for refuse collection and disposal services by local governments. They vary from a high of $3.30 per capita per year based upon the entire population of the State of New Mexico to a low of less than 1 cent or no charges at all for New Hampshire, Delaware, and the District of Columbia. A breakdown of user charges by State is given in table IX below.

In evaluating the data given in the table on the following page, it must be recognized that per capita expenditures and service charges tend to be substantially higher if they are calculated on the basis of the population actually served. A tabulation of per capita expenditures and service charges for refuse collection only, calculated on the basis of the population actually served, is given in table X.

TABLE IX.—*Per capita expenditures and revenue from service charges [1] for sanitation, other than sewerage, 1962, by State*

State	Expenditure [2]	Revenue charges	State	Expenditure [2]	Revenue charges
United States	$3.83	$0.68	Missouri	$1.67	$0.17
Alabama	1.93	.31	Montana	2.36	1.63
Alaska	2.70	1.86	Nebraska	1.85	.19
Arizona	4.82	.58	Nevada	1.08	.13
Arkansas	1.14	1.10	New Hampshire	2.59	----
California	3.44	1.41	New Jersey	4.69	.09
Colorado	2.26	.27	New Mexico	3.85	3.30
Connecticut	3.77	.14	New York	8.37	.46
Delaware	2.29	----	North Carolina	2.23	.01
District of Columbia	10.9	----	North Dakota	1.83	1.45
Florida	4.97	2.42	Ohio	3.42	.56
Georgia	3.27	1.11	Oklahoma	2.06	2.45
Hawaii	5.51	.83	Oregon	1.02	.11
Idaho	1.96	1.04	Pennsylvania	3.51	.27
Illinois	4.79	.26	Rhode Island	2.95	.01
Indiana	1.99	.04	South Carolina	2.18	.02
Iowa	1.98	.16	South Dakota	1.08	.28
Kansas	1.85	1.15	Tennessee	2.69	.08
Kentucky	1.61	.27	Texas	3.18	1.59
Louisiana	3.38	.38	Utah	1.83	.35
Maine	1.11	.02	Vermont	.75	.01
Maryland	3.75	.84	Virginia	2.72	.12
Massachusetts	4.56	.05	Washington	2.86	2.46
Michigan	3.89	.23	West Virginia	1.62	1.10
Minnesota	1.66	.34	Wisconsin	4.46	.04
Mississippi	1.58	.07	Wyoming	3.34	2.48

[1] Data refer only to total governmental expenditures and revenues for refuse removal divided by the total State population.
[2] Expenditures do not include debt service and retirement payments.

Source: U.S. Department of Commerce, Bureau of the Census.

TABLE X.—*Range in annual 1960 per capita cost for refuse collection of 38 public agencies financing their system exclusively through service charges, by type of service*

Extent and character of service	Number of cities	Maximum	Median	Minimum
Complete residential and commercial service (all classes and almost all kinds of refuse collected)	25	$7.40	$5.02	$2.04
Complete residential service only (some small commercial establishments may be included)	6	3.72	2.57	.64
Citywide service, but some kinds of refuse not collected or 1 or 2 classes omitted from business area	4	4.58	4.01	2.25
Only 1 class of refuse collected in residential area or business area or partial service throughout the agency	3	3.25	2.78	.24

Source: APWA Refuse Collection Practice, 3d edition, scheduled for publication in the late summer of 1966.

The table indicates the great differences in cost and user charges at various levels of service. Again, caution should be exercised in drawing conclusions. Some of the differences are due to variations in wage rates, population densities, collection methods, length of hauls, and other factors.

Finally, surveys conducted by APWA in 1955 and 1964 indicate that the number of cities using service charges to finance all or part of their refuse collection increased by about 20 percent in the 1955–64 time period. The current status of financing refuse collection in communities of various sizes is shown in table XI on the following page.

The data shows that the smaller communities tend to rely more on service charges than do the larger communities.

(b) *Extent to Which User Charges Cover Annual Maintenance and Operation Expenses Plus Debt Service*

User charges significantly exceed the sum of prorated operating and capital costs only in communities where refuse disposal is exclusively handled by private companies. This is the case in less than 13 percent of the Nation's communities according to a 1964 APWA survey of refuse collection practices.

TABLE XI.—*Method of financing refuse collection services, 1964, by size of community*

Population size of community	Distribution of financing methods in percent					
	Total		General tax	Service charge	Tax and service charge	Other
	Number of communities in sample	Percent				
5,000 to 9,999	180	100	47.2	39.0	13.4	0.6
10,000 to 24,999	307	100	46.0	38.0	16.0	0
25,000 to 49,999	190	100	51.5	32.7	14.2	1.6
50,000 to 99,999	93	100	58.0	28.0	12.9	1.1
100,000 to 999,999	74	100	59.5	27.0	13.5	0
1,000,000 and over	6	100	66.6	0	33.4	0
Total sample	850	100	50.1	34.9	14.4	.6

Source: Survey made in 1964 by APWA in cooperation with the U.S. Public Health Service.

According to the 1962 U.S. Census of Governments, user charges, on a nationwide basis, cover only 17.6 percent of the governmental operating and maintenance expenditures for sanitation other than

sewerage. Including debt service, user charges cover only 10 to 12 percent of the governmental refuse removal expenditures. Details of the relationships between user charges and expenditures by type of government are given in table XII.

TABLE XII.—*Expenditures and revenue in sanitation other than sewerage for local governments, 1962*

[Dollar amounts in millions]

Type of local government	Expenditures		Sanitation other than sewerage revenue from current charges	
	Amount [1]	Percent distribution	Amount	Percent distribution
Total	$981–$1,200	100.0	$121	100.0
Counties	27– 31	2.8	7	5.8
Municipalities	893– 1,100	91.0	105	86.8
Townships	51– 58	5.2	4	3.3
Special districts	10– 11	1.0	5	4.1

[1] APWA calculations.

Source: U.S. Department of Commerce, Bureau of the Census.

In the private refuse disposal field, user charges, of course, must cover all expenditures.

(c) *Extent to Which the Costs of Refuse Disposal Facilities Are Met Out of the General Tax Resources and General Obligation Bonds*

According to APWA surveys, it is estimated that about 35 to 36 percent of the communities finance their refuse collection and disposal operations through service charges, 50 to 52 percent through general taxes, and 12 to 15 percent through a combination of taxes and service charges.

The extent to which general obligation borrowings of local governments are used for this purpose is not known. However, it is believed that the cost for acquiring incinerators in many cases is financed through general obligation bond issues. Revenue bonds amortized by service charges have also been issued for such purposes.

C. TRENDS OF CAPITAL OUTLAYS

1. THE TRENDS OF ANNUAL CAPITAL OUTLAYS FOR REFUSE COLLECTION AND DISPOSAL FACILITIES DURING THE 1946–65 PERIOD

Suitable data on the annual capital outlays for refuse collection and disposal facilities during the 1946–65 period are not available. However, based on estimates obtained by the APWA from 47 communities, it is estimated that from $725 to $950 million were expended for capital outlays during the 1956–65 decade. This amount is estimated to break down from $467 to $612 million for collection equipment and facilities, $87 to $114 million for sanitary landfills and $171 to $224 million for incinerators. Based on the same survey, the total capital investment for refuse removal facilities during the 1946–55 decade is estimated at about $325 to $450 million.

The estimates for the past decade appear to be valid if one considers that the capital investments have not been spread evenly over 1956–65.

It is estimated that in 1956 the capital investments amounted to $35 to $50 million while in 1965 they may have reached a rate as high as $145 to $180 million per annum. Furthermore, surveys of selected cities indicate that capital expenditures (including debt service and new investments) amount to about 10 to 15 percent of the total refuse removal cost. Thus, if the total annual refuse removal cost is estimated at $2.5 billion, total capital expenditures would amount to $250 to $375 million per year. Deducting about $120 million for debt service consequently would suggest that current capital investments range between $130 to $255 million per annum. Therefore, it is reasonable to conclude that the current capital investment in the refuse collection and disposal field amounts to approximately $170 million per year.

Breakdown of Capital Outlays by Investor

All capital outlays, during the 1956–65 decade, for the establishment of refuse disposal facilities were made by local governments or proprietary, profitmaking organizations. It is estimated that local governments expended about 70 to 75 percent of the total amount and private organizations the remaining 25 to 30 percent. Expenditures by local governments at 72 percent of the total are estimated to include $170 to $222 million for incinerators, $70 to $93 million for sanitary landfills and about $280 to $370 million for collection equipment and maintenance and storage facilities.

2. SOURCES OF FINANCING FOR CAPITAL OUTLAYS

The sources of financing for these capital outlays include appropriations from tax sources, tax exempt municipal bonds, borrowings from banks, and private venture capital.

It is assumed that almost all incinerators (99 percent or $170 to $222 million) were financed through tax exempt municipal bonds while almost all of the remaining municipal investments in equipment, landfills, etc. (90 percent or $315 to $415 million) were financed by appropriations from tax revenues or service charges. Thus, about 43.5 percent of the total capital investments were financed by appropriations from general tax revenues and service charges and about 28.5 percent by municipal bonds. The remaining 28 percent is estimated to have been financed mainly by private, profitmaking organizations through borrowings from banks and by owner-capital.

D. Needs and Prospective Capital Outlays

Industrial and technological changes plus an increase in living standards are resulting in the production of ever-increasing quantities of refuse, per person. This increase, coupled with the anticipated population growth, results in staggering amounts of solid wastes that must be regularly collected, transported and disposed of.

1. THE ESTIMATED CAPITAL REQUIREMENTS FOR REFUSE COLLECTION AND DISPOSAL FACILITIES DURING THE 1966–75 DECADE

Conditioned upon the present situation, the capital requirements for noncaptive refuse collection aud disposal facilities during the 1966–75 decade are estimated to be at least $2.42 billion in 1965 dollars.

This estimate is based on a survey of the capital investment needs for waste disposal facilities recently conducted by the APWA in 47 communities and the findings of the previous analyses. The amounts of these capital investment demands are estimated to be as follows: $1.420 billion for collection equipment and storage and maintenance facilities, $340 million for sanitary landfills including land and equipment and $660 million for incinerators.

(a) *Factors Taken into Account in Making This Projection*

Excepting salvage operations such as hog feeding and composting, it is common to all disposal methods that, in one form or another, solid wastes have to be returned directly to the natural environment by acceptable means. The space requirements vary according to the method used and are as follows:

TABLE XIII.—*Land requirements for selected refuse disposal methods*

Disposal method	Percent reduction of volume of raw refuse	Population served annually by 1 acre-foot	Acre-feet required annually for each 10,000 population
Open dump (raw, mixed refuse)	0	412	24.2
Open dump with burning, scavenging, and casual compaction	15	487	20.5
Sanitary landfill	50	1,430	7.0
Incineration	90	2,080	4.8

Source: U.S. Public Health Service; APWA; and various waste disposal planning studies.

However, land required for waste disposal facilities is also in demand for many other more attractive uses in the metropolitan and urban centers. This, coupled with higher costs through an increase in the hauling distances to landfills, is judged to create a strong demand for modern incinerators during the next decade.

The $660 million investment need for incinerators includes an allowance of from 3 to 5 percent of this amount for land acquisition. The need for replacement of obsolete facilities is estimated to amount to 40 percent of the presently installed 82,000 tons daily, 24-hour incinerator capacity. Almost 30 percent of the existing capacity is estimated to have been built prior to 1941. Calculated at a construction cost of $6,000 per ton of daily, 24-hour capacity, this capital investment would add 109,000 tons of daily capacity to the present total capacity, whereas 33,000 tons of daily capacity would be eliminated because of obsolescence. Thus, the 1975 installed incinerator capacity is estimated at 158,000 tons per 24-hour day of operation. In support of this estimate it might be mentioned that a manufacturer of incinerator equipment forecasts, for 1975, an incinerator capacity of 120,000 to 145,000 tons per day. However, this forecast is based on a normal expansion of the demand and does not provide for stepped-up Federal activities in this field.

In estimating the sanitary landfill capital investment needs it is assumed that open dumps will be eliminated wherever feasible. However, inert waste materials, such as incinerator ash and certain demolition wastes, do not require sanitary landfills for adequate disposition. Furthermore, open dumps tend to be smaller in area than sanitary landfills. Thus a number of open dumps will not be converted to sanitary landfills but will be used for the disposal of inert

materials. Consequently it is assumed that about 30 percent of the existing open dumps in urban areas will not be converted to sanitary landfills, leaving about 4,000 open dumps to be converted. Since not all of these open dumps are located in or near metropolitan areas, nor do they belong to outlying communities in a metropolitan complex, their capital investment values for conversion to landfills is calculated at $50,000 each. In turn, the conversion of open dumps to sanitary landfills is estimated to require about $200 million during the 1966–75 decade.

In addition, it is estimated that about half of the existing 1,000 sanitary landfills will need replacement in the 1966–75 decade at an average cost of $80,000 each. This will add $40 million to the sanitary landfill investment needs.

It seems that the waste disposal needs in rural areas do not presently justify that each of the 13,600 communities be required to operate a sanitary landfill. Consequently, it may be assumed that refuse disposal in rural areas will be operated, more or less, on a countywide basis. This in turn might suggest that about 70 percent of the existing open dumps in rural areas will be closed. Because of their smaller size and lower land costs, the capital investment needs for sanitary landfills in rural areas are estimated at $25,000 each, including part of the cost for the equipment needed. Thus, the capital investment needs for 4,100 sanitary landfills in rural areas are estimated to be approximately $100 million. The equipment for sanitary landfills in rural areas will not be used on a full-time basis for landfill operations.

The capital investment needs for collection and transfer equipment plus maintenance and storage facilities are estimated at $1.42 billion during the 1966–75 decade. This includes the replacement of almost all noncompactor trucks of existing truck fleets, costing an average of $13,000 each. The current proportion of noncompactor units, including open trucks, is estimated at 30 percent of the total fleet, thus requiring a replacement of 10,000 to 12,000 units resulting in an investment of $130 to $156 million. Of course, not all of the open trucks will need to be replaced since a certain number of such trucks will be needed for the collection of oversized (bulky) wastes. In addition, it is estimated that the average sanitary landfill in rural areas would be served by four heavy duty compactor collection vehicles of 24 to 28 cubic yard loading capacity to minimize the cost impact of long-distance hauling. The cost of these vehicles is calculated at $20,000 each. Therefore, the 16,400 vehicles required for the waste disposal service in rural areas would require $328 million in capital investments. Consequently, about 34 percent of the total estimated capital investment needs for refuse collection facilities are judged to be needed for providing service where none currently exists or updating the current service to acceptable levels. The remaining $936 million are estimated to be needed for the replacement of worn out compactor trucks, the purchase of new vehicles, and the provision of the necessary maintenance and storage facilities.

The foregoing estimates have been made on the assumption of a population growth from 195 million people in 1965–66 to 230 million in 1975. In addition, it has been estimated that the production, collection, and disposal of solid wastes will increase, on a nationwide average from the present 0.75 ton per capita per year to 1 ton per capita per year in the next decade.

The foregoing estimates appear to be reasonable in the light of the capital requirement projections made by 20 metropolitan or regional planning commissions in urban and in some urban rural areas. These agencies in 1966 estimated that each of them should, realistically, spend an average of $7.5 million during the 1966–75 decade, on capital investments for refuse collection and disposal facilities. Since there are 216 metropolitan urban areas in this country, their total capital investment needs are calculated at $1.6 billion. Since such areas, however, account for about 70 to 75 percent of the population, the total U.S. investment needs on this basis can be extrapolated to $2.1 billion to $2.3 billion.

A graphic presentation of the trends in annual expenditures for sanitation on the State and local government levels is given in exhibit I (following) for comparison purposes. The exhibit indicates that those expenditures grow much faster than the population. This is in line with the findings of waste disposal studies made for a number of areas or regions in the United States. Some of these studies reveal that the collection and disposal of solid wastes increased at twice the rate of population growth.

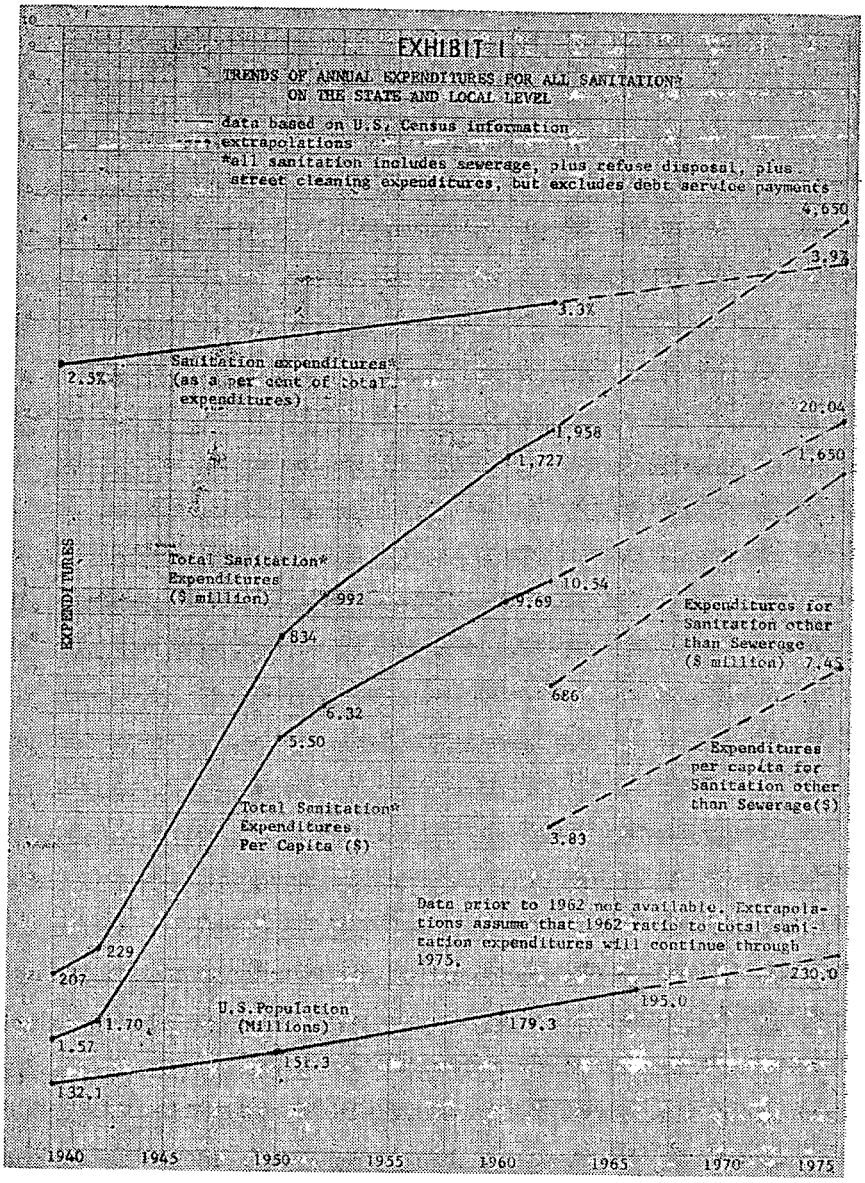
(b) *Capital Investment Needs on an Annual Basis*

If the projected needs were to be financed over the next decade in equal proportions, the annual investment would amount to approximately $240 million per year. If the backlog, which is estimated to be at least 34 percent of the investment needs, were to be funded during the first year of the decade, about $820 million would be required. Spreading the remaining $1.6 billion evenly over the 10-year period would add $160 million to the first year's requirements. Thus, it would be necessary to provide more than 40 percent, or $980 million, of the total $2.42 billion capital investment needs during the first year. The remaining $1.44 billion would be required at a rate of $160 million annually during each of the remaining 9 years. Of this amount, approximately $90 million would be required by local government, and $70 million by private entrepreneurs.

(c) *Distribution of the Investment Needs by Type of Area and Size of Community*

According to the foregoing analyses, $428 million, or 17.8 percent of the total investment needs, are estimated to be needed in rural communities. In addition, it is estimated that communities in urban areas with a population of less than 2,500 people will require about 2.2 percent of the total capital need. It is also noted that most of these communities receive their refuse disposal service in conjunction with that of other urban communities in metropolitan areas. Therefore, it is estimated that agricultural areas and communities with a population under 2,500 persons will require 20 percent, or $488 million, of the total capital investment needs. In turn, 80 percent, or $1.932 billion, would be spent in communities with a population of 2,500 or more people. According to the U.S. census, people living in such communities are considered as living in urban areas.

It is extremely difficult to make valid estimates of the capital investment needs in different population categories. In order to make such projections, as requested, it is necessary to make some more or less arbitrary assumptions, and use information which is subject to further refinement. If, for example, population distribution and past spend-



ing patterns of expenditures are used, the following estimates could be made. According to the 1960 U.S. census, 52 percent of the population at that time resided in communities of more than 50,000 inhabitants and 63 percent in metropolitan areas. According to the 1962 U.S. Census of Governments about 79 percent of all expenditures for sanitation other than sewerage was expended in metropolitan areas and about 92.5 percent in communities with a population of more than 50,000 people. To ameliorate the impact of the disproportionately large past expenditure patterns in large urban areas with the require-

ments for adequate service, it was decided to average the percentages of population and spending patterns. It is estimated that of the $1.932 billion needed in urban communities with 2,500 or more inhabitants about 70 percent, or $1.35 billion, might reasonably be allocated for communities with more than 50,000 inhabitants. This represents about 56 percent of the total $2.4 billion needed. The remainder of $582 million, or 24 percent of the total, is estimated to be needed in communities with populations between 2,500 and 50,000 persons.

(d) *Distribution of the Capital Investments by Type of Organization*

All capital investments during the 1966–75 decade are estimated to be expended by local governments (including special districts) or private organizations. In view of the increasing activity in area and regional refuse disposal, it is estimated that about 70 to 75 percent of the total required investment of $1.69 to $1.80 billion will be accounted for by local governments, and about $640 to $730 million by private organizations. In this estimate it is assumed that private organizations will continue to account for about 45 percent of the collection efforts while almost all of the disposal facilities will be established and operated by local governments.

2. SOURCES OF FINANCING

In view of the past investment trends and the demand on the financial resources of local governments for education, highway, water supply, and sewerage investment needs, it is estimated that the capital requirements herein forecast will not be met unless the Federal or State governments underwrite, in one way or another, at least two-thirds of the $1.8 billion share allocated for the investment needs of local governments. Federal financing of municipal refuse collection equipment would obviously place the private entrepreneur at an unfair disadvantage. Therefore, Congress may wish to provide Federal funds for refuse collection equipment only in those cases where adequate service, at a reasonable cost, cannot be provided without such assistance. Federal aid at the level proposed would enable local units of government to maintain their investments at approximately the same level as they were in the 1956–65 decade. However, Federal aid for refuse disposal equipment and facilities would permit local communities to reallocate funds and increase their capital investment in collection equipment needed to improve existing operations and extend service to areas not presently served by public or private systems. The present state of the current refuse collection and disposal operations reflects the strained financial situation of local governments.

The breakdown among the various sources of financing for the capital investments not underwritten by Federal or State governments is estimated to be about the same as presented in the previous discussion under the section "Sources of Financing for These Capital Outlays," on page 200.

In evaluating the portion of the investment needs to be borne by the Federal Government it must be recognized that many small communities, with their limited tax base and income potential, are not able to take advantage of Federal grants, even on a 4-to-1 basis. In addition, the annual expenditures for sanitation other than sewerage,

containing mostly direct operating expenses and excluding debt service payments, might be expected to double on a per capita basis and almost triple on a total dollar expenditure basis as suggested by the extrapolations in exhibit I.

It should also be noted that an increased capital investment of the magnitude proposed in the report would, in addition, add approximately $6 to $8 billion to the total cost of refuse collection and disposal service over the next decade. This results from the fact that additional operating and maintenance expenditures must be incurred in connection with this added investment. The increased cost would most likely be financed from service charges or general tax revenues.

Furthermore, efforts by the Federal Government in research and regulation already begun in the field by the Office of Solid Wastes of the Public Health Service, promise to produce changes in disposal methods under conditions of accelerating technological progress.

The present unsatisfactory conditions existing in the solid wastes field can be improved through efforts made to develop public awareness of the problems and their consequences. Enthusiastic leadership is needed to encourage public support of financial programs designed to improve refuse collection and disposal service. These efforts, coupled with the establishment and enforcement of acceptable standards, the training of operating and management personnel, improved data collection, and increased research in the solid wastes field are needed to provide safe, healthy, and pleasant environments for the citizens of this Nation.

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CHAPTER 8

Electric Power*

The U.S. electric utility industry has grown from an infant born in the 1880's to a giant ranked the largest in the Nation today. It has expanded at a pace nearly twice that of the overall economy, doubling roughly every 10 years and increasing at an annual compound rate of about 7 percent. Electricity provides over 22 percent of the basic energy needs in the United States today and is expected to supply nearly 28 percent by 1975. Total electric plant investment of all electric utilities in the country, both privately and publicly owned, amounted to approximately $82 billion at the end of 1965.

A. NATURE AND COMPOSITION OF ELECTRIC POWER FACILITIES

1. DESCRIPTION

An electric power supply system is composed of many interdependent parts that serve three more-or-less distinct major functions—generation, transmission, and distribution. The significance of these functions on cost to the consumer, based on composite national statistics for 1962, is shown in table 1.

TABLE 1.—*Total delivered cost of power, 1962*

[Composition in percent]

	Fixed charges	Operating expenses	Total cost
Generation	28.2	22.8	51.0
Transmission	7.9	2.0	9.9
Distribution	22.8	16.3	39.1
Total	58.9	41.1	100.0

Generating plants fall into five principal types: steamplants (fossil fuel and nuclear), conventional hydroelectric stations, pumped-storage projects, internal combustion units, and gas turbines.

Steamplants generate electricity from the energy in fossil fuels or nuclear sources by heating water to steam and using the steam, under pressure, to drive turbines which convert the energy into electrical form.

Hydroelectric plants develop the water power potential of our rivers by using the energy of falling water to drive turbines that turn the generators.

Pumped-storage plants are a type of hydroelectric development, where low-cost energy produced for the most part at steam-electric

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generating plants is used during off-peak periods to pump water from one pool to another at a much higher elevation. The water is stored in the higher reservoir until the time of peak loads when it is released back to the lower pool, to generate electricity at a time when its value to the system is at a maximum.

Internal combustion and gas-turbine generators are generally small units that frequently provide power for small systems and are adaptable for emergency and peaking power. Interest in their use for standby purposes has increased significantly during recent months, particularly since the Northeast blackout of November 9, 1965, but their combined capacity presently is only slightly more than 2 percent the total installation in the United States.

The basic energy sources used for electric power generation in the United States over the past 35 years are summarized in table 2.

TABLE 2.—*Sources of electric utility generation—Percentages of total kilowatt-hours, 1930–65*

	1930	1940	1950	1960	1965
Coal	56	54	47	54	54
Natural gas	7	8	14	21	21
Oil	3	4	10	6	6
Water power	34	34	29	19	18
Nuclear	0	0	0	0	(1)
Total	100	100	100	100	100

[1] 0.3 percent.

The geographic distribution of *generating* capacity in the United States is shown in figure 1, which also shows the distribution between hydro and thermal capacity. Figure 2 shows how the efficiency of steam generating units has increased over the past 30 years because of improved technology and the use of larger units with higher temperatures and pressures.

Transmission systems serve the basic function of carrying electricity from the generation area to the load area. The strategic importance of transmission, however, is much greater than is indicated by its 10 percent average share in the overall cost of electricity. Low-cost transmission permits the use of the most economical generation sources at mine-mouth plants or other remote-from-load areas. Adequate interconnections between systems provide the key to large-scale, low-cost generating units; to major savings in capacity due to load diversity; to the sharing of reserve generating capacity; and to the most efficient utilization of existing generating capacity. In short, a good transmission system has a significant influence on the cost of all phases of electric power service.

Transmission voltages in the United States presently in use range from 22 kilovolts to 500 kilovolts, and even higher voltage lines have been built for experimental purposes and are being actively studied. These high voltages permit the movement of large amounts of power over relatively long distances without the high transmission losses associated with lower voltage lines. The capital cost of high-capacity lines is also being reduced as a result of recent technological improvements. Almost all transmission in the United States at present is by alternating current (a.c.), but one 750-kilovolt direct-current (d.c.)

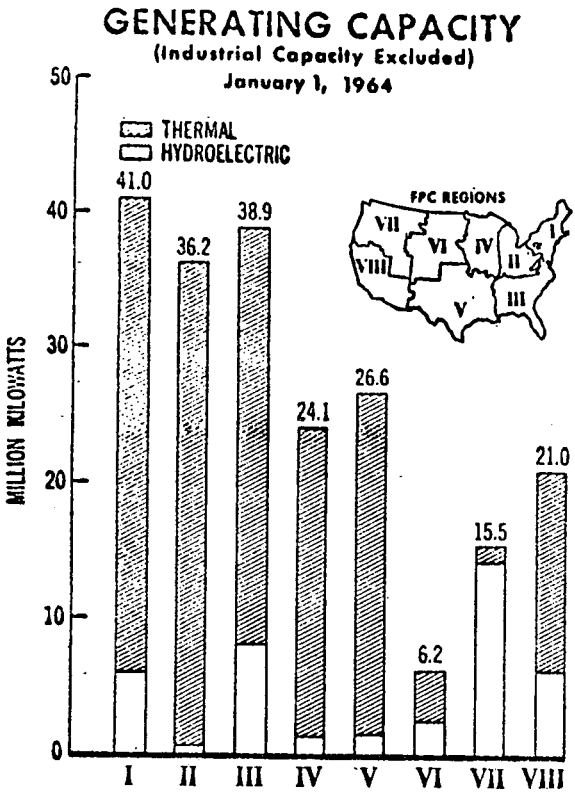

FIGURE 1

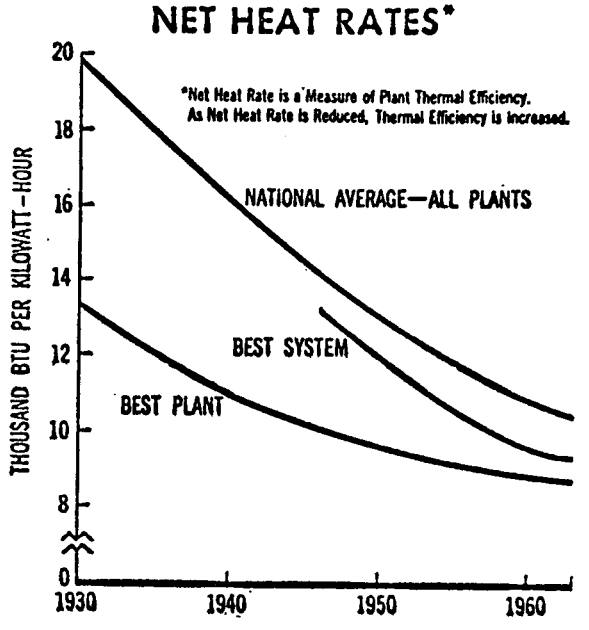

FIGURE 2

line has been contracted for and d.c. transmission may become an important factor in point-to-point movement of power where numerous taps and interconnections are not required.

Distribution is commonly considered to include all of the facilities needed to deliver power from the utility's primary transmission network to the door of the customer.

The cost of distribution is much more dependent on load density than on the size of the system. Many small distribution systems are operated by municipalities and other public or private groups and the physical nature of distribution systems permits these small distributors to operate their systems with a quality of service and at costs which are frequently comparable to those of larger power systems.

At the end of 1965 the total installed electrical generating capacity in the United States was more than 254 million kilowatts. During the year, over 1.15 trillion kilowatt-hours of energy were generated, or the equivalent of about 6,000 kilowatt-hours for every man, woman, and child in the Nation, considering all household, commercial, industrial, and other uses. Household use amounted to nearly 5,000 kilowatt-hours per family in 1965.

Electric utilities in the United States provide service that is among the most reliable to be found anywhere in the world. Many areas go for years without power service interruptions, and recurring outages in any one area are rare. A power system is a complicated mechanism, however, and short duration power failures are caused somewhere in the Nation almost daily by storms, human error, equipment failures, or other factors. Occasionally a local occurrence cascades into a major blackout, such as that experienced in the Northeast on November 9, 1965. As technology improves, and as neighboring systems are more strongly intertied, the likelihood of extended outages decreases. The Federal Power Commission recently established an Industry Advisory Committee on Reliability of Electric Bulk Power Supply, and the committee is making an exhaustive and coordinated study of problems of maintaining service reliability. In addition, almost every utility is constantly checking its own equipment and operating procedures to insure that optimum service is provided.

2. EXISTING ELECTRIC PLANT IN THE UNITED STATES

Table 3 shows the total number of plants and the installed capacity of electric utilities in the United States as of December 31, 1965, with a breakdown by States and regions. The table also shows the distribution between steam, hydro, and internal combustion installations. The generation from these plants is carried to bulk distribution centers by a network of nearly 400,000 miles of high-voltage transmission lines that serve every part of the Nation. About 1 percent of the transmission system is underground. Practically all of the underground lines are located in congested urban areas.

About 5 percent of the total generation in the United States comes from municipally owned plants. A distribution of the generating capacity of these plants by size of city is not readily available, but about half is owned by large municipalities with populations over 100,000. Many small cities own distribution facilities, and many of these own generating plants which, although small, account for nearly half of the national total for all municipally owned plants.

TABLE 3.—*Installed capacity of electric utility generating plants, by States and type (kilowatts), Dec. 31, 1965 (preliminary)*

Division and State	Number of utilities [1]	Number of plants [2]	Total capacity (kilowatts)	Type of plant					
				Hydro		Steam		Internal combustion	
				Number	Capacity (kilowatts)	Number	Capacity (kilowatts) [3]	Number	Capacity (kilowatts)
United States	1,280	3,345	235,677,074	1,248	43,792,160	1,078	188,498,817	1,019	3,386,097
New England	72	266	8,905,995	159	1,242,129	68	7,489,316	39	174,550
Middle Atlantic	65	271	34,117,493	134	4,741,371	111	29,263,938	26	112,184
East North Central	211	526	45,419,398	190	799,841	206	44,143,467	130	476,090
West North Central	430	773	16,510,939	84	2,940,313	215	12,236,025	474	1,334,601
South Atlantic	117	333	34,989,257	143	4,994,197	140	29,766,416	50	228,644
East South Central	35	111	24,104,470	47	4,489,359	46	19,594,137	18	20,974
West South Central	144	318	25,090,335	38	1,664,350	136	22,830,079	144	595,906
Mountain	123	362	12,994,522	182	5,561,572	82	7,117,500	98	315,450
Pacific contiguous States	54	327	32,628,011	255	17,273,353	58	15,291,604	14	63,054
Pacific noncontiguous States	29	58	916,654	16	85,675	16	766,335	26	64,644
New England:									
Maine	15	68	875,113	44	344,257	7	465,630	17	65,226
New Hampshire	8	30	761,212	23	394,810	6	363,386	1	3,016
Vermont	12	64	303,885	49	185,690	7	97,750	8	20,445
Massachusetts	22	62	4,144,534	26	181,922	27	3,906,429	9	56,183
Rhode Island	6	10	427,125	2	2,100	5	405,625	3	19,400
Connecticut	9	32	2,394,126	15	133,350	16	2,250,496	1	10,280
Middle Atlantic:									
New York	33	178	16,941,042	123	3,965,310	42	12,916,560	13	59,172
New Jersey	8	24	6,417,002	3	344,741	20	6,066,066	1	6,195
Pennsylvania	24	69	10,759,449	8	431,320	49	10,281,312	12	46,817
East North Central:									
Ohio	38	77	12,037,523	1	2,250	57	11,965,562	19	69,711
Indiana	25	49	8,161,296	7	29,155	35	8,105,778	7	26,363
Illinois	46	83	12,479,227	9	38,679	47	12,307,861	27	132,687
Michigan	53	149	8,279,097	74	357,555	37	7,738,944	38	182,598
Wisconsin	49	168	4,462,255	99	372,202	30	4,025,322	39	64,731
West North Central:									
Minnesota	77	165	3,095,869	33	149,852	51	2,718,865	81	227,152
Iowa	96	183	2,600,688	13	135,890	46	2,132,025	124	332,773
Missouri	64	100	4,179,751	6	800,600	37	3,186,090	57	193,061
North Dakota	12	39	740,872	1	400,000	16	296,800	22	44,072
South Dakota	32	60	1,474,188	8	1,210,496	11	184,750	41	78,942
Nebraska	69	103	1,592,747	20	238,025	19	1,193,950	64	160,772
Kansas	80	123	2,826,824	3	5,450	35	2,523,545	85	297,829

South Atlantic:									
Delaware	4	12	602,290			9	591,050	3	11,240
Maryland	11	20	3,675,893	2	493,680	14	3,161,040	4	21,173
District of Columbia	2	3	536,750	1	3,000	2	533,750		
Virginia	20	49	5,121,280	26	638,636	14	4,451,111	9	31,533
West Virginia	10	19	3,608,450	9	100,960	10	3,507,490		
North Carolina	26	77	6,345,325	51	1,726,558	18	4,606,810	8	11,957
South Carolina	10	45	2,696,019	25	936,135	17	1,758,370	3	1,514
Georgia	6	39	4,157,585	26	1,056,260	12	3,099,325	1	2,000
Florida	28	69	8,245,665	3	38,968	44	8,057,470	22	149,227
East South Central:									
Kentucky	9	23	6,092,183	5	540,614	16	5,543,542	2	8,027
Tennessee	5	34	8,462,148	26	1,993,200	6	6,468,650	2	298
Alabama	5	28	8,319,906	16	1,955,545	10	6,362,385	2	1,976
Mississippi	16	26	1,230,233			14	1,219,560	12	10,673
West South Central:									
Arkansas	14	29	2,015,176	11	869,340	8	1,101,050	10	44,786
Louisiana	31	59	4,259,498			26	4,071,899	33	187,599
Oklahoma	36	65	3,094,427	5	355,400	23	2,603,715	37	135,312
Texas	63	165	15,721,234	22	439,610	79	15,053,415	64	228,209
Mountain:									
Montana	8	26	1,396,480	20	1,261,830	5	133,650	1	1,000
Idaho	10	43	1,255,320	38	1,250,930			5	4,390
Wyoming	16	45	899,750	16	212,540	9	663,750	20	23,460
Colorado	32	78	1,986,791	28	265,257	25	1,642,200	25	79,334
New Mexico	16	30	1,791,798	2	24,630	16	1,719,129	12	48,039
Arizona	10	37	3,575,224	13	1,665,040	13	1,869,483	11	50,701
Utah	24	80	801,069	57	209,425	9	545,772	14	45,872
Nevada	7	23	1,288,090	8	681,920	5	543,516	10	62,654
Pacific contiguous States:									
Washington	20	61	9,330,105	50	9,090,301	7	236,640	4	3,164
Oregon	12	67	3,188,747	53	2,992,092	10	191,635	4	5,020
California	22	199	20,109,159	152	5,190,960	41	14,863,329	6	54,870
Pacific noncontiguous States:									
Alaska	24	43	221,587	14	82,325	7	89,110	22	50,152
Hawaii	5	15	695,067	2	3,350	9	677,225	4	14,492

[1] Total incudes 110 duplications because of utilities having generating plants in more than 1 State.

[2] Each type of prime mover at combination plants is counted as a separate plant.

[3] Includes 926,100 kilowatts of nuclear-fueled steam capacity, and 1,359,081 kilowatts of gas turbine capacity.

A precise summary of electric power facilities by age is not available, but inasmuch as the capacity, nationwide, doubles approximately every decade, it can be presumed that about half of the total current installation (capacity wise) is less than 10 years old, about one-fourth is 10 to 20 years old, and about one-fourth is more than 20 years old. These percentages apply to capacity, but not to the number of installations. A single plant of the type being constructed today may have more capacity than the combined installation at 100 plants built 30 or 40 years ago. Thus a high percentage of the number of plants in operation today are more than 20 years old. There are a few plants still in operation that were constructed shortly after the turn of the century.

Table 4 shows the distribution of generation in the United States by type of ownership for 1964 and 1965.

TABLE 4.—*Electric utility net generation, United States, 1964–65*

[Millions of kilowatt-hours]

	1964	1965
Total	983, 990	1, 054, 790
Privately owned	756, 183	809, 535
Publicly and cooperatively owned	227, 807	245, 255
Municipal	49, 600	49, 813
Federal	129, 936	145, 225
Co-ops, power districts, State projects	48, 271	50, 217

B. Costs and User Charges

1. CONSTRUCTION COST AND OPERATING COST

Construction costs for electric power facilities vary widely depending upon type of motive force, location, size, and a myriad of other factors. Average costs are therefore reasonably reliable only when they are applied to a large group of facilities within a relatively large geographical area. On a national basis, and considering all types and sizes of plants currently being constructed, steam generating plant construction costs average about $130 per kilowatt at today's prices. Hydro plants cost an average of about $250 per kilowatt, and internal combustion plants about $100 per kilowatt. When these costs are weighted for the various types of plant, the national average cost for current installations is in the neighborhood of $150 per kilowatt. Transmission and distribution costs, combined, cost somewhat more per kilowatt, on the average, than generation costs, so the total cost of constructing facilities to deliver power to the consumer, including miscellaneous costs, approximately $400 per kilowatt of required capacity. The current average cost of electrical energy to all consumers (residential, commercial, and industrial) is about 1.6 cents per kilowatt-hour.

About 41 percent of the total cost of delivered energy is attributable to operation and maintenance costs, including fuel. This percentage has been gradually decreasing, and may possibly fall to about 38 percent by 1975.

2. USER CHARGES

Customer charges for electric service generally involve two components—a demand charge and an energy charge. The demand charge relates to the kilowatts of capacity that the utility agrees to make available to the customer upon demand, or within the limits of some specified demand schedule. The energy charge is related to the kilowatt-hours of energy that the customer uses. Residential bills generally do not include a demand charge, per se, but many utilities have a minimum charge for maintaining a service connection.

Electric utilities provide what is essentially a monopolistic service. The pattern of assigned service areas and controlled rates has evolved as a matter of mutual interest of utilities and legislative bodies in assuring optimum service to all customers at minimum practicable prices. The statutes of 46 States provide for public service commissions with varying degrees of statewide jurisdiction over investor-owned electric utilities. These commissions typically regulate rates for retail sales, standards of service, issuance of securities, and accounting. Local regulation—directly and by franchise—is a factor in Minnesota, South Dakota, and Texas, where statewide regulations do not exist. In Nebraska, all electric utilities are publicly owned.

The interstate wholesale rates and services of investor-owned utilities are subject to the jurisdiction of the Federal Power Commission. The Commission's jurisdiction also extends to accounting, some compulsory interconnections, utility mergers, control of interlocking directorates, and, in some instances, issuance of securities by or of public utilities engaged in interstate commerce of electric energy.

Rates for all types of electric service by investor-owned utilities are based on the premise that revenues will: (1) permit recovery of capital investment during the useful life of the facilities, (2) cover annual operation, maintenance, and other costs, and (3) permit a reasonable return on the investor's capital. While electric rates are geared to the cost of doing business, rate regulation has not limited the incentive of utilities to increase their profits by providing increased service at the lowest possible cost. Experience has demonstrated that the electric power industry has been able to keep down cost to consumers even when the prices of almost all other basic services were increasing.

According to the BLS Consumer Price Index (based on 1957–59 prices equals 100) the index of electricity prices was 102 in the first quarter of 1966 compared with 102.1 a year earlier; during the same period the Consumer Price Index for all commodities and services increased from 108.9 to 111.5. Since 1945 the price index for electricity has risen about 6 percent while prices of all commodities have increased about 85 percent.

C. Trend in Capital Outlays

Table 5 summarizes capital expenditures of the industry for the period 1948 to 1966. The data, which were taken from *Electrical World* surveys, vary in coverage from roughly 84 to 92 percent of the entire industry.

TABLE 5.—*Electric utility industry capital expenditures, contiguous United States*

[In millions of dollars]

	Generation	Transmission	Distribution	Miscellaneous	Total (partial coverage) [1]	Total (full coverage)
1948	1,103	400	1,075	84	2,662	3,000
1949	1,410	400	1,190	93	3,093	3,500
1950	1,275	425	1,127	109	2,936	3,300
1951	1,344	504	1,089	131	3,068	3,500
1952	1,925	577	1,118	118	3,738	4,300
1953	2,088	647	1,200	127	4,062	4,700
1954	1,939	666	1,288	122	4,015	4,700
1955	1,548	571	1,343	161	3,623	4,300
1956	1,479	598	1,518	186	3,781	4,400
1957	2,234	747	1,566	199	4,746	5,500
1958	2,582	764	1,373	187	4,906	5,600
1959	2,369	708	1,413	189	4,669	5,300
1960	2,226	715	1,565	183	4,690	5,300
1961	2,114	764	1,550	180	4,608	5,200
1962	1,693	792	1,593	193	4,271	4,700
1963	1,721	837	1,568	230	4,357	4,800
1964	1,814	1,047	1,688	252	4,801	5,200
1965	1,941	1,181	1,861	269	5,254	5,700
1966 [2]	2,599	1,518	2,019	316	6,452	7,000

[1] Figures may not add due to rounding.
[2] Prospective.

Source: First 5 columns are from Electrical World Surveys (courtesy of Electrical World) and represent partial coverage. Last column represents FPC estimates of full coverage based on the Electrical World figures.

About three-fourths of all electric power facilities in the United States are controlled by investor-owned private utilities. The other one-fourth is about evenly divided between Federal developments and the combination of non-Federal public facilities and cooperatives. Table 6 shows the distribution of ownership for 1944 and 1964.

TABLE 6.—*Ownership of electric generating facilities*

	Percent of total capacity	
	1944	1964
Investor-owned utilities	81	76
Cooperatives		1
Public	19	[1] 23
Municipal	(7)	(7)
State	(2)	(4)
Federal	(10)	(13)
Total	100	100

[1] The detail does not add to the total due to rounding.

1. INVESTOR-OWNED SYSTEMS

The 480 investor-owned systems in the United States today reflect the merger and consolidation of some 4,000 separate investor-owned systems and some 1,000 additional municipal systems which were once in existence. Approximately 320 of these 480 companies are vertically integrated systems, generating most of the power they distribute. These systems account for 70 percent of the total electricity generated by the entire industry, public and private. Most of the other 160 investor-owned systems are primarily engaged in distribution.

Until 1961, investor-owned utilities obtained the major portion of their funds for construction from new security issues. Since the

early 1950's, however, internally generated funds—retained earnings, depreciation and amortization reserves, and deferred taxes—have supplied an increasing share and in 1962 nearly 60 percent of the investor-owned segment's construction funds were internally generated. Amortization and depreciation, which supplied 40 percent of construction funds in 1962, has replaced new debt issues as the most important single source of funds.

Table 7 shows the shifts which have taken place in the major sources of construction funds since 1950.

TABLE 7.—*Sources of construction funds, investor-owned electric utilities, 1950–62*

Source	1950	1954	1958	1962
Security issues:	*Percent*	*Percent*	*Percent*	*Percent*
Common stock	24.6	17.5	14.5	13.8
Preferred stock	9.5	6.7	6.6	4.4
Debt	33.0	41.6	38.2	22.7
Total securities	67.1	65.8	59.3	40.9
Internal funds:				
Retained earnings	7.8	6.2	8.6	14.0
Deferred taxes		4.5	5.9	3.9
Depreciation and amortization	25.1	23.5	26.2	41.2
Total internal funds	32.9	34.2	40.7	59.1
Total	100.0	100.0	100.0	100.0
	Millions	*Millions*	*Millions*	*Millions*
Total construction funds	$1,920	$2,950	$3,794	$3,360

The overall capital structure of investor-owned systems consists of approximately 53 percent debt, 10 percent preferred stock, and 37 percent common stock and retained earnings.

Table 8, which traces the composite of the capital structure of the investor-owned segment for selected years from 1964 to 1962, indicates that there has been little change in the capital structure since the mid–1950's.

Approximately 11 percent of the revenues of investor-owned electric utilities in 1962 were paid in Federal income taxes on the earnings of equity capital. Revenues must also cover State and local taxes, which together approximate the magnitude of Federal income taxes. The aggregate of all taxes paid by the investor-owned sector in 1962, exclusive of provisions for deferred income taxes, was about 22 percent of total revenues.

TABLE 8.—*Composite capital structure investor-owned electric utilities, 1946–62*

[In percent]

Year	Common stock	Earned surplus	Preferred stock	Debt
1946	32.1	6.3	15.2	46.4
1950	29.8	7.1	13.6	49.5
1954	28.7	7.7	12.4	51.2
1958	26.7	8.5	11.3	53.5
1962	26.8	10.2	10.2	52.8

2. FEDERAL SYSTEMS

Federal power agencies are important contributors to the Nation's electric power supply. Federal power is produced at approximately 125 hydroelectric projects which are part of Federal multipurpose water resource developments, and at steam plants of the Tennessee Valley Authority (TVA).

Nearly all Federal power is marketed by TVA and four Department of the Interior agencies—Bureau of Reclamation, Bonneville Power Administration, Southwestern Power Administration, and Southeastern Power Administration. As of January 1, 1964, the Interior Department was the marketing agency for the power developed at 95 projects having an installed capacity of 13,900 megawatts.

With the exception of TVA, capital funds for Federal systems are supplied entirely by congressional appropriations. Since 1959, TVA has been empowered to obtain funds in the private capital markets by the issuance of revenue bonds. The Government's investment in TVA is junior to the revenue bonds sold to the public. Since the 1959 self-financing act, TVA has been required to pay the U.S. Treasury a "return" or "dividend" on the Government's investment equivarent to the average rate of interest paid by the Treasury on its outstanding marketable debt. TVA is also required to repay $1 billion of the appropriated investment of $1.2 billion within the next half century.

Federal systems are not subject to Federal and State income taxes or to local property taxes. TVA, however, makes substantial payments in lieu of taxes to State and county governmental units.

There is not complete uniformity in the repayment requirements for Federal projects or in earnings standards for power sold from these projects. Normally, payments are required for the equivalent of an interest assessment and for amortization of the project investment allocated to power. Interest on new projects is currently computed at 3 ⅛ percent per annum, the average of the interest rate on all outstanding long-term securities of the United States. This figure has gradually risen as the interest rate paid by the Government on new issues—now over 4 percent—has increased.

3. STATE AND LOCAL PUBLIC AGENCIES

Local public ownership began early in the industry's development, when numerous municipal systems were organized to provide electricity to previously unserved areas. There were more than 700 public systems in 1900 and over 3,000 by the early 1920's, compared with approximately 2,100 today.

Many types of public agencies own electric generation, transmission, or distribution facilities, or combinations thereof. They vary greatly in size, ranging from small towns to the city of Los Angeles. Although it is not a common occurence, a few counties, such as Crisp County, Ga., and three counties in the TVA area, maintain their own systems. However, the most common forms of public power entities, other than municipal systems, are special utility districts (exemplified by the numerous public utility districts of Nebraska, Oregon, and Washington), municipal utility districts (such as the Sacramento Municipal Utility District in California), irrigation districts (some of which, such as the Imperial Irrigation District in California, also maintain electric

utility systems) and the various kinds of State "authorities" (such as the Grand River Dam Authority in Oklahoma, the Colorado River Commission of Nevada, the Power Authority of the State of New York, and the Arizona Power Authority).

The statutory and constitutional framework within which these public entities were created has tended to maintain their separate identities, and there is great diversity in the nature of their operations. Many municipalities and other local public agencies generate their own power requirements in varying degree, while others purchase power from Federal, investor-owned, cooperative, or other local public systems, and sometimes from a combination of such suppliers. A few are largely confined to the generating and transmission functions. An example is the Power Authority of the State of New York, which sells at wholesale the power it generates at its two big hydroelectric projects at Niagara Falls and the St. Lawrence Seaway.

The great bulk of the local public agency systems are municipally owned and serve only the areas of the municipalities themselves. In a relatively few instances (e.g., Cleveland, Ohio), a municipal system and an investor-owned system serve within the same municipality. However, territorial competition between municipal systems and others is usually confined to the expansion of municipal boundaries, which may bring competition to fringe areas previously served by cooperatives or investor-owned systems.

The local public agency systems generally obtain their capital investment funds from power revenues and by selling debt securities in the public market. In the past, such securities were often general credit obligations of the municipality, county or State. More recently, however, the emphasis has been on revenue bonds issued by the utility system itself, payable from revenues alone and not backed by the general credit of the local government or by a lien on physical properties.

Local public agencies are traditionally exempt from Federal income tax and generally not subject to State income tax. In most jurisdictions, they are also not subject to real property or other local taxes. However, by statute or ordinance in some jurisdictions and by agreement or practice in others, most local public agencies make substantial payments in lieu of taxes to their own local governments and often make large additional contributions to such governments. Many of them also make payments in lieu of tax payments to State and county governments. In addition, many municipal systems provide power free or at reduced rates to the city government for street lighting, water pumping, and other municipal uses.

Interest on the debt securities of such local agencies is exempt from Federal income tax and, in most jurisdictions, from State income tax, so that their debt securities command more favorable terms than debt securities issued by comparable investor-owned electric utility systems.

4. RURAL ELECTRIC COOPERATIVE SYSTEMS

The electric cooperative became a significant part of the electric industry beginning in the middle 1930's. Prior to that time, the investor-owned segment of the industry has extended electric service to only about 10 percent of the farms of the country.

The Rural Electrification Act of 1936 was designed to stimulate farm electrification through low cost loans by the Rural Electrification

Administration of the U.S. Department of Agriculture, originally established in 1935 by Executive order of President Roosevelt. The REA program has been extremely successful. Today, as a result of the REA program and the expansion of the investor-owned companies' rural electrification programs, 98 percent of the Nation's farms are electrified. There are now almost 1,000 cooperatives participating in the REA program, serving 50 percent of the consumers in the Nation's rural areas. Although REA may make loans to investor-owned and public systems, it appears that the cooperatives have come to be the preferred vehicle for the extension of rural electrification with Federal funds.

The vast majority of cooperatives are merely distributors and purchase all of their power at wholesale from the Federal power marketing agencies or investor-owned utilities. However, some groups of distribution cooperatives have formed generating and transmission cooperatives to generate a part or all of their electric power requirements. These "G and T" type cooperatives now supply about 15 percent of the requirements of the cooperative segment. They are also financed largely by REA.

The Rural Electrification Administration initially limited its loans to cooperatives to serve communities of not more than 1,500 persons which were without central station service. With the population shifts of the last three decades, some cooperatives now serve sizable communities. However, the cooperative systems typically serve areas of low customer density which, of course, increases the cost of distribution. Cooperatives average about 3 customers per mile of line compared with 20 customers per mile for the industry as a whole.

Except in a few States, the cooperative systems are not granted exclusive franchises for their service areas, and there is much competition between them and other systems for service to new loads. The annexation by municipalities of suburban areas initially served by cooperatives is a major cause of territorial competition. In some areas competition has led to the construction of duplicate facilities. In other areas, there are formal or informal arrangements which permit both systems to minimize the cost of service to their respective customers.

Only a small portion of the capital requirements of cooperative systems is obtained from their membership. The remainder is provided largely by long-term mortgage loans from the Rural Electrification Administration. Interest on such loans is authorized by law at 2 percent per annum.

Rates for service of cooperative systems are designed to cover costs and amortization requirements of REA loans and to provide for contingencies. Payments by consumers in excess of the cost of supplying electric energy are deemed to be capital. This capital is commonly credited to each consumer on a patronage basis and is retired on a revolving basis when the financial condition of the cooperative permits. Most cooperative systems do not return all such capital, at least until a desired reserve level has been accumulated.

Under present law the courts have held the cooperatives not to be liable for Federal and State income taxes. Most cooperatives do, however, pay State and local taxes other than income taxes.

Capital outlays by type of ownership

Table 9 shows the pattern of estimated electric utility construction expenditures for selected years.

TABLE 9.—*Estimated electric utility construction expenditures*

[Billions of dollars]

Year	Private	Federal	Municipal	States, cooperatives and other	Total
1955	3.0	0.4	0.5	0.4	4.3
1960	3.4	.4	.8	.7	5.3
1965	4.1	.5	.5	.6	5.7

Source: Estimated by FPC.

D. NEEDS AND PROSPECTIVE CAPITAL OUTLAYS

It is reported that electric utilities expect to invest over $6 billion in new facilities during 1966. This rate of expenditure is nearly double the annual rate that prevailed 10 years ago, and this accelerating trend will have to continue if the production goals anticipated for 1975 are to be met. Projections of the magnitude of future industry growth are difficult, because of the potentials that exist for improved efficiencies in delivering power to the consumer and the possibilities for new uses of electric energy. The estimates are based on a continued improvement in technology as indicated by recent trends, and on population growth, obsolescence, and other factors that are consistent with current general practice. The figures are based on the assumption that new power facilities will be designed and built to provide optimum aesthetic values, considering costs and other limiting factors. They do not anticipate extensive replacement for aesthetic reasons of facilities that have remaining useful life.

On the basis of the general criteria discussed above, it is estimated that the country's electric utilities will need approximately 315 million kilowatts of generating capacity by 1970 and 415 million kilowatts by 1975. Allowing for retirements of generating capacity in the future because of age or obsolescence, total capacity additions during the years 1966 through 1970 will have to be about 85 million kilowatts, and additions for 1971 through 1975 will need to be about 110 million kilowatts. Yearly capacity additions will range from nearly 15 million kilowatts in 1966 to 20 million in 1970 and 25 million in 1975.

Utilizing the preceding forecasts of capacity additions, total construction expenditures in the 10-year period would probably be in the neighborhood of $75 billion without any allowance for inflation.

Assuming a continuation of the ownership patterns shown in table 6, but with some adjustments to reflect the type of facilities owned by each segment of the industry, total electric utility construction

expenditures in the years 1966, 1970, and 1975 distributed by type of ownership may be estimated as follows:

TABLE 10.—*Projected electric utility financing requirements*

[Billions of dollars]

Year	Private	Federal	Municipal	States, cooperatives and other	Total
1966	5.0	0.7	0.7	0.6	7.0
1970	5.5	.8	.9	.6	7.8
1975	6.3	.9	1.1	.7	9.0

For the publicly owned segment the principal sources of capital funds are revenue bonds, *retained earnings*, and borrowing from national, State, and municipal treasuries. Cooperatives have traditionally borrowed from the Federal Treasury, but there are indications that they will enter the private money market to obtain some of the capital that will be needed during the next decade. The investor-owned utilities draw on their internal sources as well as on borrowing from insurance companies, pension plans, savings banks, and private investors.

The industry as a whole has had no difficulty in raising the capital it has needed for its continuing expansion. There seems no reason to doubt that the industry will be able to obtain sufficient funds to finance the construction program required during the next decade.

CHAPTER 9

Gas Distribution Systems*

INTRODUCTION

In 1966 the gas distribution industry celebrates its 150th year of service; the first gas distribution system was established in Baltimore in 1816, just 2 years after the famous defense of Fort McHenry and the writing of the Star-Spangled Banner. The distribution sector of the gas industry in the United States today includes 773 municipal and 728 investor-owned systems. There are no State-owned or co-operative gas distribution systems, while the only Federal systems are limited to serving military installations. (The latter are outside the scope of this study.) Although municipal systems are more numerous than investor-owned systems, they account for only between 5 and 10 percent of the gas distribution business in terms of gas distribution plant, number of customers served, or volume of gas sold.[1]

About 80 percent of the Nation's population live in areas served by gas distributors. Gas use has grown rapidly during the past 20 years as a result of service being extended to more and more communities, population growth, and increased use per customer. The demand for gas is expected to continue increasing in the years ahead. To meet the demand, substantial additional investment will be required in distribution systems as well as in natural gas transmission pipelines and gas production.

A. NATURE AND COMPOSITION OF FACILITIES

1. DESCRIPTION OF FACILITIES

The gas industry in the United States is comprised of three branches—producers, pipeline companies, and distribution companies. Ninety-eight percent of the industry's customers are supplied with natural gas [2] most of which is produced in the Southwest. The remaining 2 percent of the customers receive manufactured gas produced by distribution companies or some mixtures of manufactured and natural gas or LP gas. By contrast, in 1938 the industry supplied only 40 percent of its customers with natural gas.

In addition to supplying gas to pipelines and distributors, the producers of natural gas use some of their own gas and sell some directly to consumers (mostly for industrial purposes). About one-quarter of

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[1] Based upon data in *Gas Facts* (New York: American Gas Association, 1965); letter from I. S. Schwimmer ssistant director, Bureau of Statistics, American Gas Association, Mar. 29, 1966, and other AGA records.

[2] See: R. J. Rutherford, "Gas Industry Scores Again on All Points," *American Gas Association Monthly*, (issue of January 1966), pp. 2-5. At the end of 1965 gas utilities served 38,071,600 customers; 37,310,300 of these customers were served with natural gas.

the natural gas consumed in this country is delivered directly to ultimate consumers and is not handled by pipelines or distributors.[3]

Natural gas pipelines carry gas from producing areas to major industrial and population centers in all parts of the country. The major portion of the gas carried by pipelines is destined for delivery to distribution systems, but pipelines also make sales directly to consumers. About 5½ percent of the gas customers (exclusive of those supplied by producers as noted above) receive gas directly from pipeline companies; these sales account for about 20 percent of the gas utility and pipeline sales.[4]

The distribution systems provide most of the deliveries to ultimate consumers after having received supplies at the city gate.[5]

For statistical purposes, the American Gas Association makes the following classification of companies:

> A company classified as a gas distribution utility is one which obtains the major portion of its gas operating revenues from the operation of a retail gas distribution system and which operates no transmission system other than incidental connections within its own system or to the system of another company. For purposes of A.G.A. statistics, a distribution company obtains at least 95 percent of its gas operating revenues from sales to ultimate customers (residential, commercial, industrial, etc.) and classifies at least 95 percent of gas mains (other than service pipe) as distribution.
>
> A company classified as an integrated gas utility is one which obtains a significant portion of its gas operating revenues from the operations of both a retail gas distribution system and gas transmission system. For purposes of A.G.A. statistics, an integrated company obtains less than 95 percent but more than 5 percent of its gas operating revenues from either its retail or transmission operations or does not meet the classification of mains established for distribution companies.[6]

Statistics on the gas distribution industry as used in this chapter include data on distribution companies and integrated companies as defined above; where distribution and integrated company data are not available, statistics including data on natural gas pipelines are used to illustrate trends. In terms of capital plant the natural gas pipeline companies account for about 40 percent of the gas utility and pipeline company plant; as shown in table 1, this percent has been fairly constant since 1957.

TABLE 1.—*Natural gas pipeline company utility plant as a percent of gas utility and pipeline company plant*

Year	Percent	Year	Percent
1954	35.9	1960	41.6
1955	37.7	1961	40.7
1956	38.3	1962	41.4
1957	39.9	1963	40.2
1958	40.2	1964	40.6
1959	40.8		

Source: Based on data in *Gas Facts* (New York: American Gas Associates, 1965).

[3] The Bureau of Mines shows 1964 natural gas consumption at 15.5 trillion cubic feet. American Gas Association indicates that sales by pipelines and gas utilities plus use of gas by combination gas and electric utilities for electric generation amounts to about 11.3 trillion cubic feet of 1,032 B.t.u. gas. See: U.S. Bureau of Mines *Minerals Yearbook: 1964* (Washington: U.S. Government Printing Office, 1965) and *Gas Facts*, *op. cit.*

[4] Based on data in *Gas Facts*, *op. cit.* and Schwimmer, *op. cit.*

[5] For further detail see: Alfred M. Leeston, John A. Crichton, and John C. Jacobs, *The Dynamic Natural Gas Industry* (Norman, Okla.: University of Oklahoma Press, 1963) pp. 171-183, and *Natural Gas: A Study in Industry Pioneering* (New York: American Gas Association, 1962.)

[6] Schwimmer, op. cit.

Service to customers of gas distribution systems is classified as residential, commercial, industrial or other. Table 2 shows by class of customer the number of customers, therms[7] sold and revenues received for 1964 and 1965.

TABLE 2.—*Number of customers, therms sold, and revenues received by class of service (all utility and pipeline companies), 1964 and 1965*

	1965	1964	Percent change
Customers (annual average):			
Residential	34,345,500	33,551,200	+2.4
Commercial	2,806,400	2,712,200	+3.5
Industrial	168,200	159,400	+5.5
Other	41,200	40,500	
Total	37,361,300	36,463,300	+2.5
Sales (thousands of therms):			
Residential	40,400,500	38,696,900	+4.4
Commercial	13,839,600	12,734,900	+8.7
Industrial	61,236,600	59,120,300	+3.6
Other	5,368,800	5,360,300	
Total	120,845,500	115,912,400	+4.3
Revenues (in thousands of dollars):			
Residential	4,043,705	3,894,870	+3.8
Commercial	1,080,202	998,386	+8.2
Industrial	2,108,849	2,048,527	+2.9
Other	183,986	190,902	
Total	7,416,742	7,132,685	+4.0

Source: Rutherford, *op. cit.*

Residential service applies to customers supplied with gas by individual meter in a single-family dwelling or in an individuals apartment or to not over four households served by a single meter in a multifamily building. Residential customers use gas for space heating, cooking, water heating, clothes drying, incinerators, and more recently, air conditioning. Commercial service includes service to customers primarily engaged in wholesale or retail trade, agriculture, forestry, fisheries, transportation, communication, sanitary services, finance, insurance, real estate, personal services, service to multifamily buildings, et cetera. Industrial service covers sales to customers engaged primarily in a process which changes raw or unfinished materials into another form or product. Other services include sales to governmental agencies for illumination of public places and sales to public authorities under special agreements.[8]

A measure of the service rendered to consumers is indicated by the use of gas per customer of distribution and integrated companies as shown in table 3.

Most of the gas used by residential customers is for space heat;[9] this results in a winter seasonal peak for the gas industry unless some other summer use can be found for gas. Use of storage facilities near markets and interruptible sales to large industrial customers help

[7] A therm is 100,000 British thermal units; a British thermal unit is the amount of heat required to raise the temperature of 1 pound of water 1 degree Fahrenheit. The average natural gas sold by utilities has a heating value of about 1,030 to 1,035 B.t.u. per cubic foot. Manufactured gas has about half of the heating value of natural gas.

[8] *Gas Facts* (New York: American Gas Association, Inc., 1965) pp. 240–241.

[9] *Projected Gas Utility and Pipeline Industry Statistics:* 1965–75 (New York: American Gas Association August 1965) shows residential heating for 1964 accounted for 25,640,000,000 therms and other residential uses accounted for 13,057,000,000 therms.

TABLE 3.—*Use per customer of natural gas from distribution and integrated companies by State and class of service, 1964*

[Therms per customer—Annual]

	Residential	Commercial	Industrial	Other	All classes
United States	1,156.5	4,733.6	261,588.3	121,442.2	2,691.5
New England	662.3	2,470.2	36,228.3	32,375.0	1,002.8
Connecticut	691.1	2,460.7	57,611.1	(1)	1,174.7
Maine					
Massachusetts	658.2	2,418.5	32,321.4	26,857.1	952.1
New Hampshire	752.3	2,545.5	17,500.0	3,000.0	963.5
Rhode Island	615.7	2,878.4	28,187.5	(1)	1,027.2
Vermont					
Middle Atlantic	847.2	2,935.3	131,320.0	16,400.0	1,509.1
New Jersey	721.0	1,967.4	85,500.0	(1)	1,146.5
New York	662.0	2,326.0	47,923.1	13,986.3	983.7
Pennsylvania	1,262.6	5,357.8	315,935.8	21,500.0	2,711.5
East North Central	1,552.3	6,077.0	273,457.6	39,205.5	3,030.3
Illinois	1,321.5	5,901.7	164,211.7	53,000.0	2,476.9
Indiana	1,373.0	4,394.8	621,925.9	26,750.0	3,975.8
Michigan	1,661.3	5,878.1	202,179.4	(1)	2,926.0
Ohio	1,884.9	7,357.2	563,600.0	22,060.6	3,511.9
Wisconsin	1,170.3	4,782.8	184,263.2	(1)	2,661.5
West North Central	1,523.7	6,398.7	264,168.5	413,000.0	3,659.6
Iowa	1,536.0	6,635.5	502,875.0	1,016,000.0	3,781.1
Kansas	1,564.8	5,500.0	360,281.2	(1)	3,975.3
Minnesota	1,535.0	7,284.2	272,825.0	298,000.0	4,004.1
Missouri	1,480.9	6,217.3	231,325.0	231,000.0	2,905.0
Nebraska	1,553.9	5,701.7	145,653.8	303,500.0	4,516.4
North Dakota	1,461.9	9,615.4	245,000.0	(1)	2,962.0
South Dakota	1,470.3	8,493.8	349,000.0	39,000.0	3,744.8
South Atlantic	991.8	4,006.7	250,247.9	18,428.6	2,314.8
Delaware	815.9	2,738.1	520,000.0	(1)	1,659.6
District of Columbia	872.6	3,455.1	5,888.9	6,333.3	1,209.8
Florida	280.7	4,906.4	380,750.0	5,600.0	1,312.8
Georgia	1,128.7	5,177.8	224,435.9	32,250.0	2,806.5
Maryland	945.2	2,292.1	100,280.0	9,000.0	1,443.4
North Carolina	927.0	3,233.0	234,052.6	87,000.0	3,697.9
South Carolina	775.5	3,569.5	573,428.5	4,800.0	3,931.9
Virginia	929.5	3,760.9	182,000.0	45,300.0	1,731.8
West Virginia	1,653.9	5,346.8	1,076,833.3	18,200.0	3,805.7
East South Central	1,183.8	5,264.7	354,285.7	43,306.5	2,755.2
Alabama	973.9	5,175.3	504,800.0	2,500.0	2,246.7
Kentucky	1,511.6	4,940.9	401,875.0	38,733.3	2,577.2
Mississippi	988.1	4,157.9	214,857.1	49,071.4	2,523.5
Tennessee	1,205.5	6,555.0	358,176.4	72,736.8	3,965.5
West South Central	985.8	3,821.2	259,608.4	134,688.9	3,259.6
Arkansas	1,210.9	4,470.6	699,727.0	254,000.0	6,029.0
Louisiana	934.7	3,599.3	261,814.8	91,000.0	2,127.0
Oklahoma	1,135.9	4,731.0	290,277.0	169,000.0	3,157.2
Texas	932.5	3,499.0	211,187.5	140,909.1	3,251.8
Mountain	1,460.5	6,019.8	419,508.7	100,724.1	3,664.5
Arizona	853.5	4,483.1	153,266.6	116,571.4	2,027.2
Colorado	1,562.7	6,906.8	572,166.6	358,000.0	2,996.8
Idaho	1,141.8	4,988.0	343,250.0	7,000.0	4,511.9
Montana	1,787.1	9,117.2	442,333.3	(1)	4,754.9
Nevada	949.3	9,714.3	1,947,000.0	(1)	5,910.6
New Mexico	1,434.5	5,794.1	280,315.7	87,800.0	5,194.3
Utah	2,198.3	3,191.0	1,301,250.0	(1)	4,822.3
Wyoming	1,780.6	7,229.9	837,500.0	44,666.7	4,895.9
Pacific	1,054.0	5,106.1	578,820.3	26,761,000.0	3,160.1
Alaska	2,105.3	9,000.0	64,500.0	(1)	9,191.5
California	1,051.3	5,228.2	593,603.8	26,574,000.0	3,039.6
Hawaii					
Oregon	962.3	3,448.7	331,363.6	(1)	3,978.3
Washington	1,190.3	4,516.0	821,444.4	(1)	5,951.4

[1] Less than 50,000 therms and/or less than 50 customers.

Source: American Gas Association.

balance the loads. Interruptible industrial customers buy gas with the understanding that service will be curtailed or cut off when high priority customers' requirements call for larger volumes of gas. Firm service is provided to the customers who buy gas under schedules or contracts which provide for no interruptions of service.

2. EXISTING CAPITAL PLANT

The principal investment of the gas distribution systems in this country consists of the gas main facilities. Distribution and integrated companies operated 458,640 miles of distribution pipelines, 105,470 miles of transmission pipelines and 39,300 miles of field and gathering pipeline, a total of 603,410 miles of mains in 1964. The location of these facilities by States is shown in table 4.

As noted above, there were 728 investor-owned systems and 773 municipal systems in 1965.[10] Over 93 percent of their customers were served by the 201 investor-owned and municipal gas systems with annual revenues of $1 million or more; these large systems are concentrated in the more populous areas as shown in table 5.

Details on the distribution of the 1,300 utilities with less than $1 million revenue are not available. However, further detail is available on the 773 municipal systems which reported to the AGA in 1964.[11] As shown in table 6 the concentration of municipals is decidedly in the smaller markets.

It can be seen in table 7 that about 97 percent of the industry's growth has taken place in the past 55 years and 65 percent of the growth has taken place in the past 15 years.

There is no inventory of pipe underground showing the vintage of the Nation's gas distribution mains, but the figures in table 8, which show the growth of the pipeline network since 1932, attest to the fact that about half of the pipe in use is less than 15 years old. Replacement of old pipe is sometimes necessary, usually to allow for carrying of larger volumes of gas but it is estimated that 95 percent of the pipe requirement of the gas utilities and pipelines is for new construction and 5 percent for replacement.[12]

Of the 736,200 miles of pipeline in 1964, 603,410 are used by distribution and integrated companies. Of the distribution and integrated company pipeline, 564,580 miles, or 93.6 percent, are operated by investor-owned utilities and the remaining 38,830 miles by municipal utilities. The distribution of the gas main by type of service and State is shown for investor-owned utilities in table 9 and for municipal utilities in table 10.

[10] Letter from Schwimmer, Apr. 14, 1966, and *Government in Gas* (New York: PAR Public Information Service, American Gas Association, 1965).

[11] *Ibid.*

[12] "Gas Industry Estimates Steel Needs" (New York: Bureau of Statistics, American Gas Association, Inc., Aug. 11, 1965).

TABLE 4.—*Miles of gas main of distribution and integrated companies by State and type of main,*[1] *1964*

	Total	Field and gathering	Transmission	Distribution
United States	603,410	39,300	105,470	458,640
New England	18,380	----------	480	17,900
Connecticut	3,250	----------	60	3,190
Maine	----------	----------	----------	----------
Massachusetts	12,680	----------	360	12,320
New Hampshire	580	----------	10	570
Rhode Island	1,870	----------	50	1,820
Vermont	----------	----------	----------	----------
Middle Atlantic	87,370	6,500	13,660	67,210
New Jersey	16,450	----------	1,500	14,950
New York	29,410	560	4,520	24,330
Pennsylvania	41,510	5,940	7,640	27,930
East North Central	124,020	4,770	15,020	104,230
Illinois	31,210	20	1,410	29,780
Indiana	13,980	260	2,420	11,300
Michigan	25,960	240	3,120	22,600
Ohio	41,450	4,250	6,760	30,440
Wisconsin	11,420	----------	1,310	10,110
West North Central	69,480	4,460	22,210	42,810
Iowa	11,880	50	3,710	8,120
Kansas	22,610	4,350	8,950	9,310
Minnesota	9,600	----------	2,200	7,400
Missouri	12,060	----------	760	11,300
Nebraska	9,670	40	4,970	4,660
North Dakota	1,510	20	690	800
South Dakota	2,150	----------	950	1,220
South Atlantic	63,020	8,460	9,660	44,900
Delaware	940	----------	70	870
District of Columbia	1,150	----------	20	1,130
Florida	6,340	----------	270	6,070
Georgia	11,150	----------	660	10,490
Maryland	6,120	40	320	5,760
North Carolina	6,360	----------	1,440	4,920
South Carolina	4,690	----------	1,180	3,510
Virginia	6,780	10	750	6,020
West Virginia	19,490	8,410	4,950	6,130
East South Central	35,130	2,570	5,070	27,490
Alabama	10,350	----------	1,290	9,060
Kentucky	10,940	2,570	2,060	6,310
Mississippi	6,100	----------	660	5,440
Tennessee	7,740	----------	1,060	6,680
West South Central	99,420	8,320	24,98	66,120
Arkansas	10,200	440	3,040	6,720
Louisiana	15,030	650	2,700	11,680
Oklahoma	17,190	2,960	4,640	9,590
Texas	57,000	4,270	14,600	38,130
Mountain	37,610	3,550	7,860	26,200
Arizona	7,010	(2)	100	6,910
Colorado	7,950	360	730	6,860
Idaho	1,740	----------	470	1,270
Montana	5,800	1,160	2,560	2,080
Nevada	1,520	----------	780	740
New Mexico	6,180	1,360	1,160	3,660
Utah	4,010	180	370	3,460
Wyoming	3,400	490	1,690	1,220
Pacific	68,980	670	6,530	61,780
Alaska	150	----------	10	140
California	58,240	670	6,350	51,220
Hawaii	----------	----------	----------	----------
Oregon	4,930	----------	90	4,840
Washington	5,660	----------	80	5,580

[1] Excludes service pipe. Data not adjusted to company diameter equivalent. Mileage shown as o end of year.

[2] Less than 5 miles.

TABLE 5.—*Number of gas distributors, customers and population served, all gas utilities with over $1,000,000 revenue, 1965*

Population (class interval)	Number of utilities	Number of customers (in thousands)	Population in area served (in thousands)
500,000 or more	69	29,101	121,869
100,000 to 499,999	84	4,326	19,556
50,000 to 99,999	24	435	1,760
10,000 to 49,999	21	182	649
2,500 to 9,999	3	8	21
Under 2,500			
Total	201	34,052	143,855

Source: Schwimmer, *op. cit.*

TABLE 6.—*Number of municipal gas distributors and population served, 1964*

Population (class interval)	Number of utilities	Population in area served (in thousands)
5,000,000 or more	[1] 2	[1] 2,590
100,000 to 499,999	8	2,226
50,000 to 99,999	8	528
10,000 to 49,999	89	2,670
2,500 to 9,999	260	1,625
Under 2,500	405	506
Total	[1] 772	[1] 10,145

[1] Excludes Houston, Tex. One part of Houston is served by a city-owned gas system, but about 95 to 98 percent of the city's population reside in areas served by private gas companies.

Source: *Government in Gas* (New York: PAR Public Information Service, American Gas Association, 1965) and U.S. Bureau of the Census, *U.S. Census of Population, Number of Inhabitants* (Washington: U.S. Government Printing Office, 1961).

TABLE 7.—*Sales of gas to consumers by utilities and pipeline companies* [1]

Year:	*Billion therms*	Year—Continued	*Billion therms*
1910	3.7	1945	25.9
1920	6.2	1950	42.1
1930	13.6	1955	66.6
1935	12.9	1960	92.9
1940	17.2	1965	120.8

[1] Excludes sales for resale.

Source: American Gas Association Monthly (issue of January 1966) cover and p. 1, and *Gas Facts, op cit.*

TABLE 8.—*Miles of pipeline in use at end of year, distribution, integrated and natural gas pipeline companies*

[In thousand miles]

Year	Total	Field and gathering	Transmission	Distribution
1945	310.7	27.0	82.2	201.5
1946	319.0	26.5	87.3	205.2
1947	331.4	27.0	92.9	211.5
1948	346.4	29.2	97.0	220.1
1949	364.1	30.9	102.9	230.3
1950	387.5	32.9	113.0	241.6
1951	406.6	34.6	119.1	252.9
1952	424.2	38.3	122.0	263.9
1953	445.2	41.3	129.0	274.9
1954	470.5	43.8	139.0	287.7
1955	496.7	45.7	145.9	305.1
1956	525.2	47.6	153.8	323.8
1957	548.8	50.0	160.1	338.7
1958	571.5	52.0	165.4	354.1
1959	599.9	54.1	174.4	371.4
1960	630.9	55.8	183.7	391.4
1961	659.0	56.7	191.9	410.4
1962	683.2	58.7	196.4	428.1
1963	709.9	60.7	200.9	448.3
1964	736.2	61.0	205.4	469.8

Source: Gas Facts, *op. cit.*

TABLE 9.—*Miles of main of investor-owned distribution and integrated companies natural gas, by State and by type of main—1964* [1]

	Total	Field and gathering	Transmission	Distribution
United States	564,580	39,190	100,940	424,450
New England	17,970		480	17,490
Connecticut	3,160		60	3,100
Maine				
Massachusetts	12,360		360	12,000
New Hampshire	580		10	570
Rhode Island	1,870		50	1,820
Vermont				
Middle Atlantic	84,490	6,500	13,660	64,330
New Jersey	16,450		1,500	14,950
New York	29,380	560	4,520	24,300
Pennsylvania	38,660	5,940	7,640	25,080
East North Central	122,400	4,690	14,600	103,110
Illinois	30,470	20	1,270	29,180
Indiana	13,570	260	2,210	11,100
Michigan	25,960	240	3,120	22,600
Ohio	40,980	4,170	6,690	30,120
Wisconsin	11,420		1,310	10,110
West North Central	65,470	4,360	22,030	38,980
Iowa	11,430	50	3,700	7,680
Kansas	22,130	4,350	8,920	8,860
Minnesota	8,970		2,190	6,780
Missouri	11,310		680	10,630
Nebraska	8,030	40	4,920	3,070
North Dakota	1,510	20	690	800
South Dakota	2,090		930	1,160
South Atlantic	54,650	8,460	8,590	37,600
Delaware	940		70	870
District of Columbia	1,150		20	1,130
Florida	3,760		60	3,700
Georgia	8,030		50	7,980
Maryland	6,120	40	320	5,760
North Carolina	5,770		1,410	4,360
South Carolina	3,600		990	2,610
Virginia	5,790	10	720	5,060
West Virginia	19,490	8,410	4,950	6,130
East South Central	22,490	2,560	2,870	17,050
Alabama	4,980		90	4,890
Kentucky	10,130	2,560	1,900	5,670
Mississippi	5,140		510	4,630
Tennessee	2,240		380	1,860
West South Central	92,820	8,300	24,470	60,050
Arkansas	9,830	440	2,980	6,410
Louisiana	13,230	650	2,520	10,060
Oklahoma	16,900	2,960	4,610	9,330
Texas	52,860	4,250	14,360	34,250
Mountain	36,420	3,550	7,720	25,150
Arizona	6,690	(2)	40	6,650
Colorado	7,410	360	710	6,340
Idaho	1,740		470	1,270
Montana	5,800	1,160	2,560	2,080
Nevada	1,520		780	740
New Mexico	5,850	1,360	1,100	3,390
Utah	4,010	180	370	3,460
Wyoming	3,400	490	1,690	1,220
Pacific	67,870	670	6,510	60,690
Alaska	150		10	140
California	57,230	670	6,350	50,210
Hawaii				
Oregon	4,930		90	4,840
Washington	5,560		60	5,500

[1] Excludes service pipe.
[2] Less than 5 miles.

Source: Schwimmer, *op. cit.*

TABLE 10.—*Miles of main of municipal companies, natural gas, by State and by type of main, 1964* [1]

	Total	Field and gathering	Transmission	Distribution
United States	38,830	110	4,530	34,190
New England	410		(2)	410
Connecticut	90		(2)	90
Maine				
Massachusetts	320		(2)	320
New Hampshire				
Rhode Island				
Vermont				
Middle Atlantic	2,880		(2)	2,880
New Jersey				
New York	30			30
Pennsylvania	2,850		(2)	2,850
East North Central	1,620	80	420	1,120
Illinois	740		140	600
Indiana	410		210	200
Michigan				
Ohio	470	80	70	320
Wisconsin				
West North Central	4,010		180	3,830
Iowa	450		10	440
Kansas	480		30	450
Minnesota	630		10	620
Missouri	750		80	670
Nebraska	1,640		50	1,590
North Dakota				
South Dakota	60			60
South Atlantic	8,370		1,070	7,300
Delaware				
District of Columbia				
Florida	2,580		210	2,370
Georgia	3,120		610	2,510
Maryland				
North Carolina	590		30	560
South Carolina	1,090		190	900
Virginia	990		30	960
East South Central	12,640	10	2,190	10,440
Alabama	5,370		1,200	4,170
Kentucky	810	10	160	640
Mississippi	960		150	810
Tennessee	5,500		680	4,820
West South Central	6,600	20	510	6,070
Arkansas	370		60	310
Louisiana	1,800		180	1,620
Oklahoma	290		30	260
Texas	4,140	20	240	3,880
Mountain	1,190		140	1,050
Arizona	320		60	260
Colorado	540		20	520
Idaho				
Montana				
Nevada				
New Mexico	330		60	270
Utah				
Wyoming	(2)			(2)
Pacific	1,110		20	1,090
Alaska				
California	1,010			1,010
Hawaii				
Oregon				
Washington	100		20	80

[1] Excludes service pipe.
[2] Less than 5 miles.

The value of the gas utility and pipeline plant of natural gas distribution and integrated companies at the end of 1964 is shown in table 11.

TABLE 11.—*Gas utility plant of natural gas distribution and integrated companies as of Dec. 31, 1964 (gross plant excluding manufactured gas plant)*

[In millions]

	Investor owned	Municipal	Total
Total utility plant and adjustments	$14,940	$860	$15,800
Production and local storage	1,430	115	1,545
Underground storage	695	5	700
Transmission	3,045	(1)	3,045
Distribution	8,835	645	9,480
General and intangible [2]	725	65	790
Construction work in progress	210	30	240

[1] Less than $5,000,000.
[2] Includes plant acquisition adjustments and plant adjustments.

Source: Schwimmer, *op. cit.*

B. COSTS AND USER CHARGES

1. CONSTRUCTION AND OPERATING COSTS

The American Gas Association reports that 21,530 miles of distribution pipe were installed in 1964. Construction expenditures amounted to $784 million during the year or an average cost of $36,414 per mile. According to the AGA, "this average construction cost per mile of distribution main includes the expenses involved in bringing gas service to new customers and the strengthening of service to existing customers." [13]

The total mileage of natural gas pipeline of investor-owned distribution and integrated companies at the end of 1964 was 564,580 miles, as shown in table 9. During 1964, $1,421 million were expended for the operation and maintenance of these lines (including $1,205 million for operating expense and $216 million for maintenance).[14] This expenditure represents an average of $2,517 per mile, of which $2,134 is operating expense and $383 is maintenance expense. No data are available to measure the average per mile cost for operation and maintenance of municipally owned utilities.

2. USER CHARGES

Investor-owned utilities set rates at levels designed to recover total operating and maintenance expenses, depreciation costs, taxes, and return on investment. Municipal utilities set their rates to recover all costs including debt service and payments to municipal governments in lieu of taxes. There may be isolated instances of municipal utilities operating at a deficit but these would be exceptions to the general practice of gas distributors. Outlays for facilities and structures of municipal utilities are normally met from retained earnings or from special bonds rather than out of the general tax resources and general obligation borrowings of the municipalities.

[13] Schwimmer, *op. cit.*
[14] *Gas Facts, op. cit.* pp. 195–198. This excludes $3,356,000,000 purchased gas costs.

The rates of investor-owned distribution utilities are generally regulated by State commissions and the rates of municipal distribution systems are generally fixed by the municipal authorities. Prices for gas paid by all distribution systems to interstate pipeline companies are regulated by the Federal Power Commission.

C. Trend of Capital Outlays

The growth of the gas distribution pipeline network (see table 8) has been paralleled by increasing construction expenditures for distribution facilities (see table 12). Chart 1 shows the comparison of growth trends for the latter expenditures, natural gas production, number of gas customers, and average use per customer.

Table 12.—*Construction expenditures for gas distribution facilities, 1946–64*

[Dollar amounts in millions]

Year	Expenditures	Year	Expenditures
1946	$105	1956	$534
1947	178	1957	593
1948	219	1958	541
1949	240	1959	643
1950	299	1960	696
1951	331	1961	687
1952	349	1962	708
1953	383	1963	752
1954	423	1964	784
1955	500		

Source: *Gas Facts.*

As shown in table 13, the concentration of utility plant for all gas distribution and integrated companies (including natural, manufactured, mixed, and LP gas companies) in the investor-owned segment of the industry has declined only slightly during the past 10 years.

Table 13.—*Gas utility plant—All distribution and integrated companies, 1954–64*

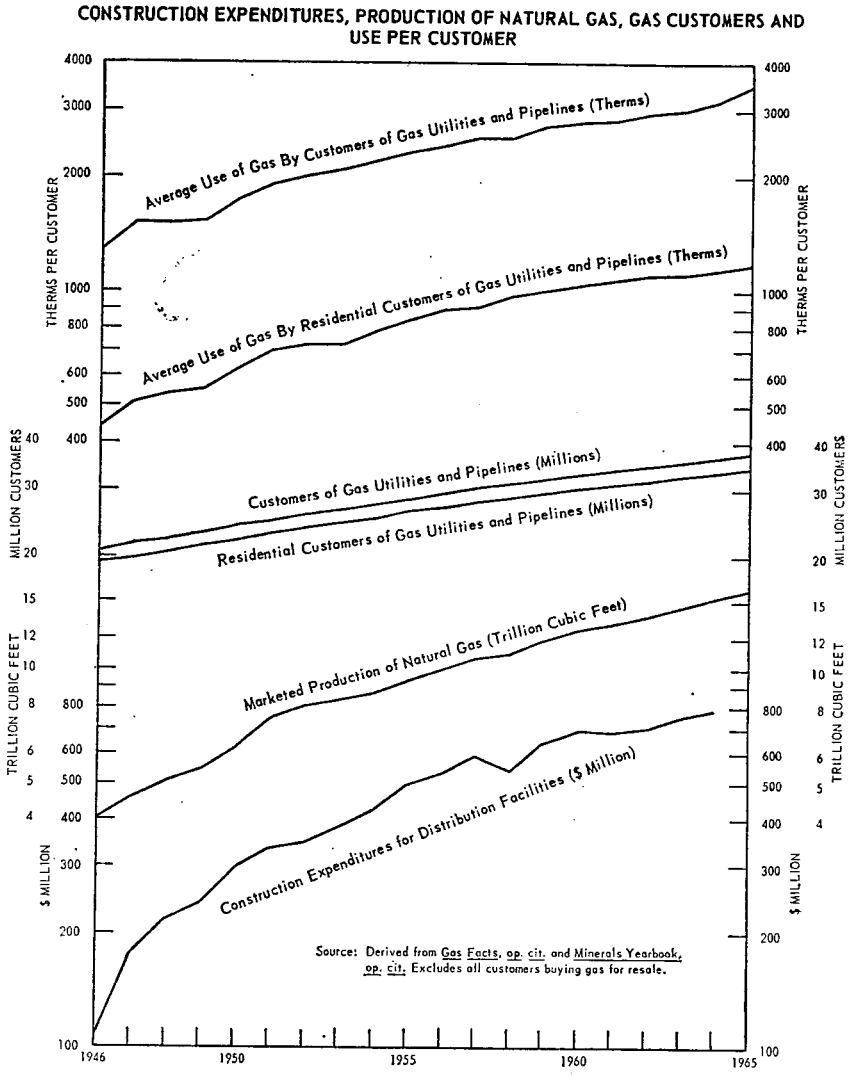
[Dollar amounts in millions]

Year	Investor-owned utilities	Municipal utilities	Total	Municipals as percent of total
1954	$7,670	$400	$8,070	5.0
1955	8,115	445	8,560	5.2
1956	8,780	440	9,220	5.8
1957	9,490	530	10,020	5.3
1958	10,200	605	10,805	5.7
1959	11,195	540	11,735	4.6
1960	11,875	690	12,565	5.4
1961	12,980	740	13,720	5.4
1962	13,690	795	14,485	5.4
1963	14,615	890	15,505	5.7
1964	15,305	940	16,245	5.8

Source: Derived from *Gas Facts.* Includes manufactured gas plant.

Based on the trends in plant expansion, it appears that municipals probably account for about 5½ percent of the construction expenditures for gas distribution facilities in recent years.

CHART 1



Sources of financing for the construction and expansion of gas distribution systems are not available in detail. Since 1946 investor-owned gas utility and pipeline companies have received 64 percent of their new capital from debt issues, 28 percent from common stock issues and 8 percent from preferred stock issues.[15] In addition, internally generated funds have become increasingly important; internal sources provided financing for about one-third of the gas utility and pipeline construction in the late 1950's and are now providing about half of the construction funds.

[15] Based on data in *Gas Facts* plus information from AGA.

The sources of financing for all construction by municipal utilities are not reported. Certain of the smaller municipal utilities are eligible for loans from the Community Facilities Administration. Such loans to municipal utilities have been used to supply less than one-half percent of total construction expenditures by all gas distribution systems.[16]

D. Needs and Prospective Capital Outlays

The projected expansion of the Nation's gas pipeline network, including field and gathering, transmission and distribution mains, as estimated by the American Gas Association is shown in table 14.

Table 14.—*Projected miles of main, gas utility and pipeline industry, 1964–75*

[In thousands]

Year	Field and gathering [1]	Transmission	Distribution	Total
1964 (actual)	61.0	205.4	469.8	736.2
1965	63.1	210.9	491.4	765.4
1966	64.5	216.3	514.3	795.1
1967	65.9	221.6	537.6	825.1
1968	67.4	226.8	559.1	853.3
1969	68.7	231.9	581.6	882.2
1970	70.0	236.8	604.3	911.1
1974	75.1	255.5	699.1	1,029.7
1975	76.3	260.0	724.1	1,060.4

[1] Excludes field and gathering facilities of producers. Reflects only field and gathering mains of pipelines and distribution companies.

Source: Projected Gas Utility and Pipeline Industry Statistics: 1965–75, *op. cit.*

Construction expenditures of the gas distribution and integrated utility and pipeline companies for this period are projected as shown in table 15.

Table 15.—*Projected gas utility and pipeline industry construction expenditure by function, 1964–75*

[In millions of dollars]

Year	Construction expenditures					
	Total	Production and local storage	Transmission	Underground storage	Distribution	General
1964	1,701	120	616	84	784	97
1965 [1]	1,913	191	688	121	809	104
1966 [1]	1,979	160	842	97	795	85
1967 [1]	1,847	152	680	118	798	99
1968 [1]	1,801	145	647	103	821	85
1969	2,037	171	683	97	971	115
1970	2,071	169	688	105	992	117
1974	2,265	165	700	120	1,152	128
1975	2,315	164	701	123	1,196	131

[1] Represents forecasts based on estimates submitted by individual gas companies.

Source: *Projected Gas Utility and Pipeline Industry Statistics*, 1965–75, *op. cit.*

[16] Letter from Melvin S. Frazer, Acting Commissioner, Community Facilities Administration, Department of Housing and Urban Development, Mar. 7, 1966, indicates that from 1957 through 1964 CFA loans of $16 million were made for gas projects. During this period construction expenditures (see table 12) totaled over $5,400 million.

These projections of miles of mains and construction expenditures reflect five basic assumptions:[17]

1. A continuation during 1964–75 of the long term economic growth of the country.
2. Natural gas supply will be available from producers for pipelines, and from pipeline for distributors as required to meet customer demands.
3. Competitive fuel prices will maintain their same relative position to gas prices.
4. Future major technological changes in the fuel industries have not been incorporated.
5. A continuation of the general inflationary cost trend.

In preparing these projections the following factors were given consideration:[18]

1. Accommodating the growing population.
2. Supplying customers with any increased demands per customer that will develop.
3. Supplying additional customers in areas where the number of customers will increase more rapidly than population.

No projections have been made indicating growth by size of community or size of service area.

The outlook for construction expenditures as shown in table 15 is heavily weighted by the projected operations of the investor segment of the industry. The stability of the relative position of investor-owned and municipal systems in the Nation's gas industry is illustrated in table 16.

TABLE 16.—*Municipal gas distributors as percent of industry totals*

Year	Customers [1]	Sales [1]	Revenues [1]	Gas utility plant		New communities initially served with gas [2]
				All plant [2]	Distribution plant only [2]	
1958	4.4	6.8	5.4	5.7	7.5	29
1959	4.6	6.9	5.3	4.6	6.7	26
1960	4.7	6.9	5.4	5.4	7.2	9
1961	4.8	7.0	5.4	5.4	7.1	16
1962	4.8	7.1	5.4	5.4	7.7	9
1963	4.8	7.2	5.4	5.7	7.0	11
1964	4.7	7.3	5.4	5.8	7.1	[3]

[1] As percent of total gas distribution, integrated and pipeline companies.
[2] As percent of total gas distribution and integrated companies.
[3] Not available.

Source: Based upon information received from AGA and *Gas Facts*.

The investor-owned utilities are expected to finance their expansion program for the next 4 years approximately as follows: 50 percent from internal sources, 45 percent from debt issues, and 5 percent from new equity issues.[19] Assuming a continuance of the trend toward increasing use of internally generated funds and decreasing use of new equity issues, while the relative use of debt issues has remained fairly constant, there will be a slight increase in the use of internally generated funds in the latter part of the decade.

[17] Schwimmer letter, Mar. 29, 1966.
[18] *Ibid.*
[19] *Ibid.*

With respect to the outlook for financing of municipal gas utilities, a study by the Council of State Governments indicates that about half of their projected construction expenditures will be financed with bond issues. The balance will presumably come from internally generated funds. Some municipal systems serving small communities will be eligible for loans from the Department of Housing and Urban Development as they have been in the past. However, such loans will provide only a small proportion of the municipals' needs.

All available studies on the gas industry point to continued financial strength. Both the investor-owned companies and the municipals should be able to finance their expansion as they have done in the past.

Chapter 10

Highways, Roads, and Streets*

A. Nature and Composition of Highway Plant in the United States

1. DESCRIPTION OF FACILITIES

At the end of 1964, there were 3.6 million miles of roads and streets in the United States. These ranged in type of service from the highest class of modern multilane, controlled access freeways, serving intercity and interstate traffic movements, through the collector roads that move people and goods from the producer to the consumer, down to the local roads and streets that provide access to the farms, the industries, and the residences of nearly everyone in America.

We truly live in the age of the automobile, and as a Nation on wheels we must place great dependence upon the highway network to move our commerce, to afford us access to working, living, and recreational areas, and to provide for the great variety of services in the protection of life, health, and safety that our populace demands and expects.

The term "highway" includes roads, streets, and parkways, and also includes rights-of-way, bridges, railroad-highway crossings, tunnels, drainage structures, signs, guardrails, and protective structures, in connection with highways. "Highway," "street," or "road" are general terms denoting a public way for purposes of vehicular and pedestrian travel, including the entire area within the right-of-way. In rural areas, or in urban areas where there is comparatively little access and egress, a way between prominent termini is called a highway or a road. A way in an urban area, with or without provision for curbs, sidewalks, and paved gutters is ordinarily called a street.

The right-of-way consists of the entire strip of land set aside or devoted to highway use. It encompasses all the essential elements of a highway cross section, such as traffic lanes, auxiliary lanes, shoulders, highway signs, traffic control devices, roadside developments, and median strips. The roadbed itself is the graded portion of the right-of-way upon which the base course, surface, shoulders, and median are constructed.

The thickness of the surface and base and the type of pavement are determined by volume and composition of traffic, availability of materials, and the experience of contractors. Pavements may be considered as three general types: (1) High; (2) intermediate; and (3) low. High-type pavements are for high-volume traffic, provide smooth riding qualities, and good antiskid properties in all weather. The surface should retain its qualities and should provide adequate support for the expected volume and weights of vehicles without undue fatigue, thus keeping maintenance costs to a minimum. Inter-

*Prepared by the Bureau of Public Roads, U.S. Department of Commerce, with minor editing by committee staff.

mediate-type surfaces vary all the way from relatively low-cost surface treatments to pavements that are only slightly less costly and lower in strength than the most expensive high-type pavements. Low-type surfaces range from surface treated earth roads and stabilized materials to loose surfaces such as earth, shell, and gravel.

Highways range from single-lane rural roads to high-speed multilane facilities of eight or more lanes. Single-lane roads are considered suitable only in low-traffic-density areas where the average daily traffic is fewer than 100 vehicles. A single-lane road may vary from 8 to 14 feet wide and serve traffic in both directions. By far the greatest mileage of highways consist of two lanes, but the mileages of four, six, eight, and more lane facilities are increasing rapidly. Lane widths are usually determined by a combination of factors such as speed, traffic composition, traffic volume, and, of course, cost. There is still a large mileage of highways with lanes less than 12 feet wide, but for a modern high-speed facility, 12 feet is generally considered to be a minimum acceptable lane width.

A highway shoulder is the portion of the roadway contiguous with the traveled way for accommodation of stopped vehicles, for emergency use, and for lateral support of base and surface courses. It varies in width from practically nothing on low-traffic rural roads, to 12 feet or even more on major roads, where the entire shoulder may be stabilized or paved.

Traffic control signs, lights, and markings, are provided for the convenience and protection of motorists, but lighting of rural highways is seldom found or considered to be justified except on critical curves, intersections, long bridges, tunnels, and areas where roadside interference is a factor.

Intersections are points of conflict and potential hazards: Ingress and egress on most highways are accomplished by direct at-grade connections. Local conditions and cost of right-of-way influence the type of intersection selected as well as many of the design details. It is mostly on divided, controlled access highways that special structures are provided to eliminate intersections at grade, with ramps and speed-change lanes provided for safe entry and exit.

The gradients on secondary and minor rural roads generally follow the natural contours of the land. In mountainous terrain the grades are frequently quite steep and the sight distance critically reduced. On major high-speed highways, gradients are limited so that reasonable speeds can be maintained by both automobiles and trucks. For design speeds of 50, 60, and 70 miles per hour on the Interstate System, gradients generally are not steeper than 3, 4, or 5 percent, except in rugged terrain where 2 percent steeper grades may be permitted.

The road and street systems in the United States have grown but little in extent in recent years, the total mileage increase since 1956 being less than 1 percent per year. The Nation's needs lie generally not in a large increase in mileage, but in improvement or replacement of existing highways. As one indication of improvement progress, the mileage of unsurfaced roads and streets has been declining at an average rate of 2 percent during recent years. The effects of the expansion of urban areas and population are reflected in the fact that municipal mileage has increased an average of nearly 4 percent per year since 1956.

2. EXISTING CAPITAL PLANT

(a) *Distribution and Growth*

A comparison of total, municipal, and unsurfaced mileages for the years 1956–64 follows:

[In thousands of miles]

Year	Total mileage	Municipal mileage	Unsurfaced mileage
1956	3,430	379	1,107
1957	3,454	389	1,082
1958	3,479	405	1,031
1959	3,503	416	1,008
1960	3,538	430	989
1961	3,573	446	985
1962	3,600	455	953
1963	3,620	475	927
1964	3,644	491	914

The distribution by States of the total mileage at the end of 1964 is given in appendix table A.

Of the 491,000 miles of city streets, 62,000 are under State control and are, for the most part, the more important cross-city connections of the main trunkline systems, including most of the major urban expressways and arterials. The remaining 429,000 miles are generally the local community and residential streets for which the cities have responsibility for maintenance and improvement.

No recent inventory of local streets has been made, but upon the basis of a study of 1961 local mileages by city population groups, it is possible to estimate that the 429,000 miles of local government streets would be arrayed as follows:

Population group	Mileage	Number of cities	Average mileage per city
Under 5,000	130,743	15,172	8.62
5,000 to 9,999	47,102	1,420	33.17
10,000 to 24,999	64,791	1,141	56.78
25,000 to 49,999	43,237	422	102,46
50,000 to 99,999	40,403	209	193.32
100,000 and over	103,091	140	736.36
Total	429,367	18,504	

No precise correlation exists between the mileage of streets and the population of the community, but a composite ratio of 240 persons to 1 mile of street was developed in 1961 for cities under 100,000 population, taken as a group.

Much study has been made of the service life of various types of roads, and the various elements comprising the road, such as land, grading, surfacing, and structures. Some of the factors developed from such studies will be discussed later. First, two other factors must be understood: (1) Roads not only wear out, they become functionally obsolete as a result of community growth, unanticipated changes in community patterns that change the volume of traffic, technological improvements in vehicles, and general reorientation of the economy that results in increased traffic movements and/or

speeds that exceed the capacities of the roads, even though structurally they may be sound; (2) the measurement of needs, which will be reported in a later section, is perhaps the best indicator of the extent to which the highway plant is—or will become—inadequate for the next decade.

During the years 1956–64, inclusive, the States built, reconstructed, or resurfaced a total of 317,000 miles of rural State highways, an average of over 35,000 miles per year. This same network of roads totaled 620,000 miles in 1955; 681,000 miles in 1964. Thus, in terms of turnover, the entire system can be expected to have some degree of improvement over a period of about 20 years. No similar data are available for local roads and streets.

From a physical standpoint, some studies have assigned the following depreciation rates for highways:

	Annual rate (percent)
Right-of-way	0
Grading	1
Surface and base	3
Structures	2

From values determined in Bureau of Public Road studies, an annual weighted rate of 1.39 percent could be used for cost amortization purposes. Obviously, this rate would not necessarily be a typical one, nor would it reflect obsolescence.

The record of rural mileage built by the State highway departments since 1923 is as follows:

	Miles
1923–40	550,000
1941–60	632,000
1961–64	136,000

Because many roads have been reconstructed or resurfaced more than once during this time, this tabulation can afford only a measure of the volume of construction activity, but not an approximation of the age distribution of the rural State highway system.

(b) Ownership Patterns

As will be seen from appendix table A, the States are responsible for some 743,000 miles of roads and streets, or about 20 percent of the total; local governments administer nearly 2.8 million miles of highways or 76 percent; while about 4 percent of the mileage is under Federal control, chiefly in the public domain areas. Trafficwise, however, the main rural roads, which are generally State-administered routes, carry about 75 percent of all vehicular travel on rural roads. Thus, based on traffic volumes, the States have a far larger share of responsibility for highways than the mileage statistics would indicate.

It is estimated that the current value of the Nation's highways (excluding toll facilities) was $63 billion at the end of 1964.

B. Costs and User Charges

1. CONSTRUCTION AND OPERATING COSTS

Typical construction costs: Many factors determine the cost of building a mile of highway, not the least of which is the cost of land acquisition, which in some urban areas can exceed the physical costs

of construction. Other factors are governed by the geometrics of design, such as vertical and horizontal curvature, width of roadway, number and frequency of interchanges, etc., and by the type of terrain, which may be mountainous, rolling, or flat. For rural roads in rolling terrain some average construction costs are as follows (excluding land acquisition and on-site engineering costs):

Roadway width	Type	Average cost per mile
24 feet	Federal-aid secondary	$70–$80, 000
Do	Federal-aid primary, noninterstate (medium type)	100–125, 000
Do	Federal-aid primary, noninterstate (high type)	160–200, 000
48 feet divided	Federal-aid interstate	600–700, 000

The cost of urban highways is generally much greater than that of the rural sections. On the Federal-aid Interstate System, the costs to build urban sections (again excluding land acquisition and on-site engineering costs) can be expected to average $1.5 million per mile for four-lane construction; $3.3 million for six-lane; and $5.3 million for eight-lane construction, based on current price levels.

Typical annual maintenance and operating costs. Here again there are many variables, such as traffic volume and frequency of heavy axle loads, terrain, number of lanes and interchanges, winter maintenance (snow and ice control), other traffic services, toll road operations, etc. In 1964, $1,055 million was expended for maintenance of the 681,000 miles of rural State-administered highways, or slightly more than $1,500 per mile, on the average. During the same year, $171 million was identified as maintenance on the 62,000 miles of municipal State highways, or over $2,700 per mile, average.

From preliminary studies, the cost of maintenance and traffic services on completed sections of the Interstate System show the following weighted average annual costs:

	Costs per mile
Rural sections (excluding interchanges)	$2, 593
Urban sections (excluding interchanges)	5, 120
Rural sections (including interchanges)	3, 153
Urban sections (including interchanges)	9, 698

2. USER CHARGES

Although highways have many aspects of a public utility in that they provide a service to the users, and the pricing of this service is in many respects based upon frequency and extent of use, here the analogy ceases. Many students of highway taxation argue that there are three classes of beneficiaries of highways, and that costs of highway transportation should be borne among the three according to the benefits derived. These three are: (1) The *user*, who would be expected to pay most of the costs of freeways and other major traffic arteries; but lesser amounts of the costs of collector roads and local land-access roads and streets; (2) the *community* which benefits collectively from highways that make possible such community services as fire and police protection, ambulance, and other lifesaving services, and sanitation facilities among others; and that should pay for a large share of the cost of collector and local roads from general

taxation; (3) the *land*, which without access to transportation would have little value and hence should pay most of the costs of residential streets and other local land-service roads through property taxes or assessments.

Some would maintain that all benefits to land and the community are in reality user benefits that have merely been transferred. These arguments are brought out here by way of explaining that user charges for highways are not necessarily intended to be sufficient to cover all highway costs. In 1964, $12.6 billion of income was applied for highway purposes (exclusive of borrowings). Of this amount, $10.0 billion was provided from user taxes, fees, and tolls (including $3.6 billion of Federal highway trust fund revenues), and $2.6 billion from nonuser taxes, appropriations, and miscellany. Interestingly enough, in that year an additional $2.6 billion was collected from users, but not applied for highways (the Federal excise tax on automobiles and parts and accessories, and State user taxes applied for nonhighway purposes). Thus on balance there was a trade-off whereby user taxation actually would have been sufficient to provide all funds applied to highways.

Appendix table B lists for each of the years 1946–65, inclusive, the amounts of user revenues allocated for highway purposes, together with amounts provided from nonuser sources. Maintenance, operation, and annual debt service payments are then recorded as charges against these revenues, with the excess shown as an amount available for capital outlay. Also shown as available for capital outlay are the amounts of Federal-aid funds paid in reimbursement to the States for work performed, together with small amounts of direct Federal outlays; and proceeds of construction bond issues. Since 1956, the Federal-aid highway funds have their source in excises on motor fuel and on certain automotive products that are placed in the Federal highway trust fund, and that are considered to be user revenues. Although there was no trust fund prior to 1956, the annual revenue from the Federal tax on gasoline was more than sufficient to cover the annual Federal-aid highway appropriations, but there was no explicit linkage.

The data in table B are also arranged so as to show the sources of funds collected by each of the four levels of government: Federal, State, county, and city; and the direct outlays by each for the purposes indicated.

C. Trend of Capital Outlays

Table B records the capital outlays for highways during the period 1946–65. The term "capital outlays" is understood to include contract and force account construction; preliminary and construction engineering on site; and right-of-way costs, including land acquisition, utility and tenant relocation costs, condemnation costs, etc. It does not include the costs of sidewalks or street lighting, unless part of a road construction contract.

The table shows the expenditure according to three functional classes of highways: main rural roads, which include the major interurban highways and toll roads; local rural roads, which include collector and feeder roads, both under State and local jurisdiction; and urban streets and highways, which include both connections of State highways and local city streets.

As a secondary classification, table B shows capital outlay according to the governmental level administering the expenditure: Federal, State, or local units. Because the States administer the Federal-aid highway programs, Federal-aid expenditures are a component of those shown for State agencies. The small amount of direct expenditures by the Federal Government are those administered by the U.S. Forest and Park Services, and other ancillary programs.

In accordance with the requirements of national growth and increasing dependence on highway transportation, the trend of highway expenditures has been upward, save for brief periods of slight declines, not in themselves significant. As the highway programs are geared to the economy and the demands for transportation as evidenced by such factors as population growth, car ownership trends, travel, and disposable income, among others, the outlays for highways have moved in large measure with the gross national product.

Some of the sources of financing highway capital outlays are known explicitly, such as Federal-aid funds and borrowings. The remainder of the funds are supplied from current Federal, State, and local income, chiefly from user taxes which provide not only appropriations, but State grants-in-aid as well. It is not possible to isolate these elements. For example, State grants-in-aid are frequently available for both road construction and maintenance, and may even be commingled with, and augmented by local government revenues and lose their identity as a discrete source of funds either for capital outlays or for operations.

The funds available for capital outlay (pt. C of table B) have exceeded the expenditures (pt. D), in most years, chiefly because bond proceeds are not usually expended entirely within the year in which sold, but may be carried in part as a reserve. At the end of 1964, the States had reserves (excluding debt and sinking funds) totaling $2.2 billion.

The States have been the chief roadbuilding agencies throughout the period covered, and have accounted for an increasing proportion of total outlays between 1946–65; from 66 to 80 percent.

Some 875,000 miles out of a total of 3,650,000 miles of roads and streets in the United States are eligible for improvement with Federal aid highway funds, or about 24 percent. Table C classifies the State and local road systems according to their eligibility for Federal assistance as part of the Interstate System, other Federal aid primary system routes, and the Federal aid secondary system. The "urban" classification of Federal aid highways refers to mileages within municipalities and other urban places having a population of 5,000 or more; all other Federal aid highways being classed as "rural." This explains the fact that some "rural" mileage (in places under 5,000 population) is found on local municipal street systems.

Table D, using the same format as table C, records the 1964 capital expenditures by the States on Federal and non-Federal systems; while table E records the 1964 estimated capital expenditures by all units of government. From table E it will be seen that $6.4 billion out of a total of $8.2 billion, or 78 percent, of all capital expenditures were for roads comprising Federal aid systems; and that a similar percentage of total outlays were made on State-administered highways.

All of this is by way of emphasizing that road improvements are concentrated on roads under the States' administrative control, and on systems eligible for Federal fund participation.

D. Needs and Prospective Capital Outlays

Pursuant to Public Law 89–139, the Bureau of Public Roads is directed to report to Congress in January 1968 estimates of the future highway needs of the Nation. It is impossible at this time to report on what these needs will be, and so for purposes of the study, prior estimates of needs have been used, principally those contained in the highway cost allocation study prepared and submitted to Congress as authorized by section 210 of the Highway Revenue Act of 1956 (70 Stat. 387), and the 1965 Interstate System cost estimate, published in 1965 as House Document No. 42, 89th Congress, 1st session. To the extent possible, these prior studies have been adjusted and modified to make them applicable to the 10-year period, 1966–75.

Table G tabulates the forecast of capital requirements in terms of amounts that probably would be assigned to State agencies, and to local governments; and in terms of the three functional classes of highways. Of the total of nearly $126 billion of estimated needs, 84 percent will be required for main rural roads and for urban streets in nearly equal proportions, with the remaining 16 percent required for local rural roads.

Table F projects estimated receipts for highways, "fixed" costs, and funds available for capital outlay during each of the years 1966–75. Projections of user revenues are based on economic projections of population, car ownership, travel, and slight annual increases in weighted motor-fuel tax rates. The present resources of the Federal highway trust fund are assumed to be extended without change through 1975.

The amount of capital expenditures in table F are then summed, and entered in total in table G. In virtually all comparisons of needs with anticipated resources, the former exceeds the latter. This is the finding as shown on table G, whereby a deficit of nearly $25 billion is forecast and is explained by the fact that needs are postulated without regard to restraints upon financing resources, but rather are a measurement of deficiencies in terms of engineering and geometric standards in light of probable levels of service demands. In other words, needs are calculated on the basis of eliminating most of the impediments to free flow of anticipated traffic volumes by some future target date.

Experience has shown that this objective has rarely been realized. With the notable exception of the Interstate System, which has a 1972 target date for completion, the remaining Federal, State, and local highway programs do not envision a "completion" date. Rather, the programs look to long-range efforts to renovate, upgrade, and otherwise bring highway systems to higher standards, recognizing that adequacy is an elusive term in the context of dynamic and changing demands for transportation.

This is by way of explaining that there is no real answer to the question of how to bridge the gap between resources and needs. The public must measure the demand for schools, for housing, and for other needs of society against that of highway transport and allocate its support accordingly. Certainly, priority programs can and will be developed both at the Federal and State levels that will produce the financial resources to meet delimited needs. Most of the non-priority needs, particularly those in rural areas, will probably not be met within the next decade, or for some other time thereafter.

TABLE A.—*Total road and street mileage in the United States, 1964—Classified by system*

State	Rural mileage									
	Under State control				Under local control				Under Federal control [4]	Total rural roads
	State primary system	State secondary roads [1]	Other State roads [2]	Total	County roads	Town and township roads	Other local roads [3]	Total		
Alabama	8,174	9,103	864	18,141	47,892			47,892		66,033
Alaska	3,242		913	4,155			1,640	1,640	124	5,919
Arizona	4,968			4,968	16,265			16,265	12,067	33,300
Arkansas	11,353			11,353	55,403		4,713	60,116	1,951	73,420
California	12,282		2,316	14,598	69,826		8,918	78,744	25,208	118,550
Colorado	8,010		17	8,027	65,474			65,474	159	73,660
Connecticut	328	977	198	1,503		3,670		3,670		5,173
Delaware	439	3,010		3,449						3,449
Florida	9,450	5,414	266	15,130	44,526			44,526		59,656
Georgia	14,851		55	14,906	67,754			67,754	28	82,688
Hawaii	457	589	2	1,048	1,319			1,319	67	2,434
Idaho	4,608		48	4,656	17,017	9,788		26,805	7,787	39,248
Illinois	13,009			13,009	16,304	73,210		89,514		102,523
Indiana	9,739		157	9,896	77,403			77,403		87,299
Iowa	8,827		202	9,029	90,622			90,622		99,651
Kansas	9,753		237	9,990	113,638			113,638	9	123,637
Kentucky	20,645		118	20,763	44,069			44,069	264	65,096
Louisiana	3,753	10,325	30	14,108	26,324			26,324		40,432
Maine	3,296	7,309	241	10,846		7,669		7,669	142	18,657
Maryland	1,793	2,843	71	4,707	14,599			14,599		19,306
Massachusetts	779		296	1,075		6,288		6,288		7,363
Michigan	8,043			8,043	86,663			86,663		94,706
Minnesota	10,241		1,089	11,330	42,420	54,743		97,163	1,330	109,823
Mississippi	9,798			9,798	49,181			49,181	192	59,171
Missouri	7,866	21,999	2	29,867	69,352			69,352	598	99,817

Montana	5,780	5,584	19	11,383	53,369			53,369	7,535	72,287
Nebraska	9,027		214	9,241	67,331	20,143		87,474	284	96,999
Nevada	2,011	4,228		6,239	38,279			38,279	1	44,519
New Hampshire	1,681	2,183	33	3,897		8,812	3	8,815	86	12,798
New Jersey	932		846	1,778	6,681	12,617		19,298		21,076
New Mexico	11,405		6	11,411	45,782			45,782	5,183	62,376
New York	12,400		1,360	13,760	19,330	51,194		70,524	10	84,294
North Carolina	11,548	57,681	188	69,417					1,644	71,061
North Dakota	6,174		25	6,199	17,382	80,461		97,843	547	104,589
Ohio	15,753		241	15,994	29,519	38,802		68,321		84,315
Oklahoma	10,899		394	11,293	83,037		13	83,050		94,343
Oregon	4,469	2,572	1,532	8,573	27,154		7,068	34,222	32,575	75,370
Pennsylvania	12,629	25,474	4,706	42,809	652	45,335		45,987	308	89,104
Rhode Island	684		64	748		603		603		1,351
South Carolina	8,468	19,545	142	28,155	23,968			23,968		52,123
South Dakota	7,744		225	7,969	20,304	54,383		74,687	1,702	84,358
Tennessee	7,883		360	8,243	58,201		27	58,318	883	67,444
Texas	57,019		27	57,046	139,937			139,937		196,983
Utah	5,031			5,031	19,372			19,372	8,377	32,780
Vermont	2,083		60	2,143		10,730		10,730	24	12,897
Virginia	7,676	40,864	96	48,636	719			719	1,716	51,071
Washington	3,882	2,263	3,811	9,956	39,201			39,201	11,571	60,728
West Virginia	4,634	26,218	230	31,082					774	31,856
Wisconsin	10,138		416	10,554	18,716	57,637		76,353	66	86,973
Wyoming	5,422			5,422	15,521		45,060	60,581	3,868	69,871
District of Columbia										
Total	411,076	248,181	22,117	681,374	1,740,596	536,085	67,442	2,344,123	127,080	3,152,577

See footnotes at end of table, p. 249.

TABLE A.—*Total road and street mileage in the United States, 1964—Classified by system*—Continued

State	Municipal mileage					Total rural and municipal mileage
	Under State control			Under local control—Local city streets [5]	Total municipal mileage	
	Extensions of State primary system	Extensions of State secondary roads [1]	Total			
Alabama	1,324	63	1,387	9,138	10,525	76,558
Alaska	112		112	399	511	6,430
Arizona	257		257	5,456	5,713	39,013
Arkansas	890		890	5,986	6,876	80,296
California	1,918		1,918	35,539	37,457	156,007
Colorado	439		439	5,485	5,924	79,584
Connecticut	861	1,317	2,178	10,105	12,283	17,456
Delaware	177	668	845	475	1,320	4,769
Florida	1,568	428	1,996	15,289	17,285	76,941
Georgia	2,129		2,219	11,338	13,467	96,155
Hawaii	49	23	72	765	837	3,271
Idaho	272		272	2,334	2,606	41,854
Illinois	3,101		3,101	22,020	25,121	127,644
Indiana	1,212		1,212	15,965	17,177	104,476
Iowa	1,130		1,130	11,323	12,453	112,104
Kansas	612		612	8,378	8,990	132,627
Kentucky	955		955	3,798	4,753	69,849
Louisiana	671	708	1,379	8,020	9,399	49,831
Maine	363	388	751	1,590	2,341	20,998
Maryland	133	165	298	3,488	3,786	23,092
Massachusetts	1,772		1,772	17,879	19,651	27,014
Michigan	1,205		1,205	17,001	18,206	112,912
Minnesota	1,752		1,752	13,335	15,087	124,910
Mississippi	865		865	5,071	5,936	65,107

Missouri	991	620	1,611	12,584	14,195	114,012
Montana	170	71	241	1,800	2,041	74,328
Nebraska	404		404	5,471	5,875	102,874
Nevada	73	73	146	1,214	1,360	45,879
New Hampshire	222	138	360	1,219	1,579	14,377
New Jersey	1,010		1,010	10,323	11,333	32,409
New Mexico	678		678	2,671	3,349	65,725
New York	1,261		1,261	16,222	17,483	101,777
North Carolina	1,458	1,811	3,269	9,052	12,321	83,382
North Dakota	236		236	2,744	2,980	107,569
Ohio	2,822		2,822	19,001	21,823	106,138
Oklahoma	1,011		1,011	10,191	11,202	105,545
Oregon	344	172	516	4,924	5,440	80,810
Pennsylvania	2,512	2,429	4,941	16,878	21,819	110,923
Rhode Island	293		293	2,864	3,157	4,508
South Carolina	929	2,960	3,889	2,017	5,906	58,029
South Dakota	230		230	2,591	2,821	87,179
Tennessee	1,017		1,017	7,573	8,590	76,034
Texas	5,135		5,135	36,531	41,666	238,649
Utah	656		656	3,455	4,111	36,891
Vermont	73		73	834	907	13,804
Virginia	1,152	652	1,804	5,529	7,333	58,404
Washington	400	188	588	7,597	8,185	68,913
West Virginia	497	164	661	2,383	3,044	34,900
Wisconsin	1,599		1,599	11,297	12,896	99,869
Wyoming	147		147	982	1,129	71,000
District of Columbia				1,243	1,243	1,243
Total	490,87	13,038	62,125	429,367	491,492	3,644,069

[1] Includes mileage of county roads under State control in all counties of Delaware, North Carolina, and West Virginia, 8 counties in Alabama; all but 2 counties in Virginia; some county mileage in Nevada; mileage designated as farm-to-market in Louisiana; and the State-aid system in Maine.

[2] Includes mileage of State park, forest, institutional, toll and other roads that are not a part of the State or local highway system.

[3] Mileage not identified by administrative system.

[4] Mileage in Federal parks, forests, and reservations that are not a part of the State highway system.

[5] Includes all roads, streets, and public ways not under State control in: Municipalities; delimited unincorporated places having an estimated population of 1,000 or more; areas which comprise the unincorporated fringe around cities of 50,000 population or greater, defined as urbanized areas by the Bureau of Census in the latest enumeration or as determined by the State highway departments.

TABLE B.—*Receipts and disbursements for highways by all units of government, 1946–65*

[In millions of dollars]

	Federal Government	State agencies	Counties and townships	Municipalities	Total	Federal Government	State agencies	Counties and townships	Municipalities	Total
	1946					1947				
A. Current receipts for highways: [1]										
Highway-user revenue		1,454	1	16	1,471		1,598	1	17	1,616
Tolls		57	7	10	64		60	8	21	89
Property taxes and assessments		1	222	91	314			246	107	353
General fund appropriations		144	61	213	418		31	79	257	367
Federal funds	8				8	12				12
Miscellaneous		16	14	22	52		19	17	32	68
Subtotal	8	1,672	305	352	2,337	12	1,708	351	34	2,505
Transfers in		18	313	78	409		22	359	106	487
Total	8	1,690	618	430	2,746	12	1,730	710	540	2,992
B. Disbursements (fixed charges):										
Maintenance	1	339	373	219	932	4	380	432	265	1,081
Administration and policing	7	132	24	26	189	8	181	27	35	251
Debt service		178	102	106	386		166	101	114	381
Subtotal	8	649	499	351	1,507	12	727	560	414	1,713
Transfers out		388	14	7	409		460	23	4	487
Total	8	1,037	513	358	1,916	12	1,187	583	418	2,200
C. Funds for capital outlay: [1]										
Excess current revenues (A less B)		653	105	72	830		543	127	122	792
Federal funds:										
Highway-user revenue										
General funds	170				170	324				324
Miscellaneous	3				3	3				3
Subtotal	173				173	327				327
Transfers	−150	147	3			−290	288	2		
Bond proceeds		57	50	46	153		80	107	122	309
Total	23	857	158	118	1,156	37	911	236	244	1,428

D. Capital outlay by road system:										
Main rural roads		475	3		478		782	7		789
Local rural roads	21	22	142		185	35	65	196		296
Urban streets and highways		35	1	100	136		111	5	212	328
Total	21	532	146	100	799	35	958	208	212	1,413
	1948					1949				
A. Current receipts for highways: [1]										
Highway-user revenue		1,812	1	20	1,833		2,080	2	23	2,105
Tolls		65	10	24	99		71	11	26	108
Property taxes and assessments			267	120	387			291	131	422
General fund appropriations		60	84	325	469		70	81	332	483
Federal funds	13				13	15				15
Miscellaneous		34	20	35	89		41	22	47	110
Subtotal	13	1,971	382	524	2,890	15	2,262	407	559	3,243
Transfers in		29	434	114	577		35	459	154	648
Total	13	2,000	816	638	3,467	15	2,297	866	713	3,891
B. Disbursements (fixed charges):										
Maintenance	5	475	478	324	1,282	5	501	498	347	1,351
Administration and policing	8	171	33	43	255	10	190	38	50	288
Debt service		169	103	117	389		161	104	127	392
Subtotal	13	815	614	484	1,926	15	852	640	524	2,031
Transfers out		539	30	8	577		603	36	9	648
Total	13	1,354	644	492	2,503	15	1,455	676	533	2,679
C. Funds for capital outlay: [1]										
Excess current revenues (A less B)		646	172	146	964		842	190	180	1,212
Federal funds:										
Highway-user revenue										
General funds	402				402	492				492
Miscellaneous	5				5	8				8
Subtotal	407				407	500				500
Transfers	−369	365	4			−434	429	5		
Bond proceeds		270	83	122	475		254	100	181	535
Total	38	1,281	259	268	1,846	66	1,525	295	361	2,247

See footnotes at end of table, p. 260.

TABLE B.—*Receipts and disbursements for highways by all units of government, 1946–65*—Continued

[In millions of dollars]

	Federal Government	State agencies	Counties and townships	Municipalities	Total	Federal Government	State agencies	Counties and townships	Municipalities	Total
	1948					1949				
D. Capital outlay by road system:										
Main rural roads		982	10		992		1,108	10		1,118
Local rural roads	37	89	236		362	61	108	250		419
Urban streets and highways		169	9	253	431		272	19	319	610
Total	37	1,240	255	253	1,785	61	1,488	279	319	2,147
	1950					1951				
A. Current receipts for highways:[1]										
Highway-user revenue		2,275	2	23	2,300		2,488	2	25	2,515
Tolls		72	12	31	115		93	12	37	142
Property taxes and assessments			327	154	481			343	145	488
General fund appropriations		39	77	308	424		44	95	323	462
Federal funds	17				17	17				17
Miscellaneous		47	30	54	131		52	31	55	138
Subtotal	17	2,433	448	570	3,468	17	2,677	483	585	3,762
Transfers in		43	489	165	697		51	531	172	754
Total	17	2,476	937	735	4,165	17	2,728	1,014	757	4,516
B. Disbursements (fixed charges):										
Maintenance	6	514	557	346	1,423	6	477	596	378	1,557
Administration and policing	11	192	44	51	298	11	221	47	55	334
Debt service		210	104	139	453		223	104	154	481
Subtotal	17	916	705	536	2,174	17	1,021	747	587	2,372
Transfers out		642	36	19	697		692	49	13	754
Total	17	1,558	741	555	2,871	17	1,713	796	600	3,126

C. Funds for capital outlay: [1]										
Excess current revenues (A less B)		918	196	180	1,294		1,015	218	157	1,390
Federal funds:										
Highway-user revenue										
General funds	475				475	471				471
Miscellaneous	8				8	11				11
Subtotal	483				483	482				482
Transfers	−431	425	6			−425	416	9		
Bond proceeds		402	89	164	655		535	79	180	794
Total	52	1,745	291	344	2,432	57	1,966	306	337	2,666
D. Capital outlay by road system:										
Main rural roads		1,232	13		1,245		1,406	10		1,416
Local rural roads	55	95	236		386	54	97	262		413
Urban streets and highways		321	16	329	666		349	13	337	699
Total	55	1,648	265	329	2,297	54	1,852	285	337	2,528
	1952					1953				
A. Current receipts for highways: [1]										
Highway-user revenue		2,776	3	35	2,814		3,003	3	49	3,055
Tolls		133	13	41	187		146	13	42	201
Property taxes and assessments			377	174	551			403	195	598
General fund appropriations		42	96	347	485		40	111	371	522
Federal funds	19				19	19				19
Miscellaneous		46	40	72	158		66	41	70	177
Subtotal	19	2,997	529	669	4,214	19	3,255	571	727	4,572
Transfers		56	581	188	825		80	615	214	909
Total	19	3,053	1,110	857	5,039	19	3,335	1,186	41	5,481
B. Disbursements (fixed charges):										
Maintenance	7	618	618	409	1,652	7	636	649	442	1,734
Administration and policing	12	229	51	70	362	12	260	56	70	398
Debt service		237	104	149	490		241	108	163	512
Subtotal	19	1,084	773	28	2,504	19	1,137	813	675	2,644
Transfers out		757	49	19	825		818	69	22	909
Total	19	1,841	822	647	3,329	19	1,955	882	697	3,553

See footnotes at end of table, p. 260.

TABLE B.—*Receipts and disbursements for highways by all units of government, 1946–65*—Continued

[In millions of dollars]

	Federal Government	State agencies	Counties and townships	Municipalities	Total	Federal Government	State agencies	Counties and townships	Municipalities	Total
	1952					1953				
C. Funds for capital outlay: [1]										
Excess current revenues (A less B)		1,212	288	210	1,710		1,380	304	244	1,928
Federal funds:										
Highway-user revenue										
General funds	535				535	620				620
Miscellaneous	20				20	21				21
Subtotal	555				555	641				641
Transfers	−503	485	17	1		−560	541	18	1	
Bond proceeds		797	103	209	1,109		1,037	106	203	1,346
Total	52	2,494	408	420	3,374	81	2,958	428	448	3,915
D. Capital outlay by road system:										
Main rural roads		1,584	13		1,597		1,802	14		1,816
Local rural roads	62	132	324		518	74	145	368		587
Urban streets and highways		374	18	379	771		488	19	415	922
Total	62	2,090	355	379	2,886	74	2,435	401	415	3,325
	1954					1955				
A. Current receipts for highways: [1]										
Highway-user revenue		3,244	4	49	3,297		3,583	4	56	3,643
Tolls		167	14	43	224		209	15	46	270
Property taxes and assessments			420	222	642			438	240	678
General fund appropriations		56	106	376	538		53	99	404	556
Federal funds	19				19	19				19
Miscellaneous		51	40	73	164		98	48	76	222
Subtotal	19	3,518	584	763	4,884	19	3,943	604	822	5,388
Transfers in		65	52	245	962		87	671	261	1,019
Total	19	3,583	1,236	1,008	5,846	19	4,030	1,275	1,083	6,407

B. Disbursements (fixed charges):										
Maintenance	7	664	677	456	1,804	7	693	701	480	1,881
Administration and policing	12	294	59	72	437	12	297	64	82	455
Debt service		318	110	207	635		380	110	195	685
Subtotal	19	1,276	846	735	2,876	19	1,370	875	757	3,021
Transfers out		883	61	18	952		913	74	32	1,019
Total	19	2,159	907	753	3,838	19	2,283	949	789	4,040
C. Funds for capital outlay: [1]										
Excess current revenues (A less B)		1,424	329	255	2,008		1,747	32	294	2,367
Federal funds:										
Highway-user revenue										
General fund	63				663	751				751
Miscellaneous	18				18	21				21
Subtotal	681				681	772				772
Transfers	−607	588	18	1		−687	70	17		
Bond proceeds		2,317	95	254	2,666		4	206	335	1,185
Total	74	4,329	442	510	5,355	85	3 0 1	549	629	4,324
D. Capital outlay by road system:										
Maintenance rural roads		2 366	22		2,388		2,412	23		2,435
Local rural roads	75	147	394		616	78	170	413		661
Urban streets and highways		621	20	65	1,106		718	13	507	1,238
Total	75	3 134	436	465	4,110	78	3,300	449	507	4,334
	1956					1957				
A. Current receipts for highways: [1]										
Highway-user revenue		3,909	3	57	3,969		4,062	5	68	4,135
Tolls		251	15	49	315		290	16	52	358
Property taxes and assessments			464	258	722			4 4	333	817
General fund appropriations		112	113	425	650		38	111	398	547
Federal funds	20				20	41				41
Miscellaneous		114	52	9	258		124	54	87	265
Subtotal	20	4,386	647	881	5,934	41	4,514	670	938	6,163
Transfers in		76	725	284	1,085		92	779	335	1,206
Total	20	4,462	1,372	1,165	7,019	41	4,606	1,449	1,273	7,369

See footnotes at end of table, p. 260.

TABLE B.—*Receipts and disbursements for highways by all units of government, 1946–65*—Continued

[In millions of dollars]

	Federal Government	State agencies	Counties and townships	Municipalities	Total	Federal Government	State agencies	Counties and townships	Municipalities	Total
	1956					1957				
B. Disbursements (fixed charges):										
Maintenance	8	775	764	542	2,089	24	830	784	567	2,205
Administration and policing	12	340	65	105	522	17	412	76	123	628
Debt service		419	119	190	728		481	124	241	846
Subtotal	20	1,534	948	837	3,339	41	1,723	984	931	3,679
Transfers out		988	71	26	1,085		1,083	82	41	1,206
Total	20	2,522	1,019	863	4,424	41	2,806	1,066	972	4,885
C. Funds for capital outlay:[1]										
Excess current revenues (A less B)		1,940	353	302	2,595		1,800	383	301	2,484
Federal funds:										
Highway-user revenue	632				632	1,936				1,936
General funds	371				371	135				135
Miscellaneous	25				25	33				33
Subtotal	1,028				1,028	2,104				2,104
Transfers	−797	776	21			−1,284	1,256	28		
Bond proceeds		1,067	102	313	1,482		701	123	365	1,189
Total	231	3,783	475	615	5,105	820	3,757	534	666	5,777
D. Capital outlay by road system:										
Main rural roads		2,745	26		2,771		2,987	30		3,017
Local rural roads	87	208	438		733	130	229	465		824
Urban streets and highways		938	10	563	1,511		1,175	23	615	1,813
Total	87	3,891	474	563	5,015	130	4,391	518	615	5,654
	1958					1959				
A. Current receipts for highways:[1]										
Highway-user revenue		4,198	4	62	4,264		4,428	9	66	4,503
Tolls		325	19	53	397		396	20	54	470
Property taxes and assessments			521	358	879			512	389	901
General fund appropriations		57	145	374	576		48	153	346	547
Federal funds	46				46	55				55
Miscellaneous		124	60	116	300		135	49	135	319

Subtotal	46	4,704	749	963	6,462	55	5,007	743	990	6,795
Transfers in		104	777	389	1,270		115	815	401	1,331
Total	46	4,808	1,526	1,352	7,732	55	5,122	1,558	1,391	8,126
B. Disbursements (fixed charges):										
Maintenance	24	886	846	613	2,369	25	923	874	659	2,481
Administration and policing	22	467	81	155	725	30	505	91	134	760
Debt service		508	126	260	894		579	124	285	988
Subtotal	46	1,861	1,053	1,028	3,988	55	2,007	1,089	1,078	4,229
Transfers out		1,126	102	42	1,270		1,176	100	55	1,331
Total	46	2,987	1,155	1,070	5,258	55	3,183	1,189	1,133	5,560
C. Funds for capital outlay: [1]										
Excess current revenues (A less B)		1,821	371	282	2,474		1,939	369	258	2,566
Federal funds:										
Highway-user revenues	1,969				1,969	2,221				2,221
General funds	140				140	125				125
Miscellaneous	31				31	27				27
Subtotal	2,140				2,140	2,373				2,373
Transfers	−2,273	2,247	26			−3,080	3,059	21		
Bond proceeds		913	140	299	1,352		669	153	336	1,158
Total	[2] −133	4,981	537	581	5,966	[2] −707	5,667	543	594	6,097
D. Capital outlay by road system:										
Main rural roads		3,462	23		3,485		3,605	22		3,627
Local rural roads	135	259	499		893	103	279	474		856
Urban streets and highways		1,287	27	656	1,970		1,518	25	631	2,174
Total	135	5,008	549	656	6,348	103	5,402	521	631	6,657
	1960					1961				
A. Current receipts for highways: [1]										
Highway-user revenue		4,731	9	70	4,810		4,868	8	67	4,943
Tolls		426	19	54	499		450	16	53	519
Property taxes and assessments			513	340	853			521	378	899
General fund appropriations		54	170	438	662		80	192	489	761
Federal funds	61				61	61				61
Miscellaneous		164	52	164	380		165	55	154	374
Subtotal	61	5,375	763	1,066	7,265	61	5,563	792	1,141	7,557
Transfers in		101	847	413	1,361		111	918	410	1,439
Total	61	5,476	1,610	1,479	8,626	61	5,674	1,710	1,551	8,996

See footnotes at end of table, p. 260.

TABLE B.—*Receipts and disbursements for highways by all units of government, 1946–65*—Continued

[In millions of dollars]

	Federal Government	State agencies	Counties and townships	Municipalities	Total	Federal Government	State agencies	Counties and townships	Municipalities	Total
	1960					1961				
B. Disbursements (fixed charges):										
Maintenance	27	1,006	922	685	2,640	28	1,040	922	738	2,728
Administration and policing	30	532	96	152	810	33	575	100	162	870
Debt service	4	604	117	296	1,021	----------	636	157	301	1,094
Subtotal	61	2,142	1,135	1,133	4,471	61	2,251	1,179	1,201	4,692
Transfers out	----------	1,235	78	48	1,261	----------	1,281	103	55	1,439
Total	61	3,377	1,213	1,181	5,832	61	3,532	1,282	1,256	6,131
C. Funds for capital outlay: [1]										
Excess current revenues (A less B)	----------	2,099	397	298	2,794	----------	2,142	428	295	2,865
Federal funds:										
Highway-user revenues	2,803	----------	----------	----------	2,803	2,808	----------	----------	----------	2,808
General funds	160	----------	----------	----------	160	172	----------	----------	----------	172
Miscellaneous	39	----------	----------	----------	39	42	----------	----------	----------	42
Subtotal	3,002	----------	----------	----------	3,002	3,002	----------	----------	----------	3,022
Transfers	−2,551	2,521	28	2	----------	−2,741	2,710	29	2	----------
Bond proceeds	----------	680	85	454	1,219	----------	718	153	401	1,272
Total	451	5,300	510	754	7,015	281	5,570	610	698	7,159
D. Capital outlay by road systems:										
Main rural roads	----------	3,294	12	----------	3,306	----------	3,487	59	----------	3,546
Local rural roads	141	237	475	----------	853	139	245	491	----------	875
Urban streets and highways	----------	1,452	13	666	2,131	----------	1,705	28	646	2,379
Total	141	4,983	500	666	6,290	139	5,437	578	646	6,800
	1962					1963				
A. Current receipts for highways: [1]										
Highway-user revenue	----------	5,155	9	67	5,231	----------	5,363	10	63	5,436
Tolls	----------	480	16	58	554	----------	497	17	60	574
Property taxes and assessments	----------	----------	527	397	924	----------	----------	564	407	971
General fund appropriations	----------	73	207	466	746	----------	50	209	508	767
Federal funds	64	----------	----------	----------	64	52	----------	----------	----------	52
Miscellaneous	----------	179	58	161	398	----------	208	58	177	443

Subtotal	64	5,887	817	1,149	7,917	52	6,118	858	1,215	8,243
Transfers in		114	925	451	1,490		102	966	485	1,553
Total	64	6,001	1,742	1,600	9,407	52	6,220	1,824	1,700	9,796
B. Disbursements (fixed charges):										
Maintenance	29	1,113	939	758	2,839	12	1,158	959	789	2,918
Administration and policing	35	623	99	163	920	40	670	109	190	1,009
Debt service		686	151	320	1,157		743	159	330	1,232
Subtotal	64	2,422	1,189	1,241	4,916	52	2,571	1,227	1,309	5,159
Transfers out		1,324	113	53	1,490		1,398	109	46	1,553
Total	64	3,746	1,302	1,294	6,406	52	3,969	1,336	1,355	6,712
C. Funds for capital outlay: [1]										
Excess current revenues (A less B)		2,255	440	306	3,001		2,251	488	345	3,084
Federal funds:										
Highway-user revenue	3,060				3,060	3,379				3,379
General funds	191				191	245				245
Miscellaneous	49				49	57				57
Subtotal	3,300				3,300	3,681				3,681
Transfers	−2,945	2,914	30	1		−3,514	3,479	30	5	
Bond proceeds		1,017	184	334	1,535		458	114	409	981
Total	355	6,186	654	641	7,836	167	6,188	632	759	7,746
D. Capital outlay by road systems:										
Main rural roads		3,627	47		3,674		3,999	22		4,021
Local rural roads	164	241	520		925	193	270	546		1,009
Urban streets and highways		2,068	39	680	2,787		2,120	50	693	2,863
Total	164	5,936	606	680	7,386	193	6,389	618	693	7,893
	1964					1965				
A. Current receipts and highways: [1]										
Highway-user revenue		5,696	10	64	5,770		6,083	10	64	6,157
Tolls		537	17	62	616		569	18	62	649
Property taxes and assessments			597	432	1,029			616	446	1,062
General fund appropriations		57	212	514	783		62	220	525	807
Federal funds	62				62	67				67
Miscellaneous		263	57	167	487		282	57	168	507
Subtotal	62	6,553	893	1,239	8,747	67	6,996	921	1,265	9,249
Transfers in		112	1,046	570	1,728		116	1,120	600	1,836
Total	62	6,665	1,939	1,809	10,475	67	7,112	2,041	1,865	11,085

See footnotes at end of table, p. 260.

TABLE B.—*Receipts and disbursements for highways by all units of government, 1946–65*—Continued

[In millions of dollars]

	Federal Government	State agencies	Counties and townships	Municipalities	Total	Federal Government	State agencies	Counties and townships	Municipalities	Total
	1964					1965				
B. Disbursements (fixed charges):										
Maintenance	15	1,236	1,022	838	3,111	18	1,363	1,069	881	3,331
Administration and policing	47	772	116	201	1,136	49	830	122	211	1,212
Debt service		754	165	342	1,261		783	172	353	1,308
Subtotal	62	2,762	1,303	1,381	5,508	67	2,976	1,363	1,445	5,851
Transfers out		1,562	115	51	1,728		1,666	117	53	1,836
Total	62	4,324	1,418	1,432	7,236	67	4,642	1,480	1,498	7,687
C. Funds for capital outlay: [1]										
Excess current revenues (A less B)		2,341	521	337	3,239		2,470	561	367	3,398
Federal funds:										
Highway-user revenue	3,536				3,536	3,740				3,740
General funds	247				247	307				307
Miscellaneous	55				55	61				61
Subtotal	3,838				3,838	4,108				4,108
Transfers	−4,029	3,978	36	15		−3,998	3,942	39	17	
Bond proceeds		634	114	411	1,159		640	115	415	1,170
Total	[2] −191	6,953	671	803	8,236	110	7,052	715	799	8,676
D. Capital outlay by road systems:										
Main rural roads		4,093	22		4,115		4,038	24		4,062
Local rural roads	179	266	590		1,035	163	272	616		1,051
United streets and highways		2,331	36	726	3,093		2,290	38	729	3,057
Total	179	6,690	648	726	8,243	163	6,600	678	729	8,170

[1] Included in pt. A are all funds available for highways except Federal funds and bond proceeds applied to capital outlay. These funds are included only in pt. C.
[2] Funds to meet these deficits were drawn from reserves.

TABLE C.—*1964 mileage classified by administrative and by Federal-aid systems*

Highways eligible for Federal-aid funds	State administered highways	County and township roads	Local municipal streets	Federal domain roads	Total
On Federal-aid systems:					
Interstate rural	34,318	9	12		34,339
Interstate urban	6,583	3	220		6,806
Other FAP rural	187,083	676	174	237	188,170
Other FAP urban	17,680	48	1,230	21	18,979
Secondary rural	298,781	301,064	7,173	109	607,127
Secondary urban	8,328	3,554	7,335		19,217
Total	552,773	305,354	16,144	367	874,638
Not on Federal-aid systems:					
Rural	181,364	2,039,597		126,713	2,347,674
Municipal	12,999		414,719		427,718
Total	194,363	2,039,597	414,719	126,713	2,775,392
Grand total [1]	747,136	2,344,951	430,863	127,080	3,650,030

[1] Includes mileage in Puerto Rico, and thus exceeds totals in table A.

TABLE D.—*1964 highway capital expenditures by State agencies, by administrative and by Federal-aid systems*

[In millions of dollars]

Highways eligible for Federal-aid funds	State administered highways	County and township roads	Local municipal streets	Federal domain roads	Total
On Federal-aid systems:					
Interstate rural	1,872				1,872
Interstate urban	1,468		26		1,494
Other FAP rural	1,304				1,304
Other FAP urban	741		13		754
Secondary rural	590	210			800
Secondary urban	14		12		26
Total	5,989	210	51		6,250
Not on Federal-aid systems:					
Rural	342	56			398
Municipal	31		11		42
Total	373	56	11		440
Grand total	6,362	266	62		6,690

TABLE E.—*1964 highway capital expenditures by all units of government, by administrative and by Federal-aid systems*

[In millions of dollars]

Highways eligible for Federal-aid funds	State administered highways	County and township roads	Local municipal streets	Federal domain roads	Total
On Federal-aid systems:					
Interstate rural	1,873				1,873
Interstate urban	1,513		26		1,539
Other FAP rural	1,306	10			1,316
Other FAP urban	746		23		769
Secondary rural	616	251	29		896
Secondary urban	14		24		38
Total	6,068	261	102		6,431
Not on Federal-aid systems:					
Rural	349	595		168	1,112
Municipal	33		667		700
Total	382	595	667	168	1,812
Grand total	6,450	856	769	168	8,243

TABLE F.—*Receipts and disbursements for highways by all units of government—Forecast, 1966–75*

[In millions of dollars]

	Federal Government	State agencies and District of Columbia	Counties and townships	Municipalities	Total	Federal Government	State agencies and District of Columbia	Counties and townships	Municipalities	Total
	1966					1967				
A. Current receipts for highways: [1]										
Highway-user revenue		6,454	10	65	6,529		6,783	8	73	6,864
Tolls		597	18	63	678		630	18	64	712
Property taxes and assessments			626	469	1,095			661	478	1,139
General fund appropriations		65	230	535	830		72	230	563	865
Federal funds	67				67	69				69
Miscellaneous		300	57	168	525		309	62	181	552
Subtotal	67	7,416	941	1,300	9,724	69	7,794	979	1,359	10,201
Transfers in		121	1,198	639	1,958		124	+1,266	+667	2,057
Total	67	7,537	2,139	1,939	11,682	69	7,918	2,245	2,026	12,25
B. Disbursements (fixed charges):										
Maintenance	18	1,432	1,124	925	3,499	19	1,499	1,182	980	3,680
Administration and policing	49	878	128	223	1,278	50	922	134	234	1,340
Debt service		810	180	363	1,353		838	182	379	1,399
Subtotal	67	3,120	1,432	1,511	6,130	69	3,259	1,498	1,593	6,419
Transfers out		1,783	120	55	1,958		1,879	122	56	2,057
Total	67	4,903	1,552	1,566	8,088	69	5,138	1,620	1,649	8,476
C. Funds for capital outlay: [1]										
Excess current revenues (A less B)		2,634	587	373	3,594		2,780	625	377	3,782
Federal funds:										
Highway-user revenue	3,888				3,888	4,041				4,041
General funds	498				498	505				505
Miscellaneous	51				51	48				48
Subtotal	4,437				4,437	4,594				4,594
Transfers out	−4,158	+4,119	+35	+4		−4,408	+4,368	+35	+5	
Bond proceeds		873	118	422	1,413		800	121	429	1,350
Total	279	7,626	740	799	9,444	186	7,948	781	811	9,726

D. Capital outlay by road systems:										
Main rural roads	----------	4,381	24	----------	4,405	----------	4,687	29	----------	4,716
Local rural roads	187	293	641	----------	1,121	186	326	667	----------	1,179
Urban streets and highways	----------	2,463	40	731	3,234	----------	2,622	34	769	3,425
Total	187	7,137	705	731	8,760	186	7,635	730	769	9,320
	1968					1969				
A. Current receipts for highways: [1]										
Highway-user revenue	----------	7,076	8	74	7,158	----------	7,368	8	75	7,451
Tolls	----------	662	18	65	745	----------	698	18	66	782
Property taxes and assessments	----------	----------	679	491	1,170	----------	----------	696	504	1,200
General fund appropriations	----------	73	231	565	869	----------	74	231	565	870
Federal funds	71	----------	----------	----------	71	72	----------	----------	----------	72
Miscellaneous	----------	318	60	181	559	----------	327	58	182	567
Subtotal	71	8,129	996	1,376	10,572	72	8,467	1,011	1,392	10,942
Transfers in	----------	127	1,325	696	2,148	----------	130	1,382	725	2,237
Total	71	8,256	2,321	2,072	12,720	72	8,597	2,393	2,117	13,179
B. Disbursements (fixed charges):										
Maintenance	19	1,588	1,209	1,024	3,840	20	1,671	1,249	1,070	4,010
Administration and policing	52	968	140	246	1,406	52	1,011	147	257	1,467
Debt service	----------	882	186	388	1,456	----------	925	188	394	1,507
Subtotal	71	3,438	1,535	1,658	6,702	72	3,607	1,584	1,721	6,984
Transfers out	----------	1,967	123	58	2,148	----------	2,052	126	59	2,237
Total	71	5,405	1,658	1,716	8,850	72	5,659	1,710	1,780	9,221
C. Funds for capital outlay: [1]										
Excess current revenues (A less B)	----------	2,851	663	356	3,870	----------	2,938	683	337	3,958
Federal funds:										
Highway-user revenue	4,189	----------	----------	----------	4,189	4,305	----------	----------	----------	4,305
General fund	591	----------	----------	----------	591	610	----------	----------	----------	610
Miscellaneous	48	----------	----------	----------	48	50	----------	----------	----------	50
Subtotal	4,828	----------	----------	----------	4,828	4,965	----------	----------	----------	4,965
Transfers out	−4,638	+4,597	+36	+5	----------	−4,770	+4,728	+37	+5	----------
Bond proceeds	----------	725	121	429	1,275	----------	650	121	429	1,200
Total	190	8,173	820	790	9,973	195	8,316	841	771	10,123

See footnote at end of table, p. 267.

TABLE F.—*Receipts and disbursements for highways by all units of government—Forecast, 1966–75*—Continued

	Federal Government	State agencies and District of Columbia	Counties and townships	Municipalities	Total	Federal Government	State agencies and District of Columbia	Counties and townships	Municipalities	Total
	1968					1969				
D. Capital outlay by road systems:										
Main rural roads		4,903	34		4,937		4,990	37		5,027
Local rural roads	190	345	690		1,225	195	350	717		1,262
Urban streets and highways		2,743	34	807	3,584		2,791	36	835	3,662
Total	190	7,991	758	807	9,746	195	8,131	790	835	9,951
	1970					1971				
A. Current receipts for highways: [1]										
Highway-user revenue		7,660	8	76	7,744		7,950	8	77	8,035
Tolls		732	19	66	817		755	19	67	841
Property taxes and assessments			708	512	1,220			725	525	1,250
General fund appropriations		75	232	568	875		76	234	572	882
Federal funds	74				74	75				75
Miscellaneous		337	58	185	580		346	58	188	592
Subtotal	74	8,804	1,025	1,407	11,310	75	9,127	1,044	1,429	11,675
Transfers in		132	1,442	754	2,328		134	1,499	782	2,415
Total	74	8,936	2,467	2,161	13,638	75	9,261	2,543	2,211	14,090
B. Disbursements (fixed charges):										
Maintenance	20	1,769	1,288	1,112	4,189	21	1,879	1,320	1,173	4,393
Administration and policing	54	1,050	152	268	1,524	54	1,090	158	278	1,580
Debt service		949	193	402	1,544		980	195	407	1,582
Subtotal	74	3,768	1,633	1,782	7,257	75	3,949	1,673	1,858	7,555
Transfers out		2,141	127	60	2,328		2,226	128	61	2,415
Total	74	5,909	1,760	1,842	9,585	75	6,175	1,801	1,919	9,970

C. Funds for capital outlay:[1]										
Excess current revenues (A less B)		3,027	707	319	4,053		3,086	742	292	4,120
Federal funds:										
Highway-user revenue	4,408				4,408	4,509				4,509
General fund	619				619	568				568
Miscellaneous	50				50	51				51
Subtotal	5,077				5,077	5,128				5,128
Transfers out	−4,882	+4,839	+38	+5		−4,928	+4,884	+39	+5	
Bond proceeds		650	123	437	1,210		600	123	437	1,160
Total	195	8,516	868	761	10,340	200	8,570	904	734	10,408
D. Capital outlay by road systems:										
Main rural roads		5,075	38		5,113		5,119	37		5,156
Local rural roads	195	360	737		1,292	200	360	758		1,318
Urban streets and highways		2,851	37	865	3,753		2,877	38	884	3,799
Total	195	8,286	812	865	10,158	200	8,356	833	884	10,273
	1972					1973				
A. Current receipts for highways:[1]										
Highway-user revenue		8,240	9	77	8,326		8,543	9	78	8,630
Tolls		778	19	68	865		801	19	69	889
Property taxes and assessments			745	540	1,285			766	554	1,320
General fund appropriations		77	236	579	892		78	239	586	903
Federal funds	76				76	77				77
Miscellaneous		354	62	197	613		362	63	199	624
Subtotal	76	9,449	1,071	1,461	12,057	77	9,784	1,096	1,486	12,443
Transfers in		136	1,559	811	2,506		138	1,619	841	2,598
Total	76	9,585	2,630	2,272	14,563	77	9,922	2,715	2,327	15,041
B. Disbursements (fixed charges):										
Maintenance	21	2,004	1,352	1,236	4,613	22	2,141	1,383	1,284	4,830
Administration and policing	55	1,128	14	287	1,634	55	1,165	169	297	1,686
Debt service		992	197	411	1,600		1,014	201	418	1,633
Subtotal	76	4,124	1,713	1,934	7,847	77	4,320	1,753	1,999	8,149
Transfers out		2,315	130	61	2,506		2,405	131	62	2,598
Total	76	6,439	1,843	1,995	10,353	77	6,725	1,884	2,061	10,747

See footnote at end of table, p. 267.

TABLE F.—*Receipts and disbursements for highways by all units of government—Forecast, 1966–75*—Continued

	Federal Government	State agencies and District of Columbia	Counties and townships	Municipalities	Total	Federal Government	State agencies and District of Columbia	Counties and townships	Municipalities	Total
	1972					1973				
C. Funds for capital outlay: [1]										
Excess current revenues (A less B)		3,146	787	277	4,210		3,197	831	266	4,294
Federal funds:										
Highway-user revenue	4,617				4,617	4,731				4,731
General fund	518				518	517				517
Miscellaneous	52				52	53				53
Subtotal	5,187				5,187	5,301				5,301
Transfers out	−4,987	+4,942	+39	+6		−5,050	+5,050	+39	+7	
Bond proceeds		550	123	437	1,110		550	125	445	1,120
Total	200	8,638	949	720	10,507	205	8,797	995	718	10,715
D. Capital outlay by road systems:										
Main rural roads		5,151	33		5,184		5,234	34		5,268
Local rural roads	200	363	784		1,347	205	369	805		1,379
Urban streets and highways		2,894	39	890	3,823		2,955	40	911	3,906
Total	200	8,408	856	890	10,354	205	8,558	879	911	10,553
	1974					1975				
A. Current receipts for highways: [1]										
Highway-user revenue		8,850	9	79	8,938		9,154	9	80	9,243
Tolls		825	20	69	914		848	20	70	938
Property taxes and assessments			789	571	1,360			812	588	1,400
General fund appropriations		80	245	599	924		82	252	616	950
Federal funds	78				78	79				79
Miscellaneous		371	65	206	642		379	65	209	653

Subtotal	78	10,126	1,128	1,524	12,856	79	10,463	1,158	1,563	13,263
Transfers in		140	1,683	872	2,695		142	1,744	902	2,788
Total	78	10,266	2,811	2,396	15,551	79	10,605	2,902	2,465	16,051
B. Disbursements (fixed charges):										
Maintenance	22	2,291	1,415	1,334	5,062	23	2,457	1,446	1,380	5,306
Administration and policing	56	1,206	174	310	1,746	56	1,247	181	318	1,802
Debt service		1,027	203	422	1,652		1,048	206	430	1,684
Subtotal	78	4,524	1,792	2,066	8,460	79	4,752	1,833	2,128	8,792
Transfers out		2,500	132	63	2,695		2,591	133	64	2,788
Total	78	7,024	1,924	2,129	11,155	79	7,343	1,966	2,192	11,580
C. Funds for capital outlay: [1]										
Excess current revenues (A less B)		3,242	887	267	4,396		3,262	936	273	4,471
Federal funds:										
Highway-user revenue	4,837				4,837	4,929				4,929
General fund	492				492	545				545
Miscellaneous	54				54	55				55
Subtotal	5,383				5,383	5,529				5,529
Transfers out	−5,178	+5,131	+39	+8		−5,319	+5,271	+39	+9	
Bond proceeds		525	125	445	1,095		500	125	445	1,070
Total	205	8,898	1,051	720	10,874	210	9,033	1,100	727	11,070
D. Capital outlay by road systems:										
Main rural roads		5,309	35		5,344		5,350	36		5,386
Local rural roads	205	377	826		1,408	210	377	847		1,434
Urban streets and highways		2,996	41	933	3,970		3,035	43	949	4,027
Total	205	8,682	902	933	10,722	210	8,762	926	949	10,847

[1] Included in part A are all funds available for highways *except* Federal funds and bond proceeds applied to capital outlay. These funds are included only in part C.

TABLE G.—*Forecast of capital requirements and capital outlays, 1966–75*

[In millions of dollars]

	Capital requirements	Capital outlays	Amounts requirements exceed outlays
By State governments:			
Main rural roads	55,280	50,199	5,081
Local rural roads	6,104	5,493	611
Urban streets and highways	31,510	28,227	3,283
Total	92,894	83,919	8,975
By local governments:			
Main rural roads	435	337	98
Local rural roads	13,437	7,472	5,965
Urban streets and highways	18,885	8,956	9,929
Total	32,757	16,765	15,992
Total:			
Main rural roads	55,715	50,536	5,179
Local rural roads	19,541	12,965	6,576
Urban streets and highways	50,395	37,183	13,212
Total	125,651	100,684	24,967

Chapter 11

Toll Bridges, Tunnels and Turnpikes*

Introduction

Toll facilities have made up important segments of the transportation system of the United States since pre-Revolutionary days. In Connecticut, for example, a toll ferry crossing between Rocky Hill and Glastonbury has been in continuous operation since 1655—121 years before the Declaration of Independence.

Although many ferries still survive, when we speak of toll facilities in our day we are more likely to mean turnpikes, bridges, and tunnels for the use of which a direct user fee is charged. In one sense, there is no basic difference among these three types of facilities. A turnpike is a highway over land; a bridge is usually a highway over water: and a tunnel is usually a highway under water.

But in the development of Federal and State law applicable to these facilities, some important distinctions have been made over the years and it is necessary to go back into history to understand and appreciate these.

A. Nature and Composition of Facilities

I. TOLL ROADS

1. BRIEF HISTORY

The first turnpikes in this country were direct descendants of those in England and they reached their first full flowering after the American Revolution. The principal reason was that neither the new Republic nor its individual States was able to assume the financial burden of providing the transport facilities needed to bind the young Nation together.

In 1792, Pennsylvania pioneered in the field by authorizing incorporation of a company to build and operate a road from Lancaster to the port of Philadelphia. The turnpike was completed 4 years later and its success prompted similar projects in other areas. In the next quarter century, State legislatures chartered hundreds of private turnpike companies and some 8,000 miles of roads were constructed The bubble burst in the 1830's under the competition from canals and railroads, coupled with the high cost of maintaining and operating the turnpikes. The toll roads gradually fell into disrepair except where the citizenry kept portions open for local use. Toll bridges, with relatively lower maintenance costs and fewer competing facilities, fared better financially.

Between 1843 and 1857 some of the States became fascinated with plank roads and during that period over $10 million in bonds were issued to build more than 7,000 miles of these all-weather roads.

*Prepared by the International Bridge, Tunnel, & Turnpike Association, with minor editing by committee staff.

The plank roads declined and practically disappeared by the 1860's when it became evident that the pavement needed replacement after about 5 years. Moreover, the public became concerned about the abandonment of turnpikes with no provision for incorporating them into the system of public roads.

The development of the automobile revolutionized not only transportation, but also the means of financing the needed roads. In 1901, New York initiated the annual motor vehicle registration fee.

The original Federal-Aid Road Act of 1916 for the first time made Federal funds available to the States as assistance in providing roads. Section 1 of that act provided "that all roads constructed under the provisions of this act shall be free from tolls of all kinds." Section 2 provided that "necessary bridges and culverts shall be deemed parts of the respective roads covered by the provisions of this act."

In 1919 the first motor fuel tax was enacted in Oregon and in 1932 the first Federal gasoline tax was imposed. Between 1920 and 1940, something like 1 million miles of highways were built or improved, mostly from the proceeds of highway user taxes of various kinds.

The Federal statutes and policies relative to toll facilities were reemphasized in the Federal Highway Act of 1921 and in much subsequent legislation. Despite the opposition to toll roads the first modern toll road—the Pennsylvania Turnpike—was built almost entirely with Federal assistance. It was opened to traffic between the vicinities of Harrisburg and Pittsburgh on October 1, 1940.

Thus there was some inconsistency in Federal policy toward aid to toll roads during this period; with the Bureau continuing to oppose the use of Federal-aid funds on such projects while other agencies were providing assistance. However, assistance by such agencies as WPA, PWA, and RFC was more likely prompted by the policy of supporting projects that would create a demand for materials and employment during times of economic distress, than from any endorsement, *per se*, of the toll method of financing.[1]

The success of the Pennsylvania Turnpike created a postwar boom in toll road financing and by the mid-1950's some 30 States had built, were building, or were planning toll roads. The boom apparently reached an end in 1956 with passage of the Federal-aid Highway Act of that year. This provided for 90 percent Federal financing of the 41,000-mile Interstate System and a substantial increase in Federal funds available for the "regular" highway networks.

On the surface, it appeared that a Federal contribution of 90 cents on the dollar to build new, limited access highways through the most heavily traveled traffic corridors would discourage any further substantial private investment in toll roads or, for that matter, in bridges and tunnels on interstate routes. This proved to be a false assumption as will be shown later.

The 1956 act

The Federal-aid Highway Act of 1956 authorized the inclusion of toll roads, bridges, and tunnels in the Interstate System where they met the standards. The historic prohibition on the use of Federal funds for construction, reconstruction, or improvement of toll roads was continued, but the legislation blazed some new trails in Federal policy by permitting Federal funds to be used for approaches to toll roads. It provided:

[1] "A Review of Federal Statutes and Policies on Highway Toll Facilities," U.S. Department of Commerce, Bureau of Public Roads.

1. Federal-aid funds may be expended on projects "approaching any toll road, bridge, or tunnel to a point where such project will have some use irrespective of its use for such toll road, bridge, or tunnel."

2. Interstate System funds may be expended on projects "approaching any toll road on the Interstate System, although the project has no use other than an approach to such toll road: Provided, that agreement satisfactory to the Secretary of Commerce has been reached with the State prior to the approach of any such project—

(1) that the section of toll road will become free to the public upon the collection of tolls sufficient to liquidate the cost of the toll road or any bonds outstanding at the time constituting a valid lien against such toll road covered in the agreement and their maintenance and operation and debt service during the period of toll collections, and

(2) that there is one or more reasonably satisfactory alternate free route available to traffic by which the toll section of the System may be bypassed.

This recital of some of the Federal legislation affecting toll facilities has been made because of its direct bearing in many cases on past, present, and future financing of such facilities.

2. EXISTING CAPITAL PLANT

(a) *Growth and Distribution*

According to information available to the International Bridge, Tunnel & Turnpike Association, there are now 58 toll roads. Of this total, 20 are considered in a special classification because they are comparatively short in length, were designed for special purposes including seasonal tourist-recreational use. This report is centered on the 38 toll roads which are considered a full-fledged part of the public highway system.

Prior to 1900, there were only three toll roads constructed, all of which fall into the scenic, seasonal, or recreational class. Their total cost was $305,000. From 1900 through 1919, there are no toll roads recorded as being constructed.

From 1920 through 1929, four toll roads costing $10,358,000 were constructed: the Wantagh Parkway, the Saw Mill River Parkway, and the Hutchinson River Parkway in New York State, and the Broadmoor-Cheyenne Mountain Scenic Highway in Colorado. However, the Saw Mill River Parkway and the Hutchinson River Parkway did not become toll facilities until 1947, when toll stations were installed and tolls collected for the first time.

In 1934 construction was begun on the Merritt Parkway in Connecticut, which incorporated the first features of modern design. Through 1939, several other parkways were constructed in the State of New York at a cost of over $8,238,000 to bring the total toll road investment by 1940 to $29,638,000.

From 1940 to 1949, five toll roads were built; the Wilbur Cross Parkway in Connecticut, the first sections of the Pennsylvania and Maine turnpikes, the Buccaneer Trail in Florida and the recreational Equinox Skyline Drive in Vermont, at a total combined cost of $113,791,000.

The greatest period for construction of toll roads in the United States was from 1950 through 1959, when a total investment of over

$4,817,669,000 was recorded. This pace slowed briefly upon passage of the 1956 Highway Act, but following 1960, there was a resurgence in the construction of toll roads, and new investment totaling $571,366,000 was recorded between 1960 and 1965.

The grand total of the investment in all 58 toll roads in the United States on which information is available up through 1965 is slightly in excess of $5,538,762,000. Table I shows the 38 major toll roads by name, State, year of completion, and mileage.

TABLE I

Toll road	State	Miles	Year completed
Connecticut Turnpike	Connecticut	129	1958.
Merritt and Wilbur Cross Parkways	do	66	1940.
Denver-Boulder Turnpike	Colorado	17	1952.
Delaware Turnpike (John F. Kennedy Memorial Highway).	Delaware	11	1963.
Airport expressway	Florida	8	1961.
Buccaneer Trail	do	15	1950.
Sunshine State Parkway	do	265	1956—110 miles. 1964—155 miles.
Illinois Tollway	Illinois	187	1958.
Indiana east-west toll road	Indiana	156	1956.
Kansas City Expressway	Kansas	5	1959.
Kansas Turnpike	do	236	1956.
Kentucky Turnpike	Kentucky	40	1956.
Bluegrass Parkway	do	65	1965.
Mountain Parkway	do	43	1963.
Mountain Parkway extension	do	32	1963.
Western Kentucky Parkway	do	127	1963.
Maine Turnpike	Maine	106	1947-43 miles. 1955-63 miles.
John F. Kennedy Memorial Highway	Maryland	42	1963.
Massachusetts Turnpike	Massachusetts	123	1957.
Boston extension	do	12	1965.
New Hampshire Turnpike	New Hampshire	15	1950.
Everett Turnpike	do	40	1957.
Spaulding Turnpike	do	25	1957.
Atlantic City Expressway	New Jersey	44	1964.
New Jersey Turnpike	do	131	1951.
Garden State Parkway	do	173	1954.
New York State Thruway:			
Main line	New York	426	1954—381 miles. 1955—42 miles. 1956—3 miles.
Niagara section	do	21	1956—7 miles. 1959—8 miles. 1960—6 miles.
Erie section	do	70	1957.
Garden State Parkway connection	do	8	1957.
Berkshire section	do	24	1958—18 miles. 1959—6 miles.
New England section	do	15	1958.
Hutchinson River Parkway	do	15	1927.[1]
Saw Mill River Parkway	do	30	1926.[1]
Ohio Turnpike	Ohio	241	1955.
H. E. Bailey Turnpike	Oklahoma	86	1964.
Indian Nation Turnpike (sec. A)	do	41	1966.
Will Rogers Turnpike	do	88	1957.
Turner Turnpike	do	86	1953.
Pennsylvania Turnpike	Pennsylvania	470	1940—160 miles. 1951—167 miles. 1954—33 miles. 1957—110 miles.
Dallas-Fort Worth Turnpike	Texas	29	1955.
Richmond-Petersburg Turnpike	Virginia	34	1956.
West Virginia Turnpike	West Virginia	88	1954.
Total		3,880	

[1] Toll stations established in 1947.

(b) *Age of Facilities*

Total length of all 38 major toll roads included in table I is 3,880 miles. Of this mileage, 271.4 miles, or approximately 6.9 percent, was completed and in operation prior to 1946, and 93.1 percent, or

3,564 miles, was opened to traffic between 1946 and 1965. Some 2,432 miles were completed from 1955 to 1965 inclusive, so that a little over 62 percent of these modern toll highways were built within the last 11 years.

(c) *Description of Facilities*

The 38 major toll roads in the United States are, with few exceptions, high-speed expressways having divided roadways with two or more lanes in each direction and with limited access to and from other highways by grade separated interchanges. In general, the functional design of modern toll roads corresponds to construction standards required (and permitted) on the Federal System of Interstate and Defense Highways, of which many toll roads are a designated part. Design standards on some toll roads built prior to establishment of Interstate standards are not entirely in accord with present Interstate requirements. On the other hand, they also exceed Interstate design standards in many instances.

The function of a modern toll road is to provide safe and economical high speed automotive travel over considerable distances without interruption by cross traffic.

In order to attract traffic at a level sufficient to discharge obligations incurred by the original investment, toll roads must provide and maintain a considerably higher level of service than other alternate routes. They must follow the highest standards of maintenance to provide if at all possible a smooth, dry and safe driving surface, even during periods of adverse weather conditions. They must provide adequate highway patrol and other services to assure a higher level of safety and a free flow of traffic.

In addition, most toll roads provide on-the-road service facilities including restaurants and service stations. Toll roads also provide emergency highway services to motorists with disabled vehicles, a service not normally provided on other public highways.

In 1965, the major toll roads reported that a grand total of 676,782,999 vehicles utilized their facilities, driving a total of 19.28 billion vehicle miles, an increase of 10 percent over 1964.

(d) *Ownership*

All of the 38 major toll roads (table I) are owned and operated either by a State highway department or by toll road authorities or commissions created by State law. The State highway departments owning and operating toll roads include Colorado, Connecticut, Delaware, Florida, and Maryland. The Florida State Turnpike Authority, a separate agency, owns and operates the 265-mile Sunshine State Parkway.

Because they are, by law, State agencies, toll road authorities and commissions are given through enabling legislation certain authority and specific responsibilities within that authority. While the specific provisions of such enabling legislation may vary in detail from one State to another, such enabling acts generally provide that a toll road authority or commission may be established, in some instances outlining its requirements and describing the facility or facilities authorized, their financing, construction, and operation in the public interest.

II. TOLL BRIDGES AND TUNNELS

1. BRIEF HISTORY

Bridges, causeways, and tunnels are being combined under a single category because their functions are basically the same.

Toll bridges came into being for the same reason as toll roads. They became feasible and practical because of the demand for crossing a body of water at a particular point. Ferries powered by horses or oxen had a limited capacity and were adaptable for use only on relatively short crossings. As the demand for better crossings grew, enterprising individuals, and sometimes companies organized for this purpose, began constructing toll bridges under special charters to connect the primitive road system in the early years of our Nation. Thus, the first toll bridges, like toll roads, came into existence as a venture of private enterprise.

In a young, growing country having very limited tax resources, the advantages of private financing, ownership and operation of toll bridges were obvious. Public funds were not available, a crossing was definitely required and the private enterprise approach was the fastest and least painful way of providing a bridge, while at the same time avoiding direct responsibility for its operation and maintenance.

Unlike early toll roads, construction and operation of toll bridges flourished, and the trend toward publicly owned and operated toll bridges did not become general until about 1930.

Original statutory and policy opposition of the Federal Government to the imposition of tolls on all highway facilities was softened as to bridges in 1927. The "Oldfield Act" of that year provided that Federal-aid highway funds could be extended to the construction of any toll bridge and approaches thereto under certain conditions. These were: (1) that the bridge be owned and operated by States or their political subdivisions, and (2) that "all tolls received from the operation thereof, less the actual cost of operation and maintenance, are applied to the repayment to the State or States, or political subdivision or subdivisions thereof, of its or their part of the cost of construction of such bridge and, upon the further condition that when the amount (so contributed) shall have been repaid from the tolls, the collection of tolls for the use of such bridge shall thereafter cease, and the same shall be maintained and operated as a free bridge."

The statute was further amended in 1956 to include tunnels as well as bridges and has remained part of Federal law. Federal-aid funds were used in the construction of a number of bridges and/or approaches under the Oldfield Act, but several of these have since become toll free and only eight were in operation as toll facilities by the end of 1964.

The trends toward governmental ownership and the creation of special authorities and commissions to finance and operate toll bridges were revolutionary. Many of the original structures built by bridge companies had, by the late 1920's, become old or obsolete so that an entirely new and larger facility was required. In some instances, the original bridge owners could finance a new structure or rebuild the existing structure to new specifications. Others were not in a position to do so. The result was that a privately owned bridge was sometimes purchased by a municipality, a county or a State, which in turn operated it or created an authority or commission to provide, operate,

and maintain a new structure. In some cases, financial failure of the original venture made it necessary for the owners to sell the structure. In others, disasters, including serious floods or fires, rendered the original structure useless and unsafe, which in turn led to a transfer of ownership. The trend toward public ownership and operation of toll bridges has continued to the present time.

Vehicular toll tunnels in comparison to bridges are a rather recent development made possible by tremendous advancements in technology. Their functions and services are essentially the same as toll bridges.

2. EXISTING CAPITAL PLANT

As of early 1965, there were 193 toll bridges and causeways located entirely within the United States, according to information compiled by the International Bridge, Tunnel & Turnpike Association. There are also 10 toll bridges crossing the border from the United States to Canada and 11 between the United States and Mexico. Table II lists these bridges by State, indicating that a number are bistate bridges.

It is difficult to arrive at figures reflecting true or total investment in toll bridges in the United States. Tabulated below is a listing of bridges by number constructed in each 10-year period and a corresponding reported investment cost.

TABLE II

United States:	Number of bridges
Alabama	1
Arizona	1
California	8
Colorado	1
Connecticut	8
Delaware-New Jersey	1
Florida	18
Georgia-Florida	1
Georgia-South Carolina	1
Illinois	2
Illinois-Indiana	3
Illinois-Iowa	9
Illinois-Kentucky	1
Illinois-Missouri	7
Indiana-Kentucky	1
Iowa-Nebraska	5
Iowa-Wisconsin	1
Kansas-Missouri	2
Kentucky	1
Kentucky-Ohio	3
Kentucky-West Virginia	3
Louisiana	3
Maine	4
Maine-New Hampshire	1
Maryland	5
Maryland-Virginia	1
Maryland-West Virginia	1
Massachusetts	1
Michigan	2
Minnesota-Wisconsin	2
Mississippi	2
Missouri	4
Missouri-Iowa	1
Missouri-Nebraska	2
Montana	1
New Hampshire	1
New Hampshire-Vermont	1
New Jersey	8
New Jersey-Pennsylvania	10
New Jersey-New York	4
New York	19
New York-Pennsylvania	1
New York-Vermont	2
Ohio-West Virginia	4
Oregon-Washington	7
Pennsylvania	1
Rhode Island	2
South Carolina	1
Texas	2
Virginia	10
Washington	10
West Virginia	1
West Virginia-Virginia	1
Total	193
International crossings:	
Michigan-Canada	2
Minnesota-Canada	1
New York-Canada	7
Texas-Mexico	11
Total	21
Grand total	214

TABLE III

Year	Number of bridges	Investment
Prior to 1899	8	$17[illegible], 297, 620
1900–09	5	1[illegible], 254, 840
1910–19	9	34[illegible], 772, 250
1920–29	43	154[illegible], 185, 850
1930–39	34	43[illegible]1, 261, 230
1940–49	23	[illegible]4, 208, 300
1950–59	82	1, 3[illegible]6, 816, 450
1960–65	14	64[illegible], 693, 960
Total	218	2, 69[illegible], 490, 500

Improvements to toll bridges over this period amounted to $254,355,000 making the total investment in bridges $2,948,845,500. Four bridges of the 218 recorded are now toll free.

III. TUNNELS

1. HISTORY

Exclusive of those tunnels which are a part of combined bridge-tunnel or road-tunnel projects, there are now 10 vehicular tunnel projects, including 1 between the United States and Canada. The first of these was the Holland Tunnel constructed by the Port of New York Authority between New York and New Jersey and opened in 1927 at an original reported cost of $50,813,600.

From 1930 to 1939, a total of $224,800,000 was utilized to build three major tunnels: the Sumner Tunnel in Boston, the Detroit-Windsor Tunnel between Michigan and Canada and the Lincoln Tunnel between New York and New Jersey; plus $8,200,000 for tunnel improvements. From 1940 to 1949 the Bankhead Tunnel in Alabama and the Queens Mid-town Tunnel in New York were completed at a cost of $69,910,000. This amount plus an expenditure of $8,200,000 for tunnel improvements brought the investment for this period to $78,110,000. A total of $319,046,000 was invested in the construction of new tunnels and the improvement of two existing tunnels between 1950 and 1959. The new tunnels constructed in these years include the Baltimore Harbor Tunnel, the Brooklyn Battery Tunnel in New York and the Callahan Tunnel in Boston. The Mid-town Tunnel in Hampton, Va. was constructed at a cost of $41,700,000 in 1960.

The total original cost of these 10 tunnels is reported as $703,769,600. Improvements made over the years are given as $11,748,000, making the total tunnel investment $715,517,600.

Approximately 99 bridges and causeways are less than 20 years old, 20 are over 20 years old and 34 are over 30 years old. Bridges 40 or more years old total 65.

All of the 10 tunnel projects are less than 40 years old. Two are 5 years old, one is 10 years old, and one 15 years old. Five were completed a little over 20 years ago. The Holland Tunnel was completed in 1927.

2. DESCRIPTION OF FACILITIES

Toll bridges in the United States can truthfully be described as encompassing every size and description. They vary from the Oldtown Bridge between Maryland and West Virginia built at a cost of a little over $12,000 to such giants as the George Washington and Verrazano-Narrows Bridge in New York, the Golden Gate Bridge in San Francisco, and the Chesapeake Bay Bridge-Tunnel project between Cape Charles and Norfolk, Va.

From a standpoint of construction and design, the largest bridges are suspension type structures, others are steel truss, some are steel or concrete trestle bridges, some are bascule bridges and others are steel and concrete arch structures and some are various combinations of types. In traffic-carrying capacity, they vary from a simple 2-lane bridge to the 14 lanes of traffic accommodated by the George Washington Bridge on 2 levels.

The basic function of a toll bridge or tunnel is, of course, to provide an expeditious, safe, and direct crossing of a body of water or other geographical barrier along a route desired by vehicular traffic.

In order to perform this function, the bridge or tunnel must be constructed at a point where established traffic desires can be served and to such design standards that it will assure good direct traffic service so that it may discharge the financial obligation incurred in its construction plus cost of operation and maintenance.

In 1965, the International Bridge, Tunnel, & Turnpike Association received reports showing that a grand total of 676,467,519 vehicles utilized 90 bridge and tunnel facilities during the year.

Ownership

Exclusive of the few bridges and one tunnel in private ownership toll bridges and tunnels in the United States are owned and operated either by a special public service authority or by a State or local government. In some cases, these authorities or commissions were created by States, others by cities and/or counties under State enabling legislation. In a number of cases, such authorities are bistate in nature and were organized under enabling legislation of two States with concurring legislation adopted by Congress. Among these are the Port of New York Authority (New York and New Jersey), the Delaware River & Bay Authority (Delaware and New Jersey), the Delaware River Port Authority (Pennsylvania and New Jersey). In cases where bridges or tunnels cross international boundaries, special approval is required not only from the State or Province in which they are to be located, but by international compact or other agreement between cooperating countries to authorize the construction and operation of the facility.

B. Operating Costs and User Charges

1. OPERATING COSTS

For purposes of this report, operating costs are considered to include administrative costs, operating expenses, maintenance costs and overhead costs which are basic and essential to the operation of toll facilities.

Operating costs on toll bridges and tunnels vary widely in relation to the physical size of the facility, the amount and kind of traffic handled, the age of the facility and its geographical location. In brief, a short two-lane bridge with traffic volumes of perhaps 4,000 to 5,000 vehicles per day will have small operating expenses in comparison to a six-lane bridge handling 50,000 vehicles a day. The costs of personnel and maintenance in a large metropolitan area will normally be higher than those in a comparatively small city. Considering these and many other local and individual factors, there appears to be no common denominator which can be applied to develop an average cost for the operation of toll facilities. Although detailed reports of operating costs on all toll bridges are not available, it is estimated that these total costs as defined above for toll bridges and tunnels in the United States exceed $75 million annually.

Operating costs for toll roads are somewhat different, but they again vary widely for the same general reasons as indicated for bridges. Generally speaking, total operating costs of toll roads, including administration, maintenance and overhead expenses essential to the operation, vary from $20,000 per mile to over $40,000 per mile annually. A toll road carrying high volumes of mixed traffic will have greater operating expenses than another of equal length having a much lower volume of traffic. A toll road in a northern climate will have comparatively higher operating costs than one in a warm climate. Similarly, a toll road traversing a heavily populated area will have higher operating costs than one passing through a rural area, and a toll road 15 years old will have higher annual maintenance costs than one built in 1964.

Taking these and other factors into consideration, it is estimated that the total cost of operation, including administration, maintenance, and necessary overhead expense, exceeds $150 million annually for the 38 major toll roads in the United States.

2. USER CHARGES

All toll facilities, regardless of size or location, provide funds for their operations and debt service through placing a user charge on all vehicles using their facility. The "user-pay" principle is the basis for their existence.

On toll bridges, the user fees or tolls vary from a 5-cent toll for passenger vehicles to $4.95. A few facilities also make a small charge per passenger and some for pedestrians.

Truck user fees are, of course, higher than passenger vehicles. These are usually divided into classes based generally upon size and weight. The classifications adopted vary from one facility to another.

Passenger car toll rates on toll roads can best be described as ranging from 1 cent per mile to about 3.5 cent per mile. Again, these rates reflect differences in the original cost of construction, the amount of passenger car traffic in relation to commercial trucks and buses, debt retirement and interest costs, and costs of operation and maintenance. Toll rates for commercial vehicles are higher than those of passenger vehicles on toll roads. As in the case of bridges and tunnels, commercial vehicles are generally classified by size and weight and a toll rate is established for each class.

A number of facilities have adopted commuter discount rates for passenger vehicles and volume discount rates for commercial vehicles.

Some toll agencies also have charge accounts for trucks and buses. These special rates and regulations vary considerably from one agency to another.

Basically, the toll structure (schedule of toll rates by class of vehicle) is designed to produce sufficient revenue from user fees to provide for the operation and maintenance costs of the project and for interest on and retirement of the debt incurred in its financing. This involves adopting a rate schedule that is fair and equitable for each class of vehicle and one which will attract sufficient traffic to meet all financial obligations incurred.

Since toll schedules are calculated and adopted well in advance of project completion, actual experience may in some instances indicate that the rates are too low or too high. As a result, there have been instances where toll schedules have been adjusted upward to meet fiscal requirements or downward in the interest of the public service.

C. Trend of Capital Outlays

1. ANNUAL TRENDS

The trend of reported capital outlays for toll facilities between 1946 and 1965 is tabulated on an average annual basis below. An annual average is utilized primarily because expenditures for all projects do not lend themselves to annual allocations due to size of the project, its method of financing, improvements added, and other reasons.

Type of facility	Capital investment, 1946–65	Annual average, 1946–65
Tolls roads	$5,389,035,000	$269,451,750
Toll bridges	2,002,170,400	100,108,000
Toll tunnels	361,784,000	18,089,000
Total	7,752,989,400	387,648,750

As shown above, the average annual capital outlay for toll facilities between 1946 and 1965 is reported at over $387 million a year.

Investment by levels of government

Except by visiting each toll facility or authority and making a detailed investigation, it would be impossible to determine the role of the various levels of government in financing toll facilities over a period of 50 years. Many of them were financed in various ways and sometimes by more than one agency. In general, it may be said that over 90 percent of all toll facilities presently in existence were financed through an authority or commission created by State and local governments for this purpose and in certain instances via enabling legislation by Congress.

2. SOURCES OF FINANCING

Toll facilities are financed by the sale of bonds which fall into three general classifications. *Revenue bonds* are those supported only by the income from the toll project. *Limited obligation bonds* are issues secured wholly or partly from the proceeds of highway use taxes, such as the State gasoline tax, but which do not carry the further guar-

antee of the State's credit. *General obligation bonds* are backed by the full faith and credit of State, county, or municipality.

Revenue bonds usually carry a higher interest rate than either limited obligation or general obligation bonds because of the greater risk involved. In some cases, a combination of two or more of these financing methods is employed, notably in the financing of the New York Thruway, which is worthy of further comment.

The thruway is a 559-mile toll road running through the principal traffic corridors of New York State, the main trunk connecting New York City with Buffalo. It was begun as a free facility shortly after World War II, but it soon became obvious that it could not be completed for a generation or more from tax resources.

It was decided to make it a toll road and the New York State Thruway Authority was created to finance, build, and operate the facility. It obtained its first financing from short-term notes, comprising a $10 million loan in 1950 and a $60 million loan in 1952. In 1951, the New York electorate authorized the State guarantee of $500 million of thruway authority bonds, which was considered sufficient to cover the cost of the thruway as then contemplated. In 1953 the short-term notes were retired from proceeds of the authority's first issue of State guaranteed bonds.

It became apparent, meanwhile, that rising construction costs and additions to the thruway system would result in a final cost greatly in excess of the authorized $500 million of State guaranteed bonds In. 1954 the legislature granted the authority power to issue revenue bonds to finance completion of the project. The revenue bonds have first claim on thruway income, even over the State guaranteed issues, and this situation held the interest costs on the revenue bonds to a low level.

The Garden State Parkway in New Jersey also was financed largely by State guaranteed bonds. But these cases are the exceptions, rather than the rule. Another unusual feature in both cases is the fact that there are "free" sections on both toll roads where Federal aid was made available. Bond issues, of course, have financed many nontoll highway projects and are continuing to do so, but these are outside the scope of this report.

Total investment in toll facilities

It is difficult to arrive at figures reflecting the value of all toll facilities presently operating in the United States. A survey of the membership of the International Bridge, Tunnel & Turnpike Association, and data gathered from many different sources indicate that the original cost and improvements made for all toll facilities in existence are as tabulated below:

	Investment to date
38 toll roads	$5, 248, 203, 000
Toll bridges	2, 948, 845, 500
Toll tunnels	715, 517, 600
Total	8, 912, 566, 100

If the investment of $290,559,000 for the 20 special purpose toll roads is included, the original investment in all toll facilities is calculated as a little over $9.2 billion. This total does not reflect their present or "replacement" value.

New toll facilities now under construction are estimated to cost $627 million, including $192 million for toll roads and $435 million for bridges. New tunnels are planned but are not yet under construction.

D. The Outlook: 1966–1975

Forecasting activity in the provision of new and expanded toll facilities over the next decade involves the cloudiest of crystal balls. Aside from the ever-present possibility of a major war or depression, predictions must be hedged by—

1. Uncertainties as to the amount of Federal and State financing available during this period.
2. Conditions in the bond market.
3. The impact of other forms of transportation on motor vehicle highway travel.

Even assuming that pending legislation is enacted to provide the necessary financing to complete the National System of Interstate and Defense Highways on schedule in 1972, there is presently no provision for a Federal-aid highway program thereafter. It is generally assumed that there will be one but its size, direction and Federal-State matching ratios are unknown quantities.

At the State level, matching of Federal-aid funds in the required ratios has been a serious problem in some cases and will mount as more of the new interstate and other highways are opened. Under existing law, the States bear the entire cost of maintaining the Federal-aid roads.

Also, under existing law, a State may decide to build a section of the Interstate System as a toll road, provided no Federal funds are used. Under the dual compulsion of limited budgets and the need for providing a traffic facility faster than the flow of Federal-aid funds would permit, additional States may turn to toll financing of portions of their Interstate or other highways. This was done, for example, by the States of Delaware and Maryland in 1962 to finance Interstate 95 through those States.

Conditions in the bond market naturally affect the timing of proposed borrowing. Early in 1966, the New Jersey Turnpike Authority sought to market a $440 million bond issue, but rejected the bid it received as too high.

Another imponderable is the effect on highway travel of other forms of transportation during the next decade. Highway needs may or may not be diminished by fast rail service, increased use of jet planes for short hauls, and more exotic forms of transportation such as underground tubes, hydrofoils and air-jet vehicles.

Nevertheless, a survey of the member facilities of the International Bridge, Tunnel & Turnpike Association shows this picture for projected new projects and capital improvements between 1966 and 1975.

	New facilities	Improvements
Toll roads	$540,000,000	$602,000,000
Toll bridges	728,000,000	367,000,000
Toll tunnels	45,000,000	200,000
Total	1,313,000,000	969,200,000
Total	2,282,200,000	

This includes only those projects planned to a point where general cost estimates are available and is limited only to members of the IBTTA who replied to the survey questionnaire. There may be other projects that are not now planned which may become a reality. Nor does this figure take into account the fact that new toll authorities and commissions are being created and that other toll projects are undoubtedly being planned on which specific information is not available. Such projects may well increase the total of $2.282 billion.

More than 2,200 miles of new toll facilities including toll roads and 47 bridges are presently under construction or planned, according to the Special Committee on the Federal-aid Highway Program, House Committee on Public Works. The cost of only a portion of these is included in the $1,313 million above because firm cost estimates are not yet available for the remainder. It is believed, however, that if all of these projects move on to become a reality, total expenditures for new projects, and for extensions to and improvements of existing projects, may approximate $5 billion between 1966 and 1975. This general estimate, assumes of course, that a continuing and uninterrupted high level of economic activity will be maintained throughout the period and that the present provisions of Federal highway law will not be changed in a way which will have an adverse effect on existing or projected toll facilities.

CHAPTER 12

Offstreet Parking Facilities *

A. NATURE AND COMPOSITION

1. DESCRIPTION OF FACILITIES

Offstreet parking is a service that is provided by both the private and public sectors of our urban communities. In the public area it is planned, financed and operated by a variety of municipal agencies. These are city departments, parking agencies, parking boards and autonomous parking authorities. In all cases there is legislative action which usually defines the limits these bodies possess. These official groups have a keen interest in assuring that the motoring public is provided with a coordinated system of terminal facilities.

In the post-World War II years the crushing impact of demand for parking space in urban areas, large and small, became apparent to most American cities and as a result many legislative proposals were introduced and enacted into law by the various State legislatures and in city councils throughout the land. Many reasons were behind this governmental movement into a field that had been one primarily of private enterprise. Among these reasons were that private industry could not meet the challenge alone, either due to difficulty in financing parking developments on a broad basis or lack of ability in acquiring properly located sites which would relate to the overall transportation plans of the urban area.

The general physical characteristics of the plant and equipment involved in such installations are the surface parking lot which may be operated by automatic gates, attendants, parking meters or in a variety of other methods. This is the most elementary of the methods for storing the vehicle. Next in the order of complexity would be the open ramp garage, followed by the underground garage which is usually only found in the largest urban areas and almost without exception beneath publicly owned land providing a multipurpose use of the land for a park and vehicle storage area. In both of these types of garages very sophisticated equipment is utilized to maintain complete control of occupancy levels and to provide very rigid financial controls on the operations. In addition there have been limited numbers of mechanical parking garages developed and installed throughout the country. Usually these are found on very high priced land in areas where there is a very high demand for short-term parking with a resultant high turnover. The latest trend in some areas of the country is the

*Prepared by William D. Heath, Executive Director, District of Columbia Motor Vehicle Parking Agency and Secretary of the International Municipal Parking Congress, with minor editing by committee staff.

multipurpose building; that is, an office building with a certain amount of parking provided as an integral part of the building. Quite frequently the reason for the provision of parking integrally is to comply with local zoning ordinances which require the provision of parking based on various scales.

Services Rendered

The parking services rendered by municipalities are in great part confined to the commercial heart of the city, however, there are exceptions to this. In some cases where a parking shortage has occurred in an industrial area the municipality has stepped in to relieve the deficiency. In the case of a manufacturer who may be thinking of moving his plant to an outlying area because of the difficulties his employees have parking, it can be to the economic benefit of the community from a fiscal standpoint for the city to provide the parking facilities rather than to lose the tax revenues from the plant. Other municipalities have found it desirable and necessary to provide offstreet parking in residential areas, an outstanding example of this is a midwestern city which has provided a great many residential parking lots. Another facet of municipal parking is the provision of parking facilities in neighborhood shopping areas. This has generally occurred in the older and larger cities where the neighborhood centers were situated in a strip development along streetcar lines and before the automobile became a part of the American way of life. Other cities which are located in the center of recreational areas have had to establish parking facilities to serve the users of such areas. Examples of this type are found both on our east and west coast where large numbers of persons are attracted by the pleasures that the oceans afford.

A recent study conducted for the Automobile Manufacturers Association disclosed the distribution of central business district parking facilities by population groups, registered vehicles, and area. (Figs. 1–5.)

The durability of parking structures can be equated with any commercial building constructed of reinforced concrete or structural steel. Maintenance of these structures is of limited nature and consists primarily of sealing and waterproofing of floors, painting and striping of stalls. One of the greatest factors of obsolescence found in older garage structures has been the increase in size of the vehicle over a period of years. Many old structures designed for three cars to a bay have had their capacity reduced by one-third because of this factor. Using modern techniques the garage of today is a clear span structure and any change in the size of vehicles will only result in the repainting of stall lines with very minimal loss of space.

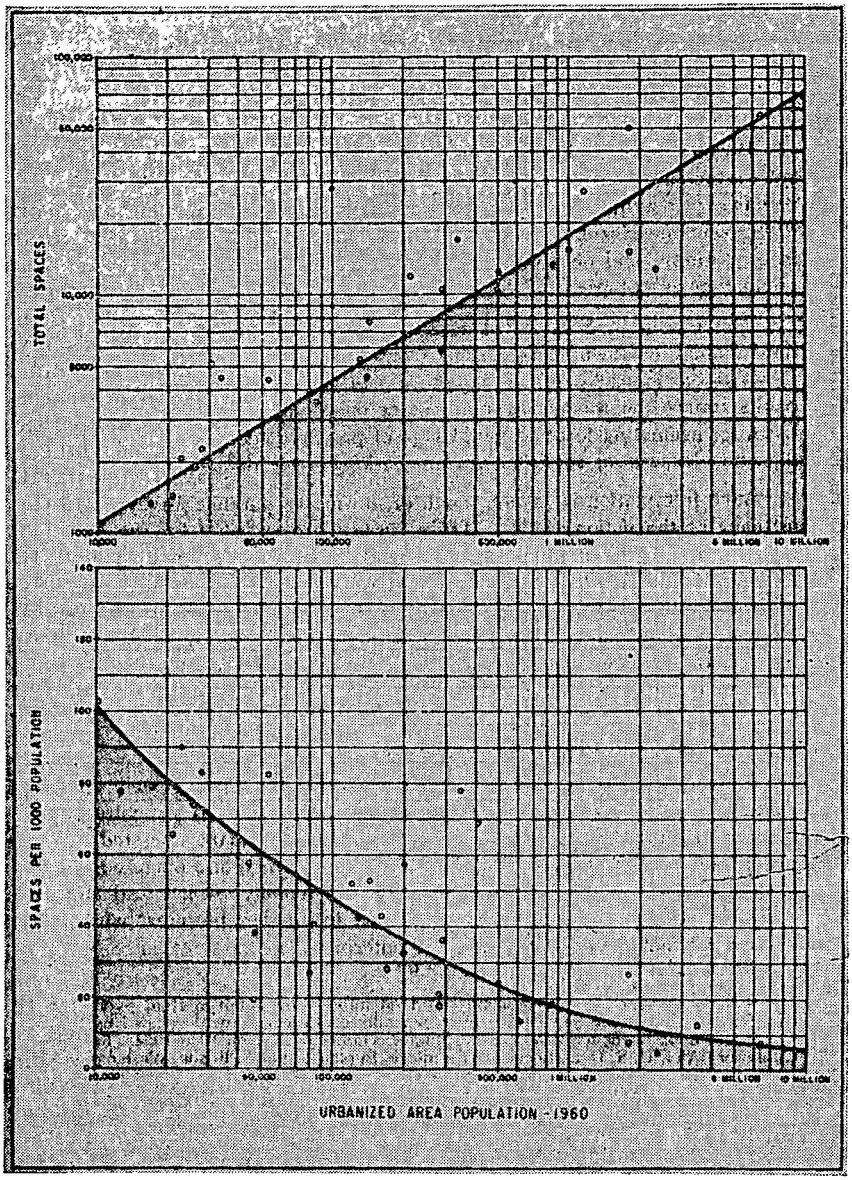


FIGURE 1

CENTRAL BUSINESS DISTRICT PARKING SPACES IN RELATION TO URBANIZED AREA POPULATION

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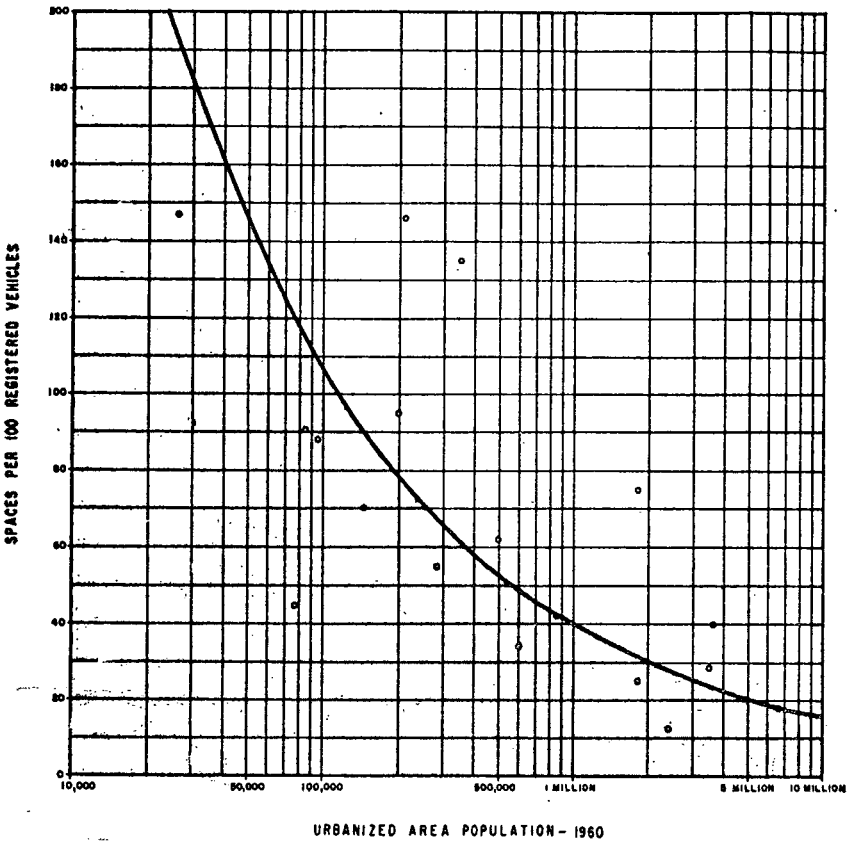

FIGURE 2

CENTRAL BUSINESS DISTRICT PARKING SPACES PER REGISTERED VEHICLE, 1960

The spaces per registered vehicle decline as the urban area increases in population. When urbanized area population approximates 100,000, central business district parking spaces approximate 110 per 1,000 registered vehicles. When the urbanized area reaches one million people, there are approximately 40 spaces per registered vehicle. For Los Angeles (with an urbanized area population of six million) there are only 18 spaces per 1,000 registered vehicles.

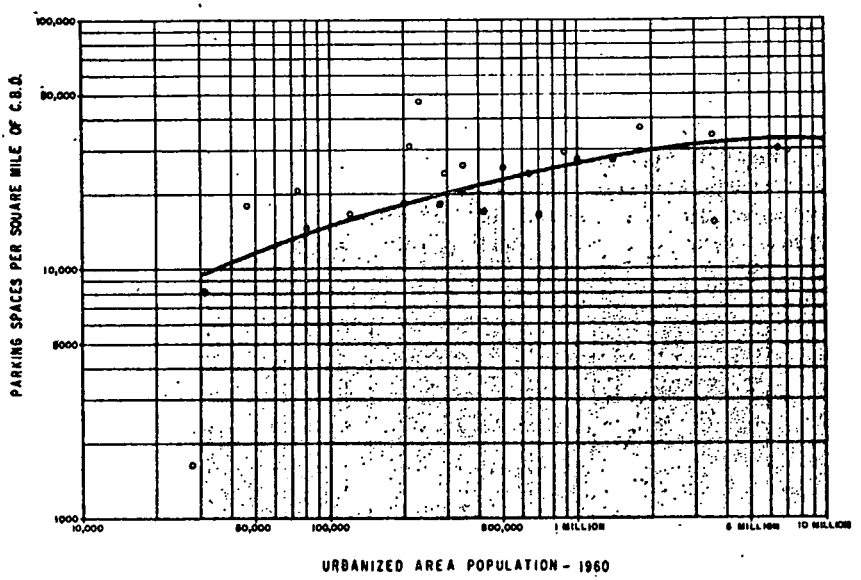

FIGURE 3

PARKING SPACES PER SQUARE MILE OF CENTRAL BUSINESS DISTRICT

On a square-mile basis, the number of downtown spaces increases gradually as urban population rises. Parking spaces per square mile of downtown approximate 15,000 for urban populations of 100,000, and 23,000 for urban populations of 500,000. When urbanized areas approach two million, parking spaces per square mile level off at about 30,000.

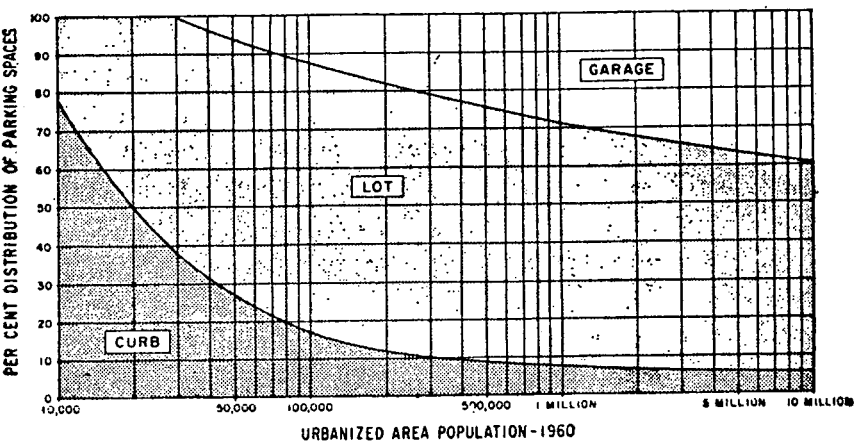

FIGURE 4

DISTRIBUTION OF CENTRAL BUSINESS DISTRICT PARKING SPACES BY TYPE OF FACILITY

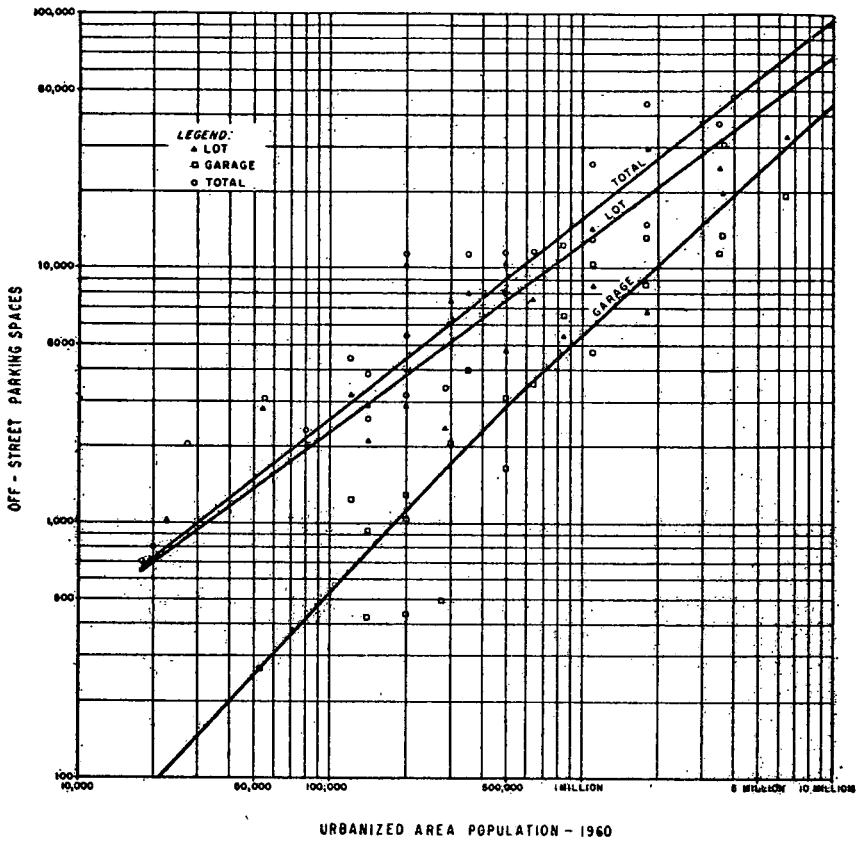

FIGURE 5

OFF-STREET PARKING SPACES
IN RELATION TO URBANIZED AREA POPULATION

As urban areas increase in size, the number of garage spaces increases at a faster rate than parking lot spaces. Central business districts in urbanized areas of 200,000 or less usually have fewer than 1,000 spaces in parking garages. This number increases substantially as urban areas enlarge; there are about 5,500 garage spaces in urban areas of one million in population. The total off-street spaces averaged 2,800 in urbanized areas of 100,000, 16,000 in areas of one million, and about 28,000 in urbanized areas of two million population.

2. EXISTING CAPITAL PLANT

Capital plant in the parking field is presented from two sources: The 1961 Municipal Yearbook published by the International City Managers' Association reports that for 1960 the following city-owned parking lots and spaces existed:

City-owned parking lots and spaces, 1960

Population group	Number of cities reporting	Total number of cities					
		With parking lots	Charge, all lots	Free, all lots	Some charge, some free	Median number city-owned spaces	Total number city-owned lots
Over 250,000	43	23	17	1	5	914	226
100,000 to 250,000	77	37	25	2	10	800	230
50,000 to 100,000	169	121	80	10	29	609	802
25,000 to 50,000	322	241	111	56	73	414	1,221
10,000 to 25,000	479	353	140	93	117	240	1,382
All cities over 10,000	1,090	775	373	162	234	255	3,861

Census of Business for 1963 published by the U.S. Census Bureau

Region, division, and State	Auto parking					
	Total		Parking lots		Parking structures	
	Establishments (number)	Receipts (in thousands of dollars)	Establishments (number)	Receipts (in thousands of dollars)	Establishments (number)	Receipts (in thousands of dollars)
United States total	11,269	415,605	9,141	225,767	2,128	189,818
Regions:						
The Northeastern States	3,365	(D)	2,382	64,068	983	(D)
The North Central States	2,849	104,011	2,421	58,728	428	45,283
The South	2,965	86,269	2,540	(D)	425	(D)
The West	2,090	(D)	1,798	(D)	292	(D)
The Northeastern States:						
New England	538	(D)	452	12,046	86	(D)
Middle Atlantic	2,827	127,782	1,930	52,022	897	75,760
The North Central States:						
East North Central	2,100	77,365	1,790	43,187	310	34,178
West North Central	749	26,646	631	15,541	118	11,105
The South:						
South Atlantic	1,312	43,901	1,105	28,055	207	15,846
East South Central	554	12,253	492	8,694	62	3,559
West South Central	1,099	30,115	943	(D)	156	(D)
The West:						
Mountain	389	(D)	354	(D)	35	2,851
Pacific	1,701	65,595	1,444	(D)	257	(D)
New England:						
Maine	26	643	21	409	5	234
New Hampshire	6	76	6	76	0	0
Vermont	1	(D)	0	0	1	(D)
Massachusetts	270	13,075	220	6,576	50	6,499
Rhode Island	92	2,493	83	2,011	9	482
Connecticut	143	4,403	122	2,974	21	1,429
Middle Atlantic:						
New York	1,664	91,187	952	30,258	712	60,929
New Jersey	350	8,350	312	6,745	38	1,605
Pennsylvania	813	28,245	666	15,019	147	13,226
East North Central:						
Ohio	678	23,817	589	14,877	89	8,940
Indiana	250	7,368	232	5,365	18	2,003
Illinois	505	27,987	360	10,617	145	17,370
Michigan	561	14,784	521	10,126	40	4,658
Wisconsin	106	3,409	88	2,202	18	1,207

See footnote at end of table.

Census of Business for 1963 published by the U.S. Census Bureau—Continued

Region, division, and State	Auto parking					
	Total		Parking lots		Parking structures	
	Establishments (number)	Receipts (in thousands of dollars)	Establishments (number)	Receipts (in thousands of dollars)	Establishments (number)	Receipts (in thousands of dollars)
West North Central:						
Minnesota	176	8,893	143	4,766	33	4,127
Iowa	94	2,136	83	1,314	11	822
Missouri	331	11,179	287	7,244	44	3,935
North Dakota	22	426	20	(D)	2	(D)
South Dakota	9	111	8	(D)	1	(D)
Nebraska	68	2,735	51	1,214	17	1,521
Kansas	49	1,166	39	613	10	553
South Atlantic:						
Delaware	26	828	23	(D)	3	(D)
Maryland	184	5,613	146	2,860	38	2,753
District of Columbia	286	13,848	237	(D)	49	(D)
Virginia	90	2,526	79	1,588	11	938
West Virginia	72	1,846	64	1,468	8	378
North Carolina	140	2,880	129	2,301	11	579
South Carolina	42	548	40	(D)	2	(D)
Georgia	207	7,764	153	4,096	54	3,668
Florida	265	8,048	234	6,064	31	1,984
East South Central:						
Kentucky	133	3,213	122	2,574	11	639
Tennessee	237	5,921	200	3,757	37	2,164
Alabama	152	2,694	142	2,087	10	607
Mississippi	32	425	28	276	4	149
West South Central:						
Arkansas	65	1,338	51	(D)	14	(D)
Louisiana	164	5,325	135	2,669	29	2,656
Oklahoma	158	3,494	139	2,092	19	1,402
Texas	712	19,956	618	12,478	94	7,480
Mountain:						
Montana	5	(D)	3	14	2	(D)
Idaho	8	105	8	105	0	0
Wyoming	7	234	7	234	0	0
Colorado	180	5,680	161	4,118	19	1,562
New Mexico	17	213	17	213	0	0
Arizona	76	1,989	69	1,636	7	353
Utah	59	1,498	54	1,055	5	443
Nevada	37	1,406	35	(D)	2	(D)
Pacific:						
Washington	203	9,203	151	4,069	52	5,134
Oregon	93	5,124	77	4,062	16	1,062
California	1,385	49,764	1,197	30,249	188	19,515
Alaska	0	0	0	0	0	0
Hawaii	20	1,504	19	(D)	1	(D)

(D)—Withheld to avoid disclosure.

There is no definitive material available on the age of such facilities but from experience we can be sure that the greater part of them have been constructed since the post World War II years.

B. Costs and User Charges

1. CONSTRUCTION AND OPERATION COSTS

For the open parking lot, based on a per parking stall basis, 1965 construction costs range from a low of $200 per space to a high of $1,300 per car space with an average of $719 per car space. Of necessity all of the construction cost estimates in this section must exclude land costs because of the great variance that would exist between such costs in the central business district of a large urban area and such costs in a smaller urban area. While there would be some difference in construction costs for like areas it is believed that these are not significant and no weight is placed on such differences.

For the open deck garage structure construction costs range from a low of $1,700 per car space to a high of $3,582 per car space with an average of $2,270 per car space. Here again a great variation can exist in the price range per car space. This can be attributed to architectural treatment of the structure, the amount of sophisticated electronic equipment for control purposes and quality of installations for customer convenience. The most costly form of construction is the underground parking garage. There is a saving grace, however, in that without exception such facilities are constructed in public land, usually a park, and there is no cost of land attributed to the facility. Upon completion of the parking facility the park on the surface is restored and in most cases to a higher degree than existed before the construction.

Examples of this type of construction are found in the larger cities such as: Pittsburgh, Chicago, San Francisco, Los Angeles, Detroit, Kansas City, Philadelphia, and many others. Construction costs for this type of parking facility range from a low of $3,100 per car space to a high of $6,500 per car space with an average of $4,250 per car space. There will not be a great deal of difference in these construction costs for different size facilities as the size of a parking facility is based on the parking demand that is forecast for the area. Of necessity there must be a minimum size of a facility otherwise the ramp and aisle areas would make it uneconomic. The usual limiting factor for this type of facility, other than parking demand, is the street or highway capacity to serve it properly.

Annual maintenance costs of the surface parking lot vary greatly dependent upon whether it is an attendant facility, metered facility, or operated by means of automatic parking gates that are actuated by the insertion of a coin or card. The geographical location of the facility also has a great bearing on such costs. In our northern cities snow removal is a large item that does not occur in the warmer climes. In one of the major cities their maintenance costs for attendant parking lots were $9.10 per car space, for metered lots $30.75 per car space and for gate-operated facilities they averaged $11.20 per car space. It should be noted, however, that their operating costs were in a direct inverse ratio. Reported maintenance costs for surface parking lots were from a low of $3.14 per car space to a high of $51.76 per car space. The $3.14 cost came from a southern city where they have no snowfall and the $51.76 cost came from a northern city that experiences heavy snowfall. Excluding these highs and lows the average maintenance cost for surface parking lots averaged $21.18 per car space. For the open deck parking garage maintenance costs per car space go from a low of $5.73 per car space to a high of $22.04 per car space for an average cost of $10.03 per car space. Variations in reported data in this item occur because some cities include certain items as operating expense while others call it a maintenance item. The cost of maintenance per car space for underground garages ranges from $6.19 per car space to $15 per car space.

Annual operating costs for parking facilities are subject to widespread differences. As an example a metered facility has a low labor cost, a self-park facility has moderate labor costs while an attendant park facility has high labor costs. Also the size of the facility has a very great bearing on the operating cost per unit. Operation costs

of metered lots range from a low of $11.70 per space to a high of $32.26 per space with an average cost of $17.90 per space. Lots operated by gates frequently require the services of a cashier and the average annual operating cost of this type of facility is $17 per car space. Lots which are operated as attendant park facilities naturally have the highest operating costs. The lowest cost reported for this type of operation was $54.65 per car space while the highest cost was $192.30 per car space with an average of $82.32 per car space.

2. USER CHARGES

(*a*) Parking fees, lease payments, rentals and assessments are all used in one form or another to pay for all of the services and use of the facilities.

(*b*) A recent survey made by one of the major bond rating services of parking revenue bonds disclosed the following:

(1) The survey covered 52 rated bond issues for 39 cities (45 bond issues) and 7 single project agencies.

(2) As of November 1, 1965, 51 of the 52 issues totaled $195,384,000 in outstanding bonds, one issue unknown.

(3) About 70 percent of the 45 city bond issues with about 80 percent of the bonds were for midwestern and eastern cities.

(4) Pennsylvania had the largest State total with $40,281,000 outstanding and Chicago led the cities with $30,474,000 outstanding.

(5) Twenty of the forty-five city bond issues originated in cities of less than 100,000 population.

(6) Debt service coverage for the 52 bond issues ranged from a low of 0.62 to a high of 5.17. City bond issues average 1.62 and single project bond issues averaged 1.68. The overall average for the group was 1.63.

(7) About 70 percent of the 52 bond issues are rated BB or BBB. These issues averaged 1.41 in debt service coverage. The 17 issues rated A averaged 2.33 in debt service coverage.

(8) Only 4 of the 52 issues showed a debt service coverage of less than 1.

(*c*) The extent to which municipal parking facilities are paid for from general obligation borrowings is impossible to estimate. In many localities onstreet parking revenues and offstreet parking revenues are placed into general funds and expenditures for this type of facility are made from the general fund.

C. Trend of Capital Outlays

The 1963 Census of Business reported that there were 9,141 privately owned parking lots in the United States. The latest data for municipal parking lots in cities over 10,000 population was for the year 1960 and at that time there were 3,861 city owned parking lots. It is estimated that from 1960 to 1963 there were 639 municipally owned parking lots established for a total of 4,500 facilities. Combined with the 9,141 privately owned lots this gives a grand total of 13,641 parking lots in operation at the end of 1963. The municipal operations contain 476,858 offstreet spaces and based on 1965 construction

cost data of $719 per car space represent an investment of almost $345 million (excluding cost of land). This does not take into account the amount invested in the 9,141 privately owned parking lot facilities or the larger amount invested in the 2,128 privately owned parking structures and the unknown number of municipally owned parking structures. Assuming that the privately owned lots are on an average similar in size and construction characteristics to the municipally owned lots we arrive at a capital investment of approximately $700 million in parking lots (excluding land) based on 1965 construction costs. The trend of dollar expenditure for offstreet parking facilities must of necessity increase as our urban population grows and the production of motor vehicles show yearly gains. The Census Bureau Bulletin on City Government Finance in 1963–64 showed that cities expended $102 million during fiscal 1964 for parking facilities while they expended $80 million for the same services in fiscal 1963. This was an increase of 28 percent in 1 year and represented the greatest increase for any one service provided by the cities.

The source of financing municipally owned facilities is listed with the most frequently used method first and the other methods in descending order:

1. General obligation bonds secured by both parking revenues and full faith and credit of the city government.
2. Revenue bonds secured by revenues of the parking system (off- and on-street parking revenues).
3. Revenue bonds secured only by the earnings of the offstreet facilities.
4. Combination of revenue and general obligation bonds.
5. General obligation bonds only.
6. Capital reserve funds.
7. Private capital and other methods.

D. Needs and Prospective Capital Outlays

As noted in the preceding section outlays for municipal parking facilities increased 28 percent from 1963 to 1964 for a total expenditure of $102 million. With the ever-increasing numbers of motor vehicles on our streets and highways and the increasing urbanization of America it would appear as though a 15-percent increase per year for the years 1966 through 1975 would be ultraconservative. This will require capital expenditures for municipally owned parking facilities of $2.4 billion during this decade. While at the present time about one-half of the municipally owned parking spaces are in cities below the 50,000 population level it is believed that because of the increase of population in urban areas that approximately 80 percent of this expenditure will occur in cities with populations of 50,000 or more. It is further believed that the municipally owned facilities account for about 30 percent of the total supply of parking; so on that basis the private sector will require about $5.5 billion for construction of offstreet parking facilities. It is estimated that this expenditure would be made exclusively in cities with a population of over 50,000. This will give an estimated total expenditure of $7.9 billion for the decade 1966 through 1975.

The municipal capital outlays will be made almost exclusively by cities, counties, towns, public authorities, and other local public bodies while the expenditures by the private sector will be made by proprietary or profitmaking organizations.

The expected source of funds for the municipal facilities will be the borrowing in the tax-exempt municipal bond market and appropriations from parking revenues. It is not feasible to give a percentage distribution to each method because of the variety of methods used in municipal budget processes. The source of funds for the privately developed facilities will be exclusively capital flotations in other security markets.

As parking facilities should be self-amortizing, whether municipal or private, there should be no gap between revenues and expenditures. If such a gap is projected there would be recourse to either of two actions. Eliminate the project or increase the fee schedule to make it a self-supporting project. If neither of these actions are practical there is a third course of action for a municipality. It can create an assessment benefit district within the area of influence of a project and assess the property owners who would benefit from the parking facility.

CHAPTER 13

Urban Mass Transit Facilities*

A. NATURE OF URBAN MASS TRANSPORTATION FACILITIES

1. DESCRIPTION OF FACILITIES

As U.S. cities have grown in size and number, urban mass transportation facilities have not grown with them. Unlike other public facilities such as water and sewage systems which lagged behind population growth and increasing concentration of population in urban centers, mass transportation facilities actually decreased in the years following World War II. This was due to several causes, the most important being a great increase in the number and use of private automobiles, coupled with a decline in mass transit service and an increase in its fares.

Urban mass transportation is defined in this chapter as the movement of people within urban areas by large-capacity vehicles operating as common carriers. Mass transportation facilities, therefore, consist of bus, trolley coach, rapid transit, and surface or elevated electric railway systems. Railway commuter service, although a vital part of urban mass transportation, especially in the larger metropolitan centers, is not included in this analysis because of the difficulty in separating it from the railroads' long-distance, intercity service.

Since urban areas vary so widely and there is no consensus on the ideal transportation system or the correct level of service, general standards of performance for mass transportation systems have not been set. The situation is not analyzed by reference to standards of performance but rather in terms of an urban transportation problem. In the 1966 edition of his book *The Metropolitan Transportation Problem*, Wilfred Owens of the Brookings Institution states:

> Every metropolitan area in the United States is confronted by a transportation problem that seems destined to become more aggravated in the years ahead. Growth of population and expansion of the urban area, combined with rising national product and higher incomes, are continually increasing the volume of passenger and freight movement. At the same time, shifts from rail to road and from public to private transportation have added tremendous burdens to highway and street facilities. They have created what appear to be insuperable terminal and parking problems. Continuing economic growth and the certainty of further transport innovation threaten to widen the gap between present systems of transportation and satisfactory standards of service.
>
> Manifestations of the transportation problem in urban areas include the mass movement between work and home and the cost that it represents in money, time, and wasted energy. The transit industry is experiencing rising costs and financial difficulties, while the rider is the victim of antiquated equipment and poor service * * *.

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*By Marge Schier, Urban Transportation Administration, U.S. Department of Housing and Urban Development, utilizing data furnished by the American Transit Association, with minor editing by committee staff.

Half a century of neglect has meant a long-term deterioration of transit service and failure to keep pace with technological change. Rising costs and declining patronage have led to a succession of fare increases and further reductions in service. In many cases, it has been impossible to set aside necessary allowances for depreciation of equipment, and the industry as a whole has been unable to attract sufficient capital to renew, modernize, or extend its services for the nearly eight billion riders per year who depend on public carriers.

2. EXISTING CAPITAL PLANT

(a) *Mass Transit Facilities and Their Distribution by State and City*

As of the end of 1964, common carrier intraurban transportation in the United States was provided by approximately 1,152 transit systems. Of these, 1,129 were exclusively motor bus, 14 electric railway, both subway and elevated (including joint trolley coach and/or motor bus operations), and 9 trolley coach and motor bus operations combined. (See table I.) Table II lists the number of transit companies, both privately and publicly owned, operating in each State and the number and type of transit vehicles in use in each State.

Only five cities in the United States now have high-speed rail rapid transit systems. These are New York, Chicago, Philadelphia, Boston, and Cleveland. A new system is under construction in the San Francisco metropolitan area by the San Francisco Bay Area Rapid Transit District and is scheduled for completion in 1969.

Table IV indicates the distribution of transit systems among cities of varying population. It should be noted that rapid transit systems are confined to cities of 500,000 population or above. The smaller cities rely primarily on bus systems for their public transportation.

On December 31, 1964, there were 2,173 miles of surface, subway, and elevated railway track, 986 miles of trolley coach, and 118,300 miles of motor bus routes in intraurban service in the United States. The equipment operating on these routes consisted of 10,624 railway cars, 1,865 trolley coaches, and 49,200 buses.

TABLE I.—*Number of urban transit companies in the United States, 1951–64 (50 States and the District of Columbia)*

Dec. 31—	Electric railways (including joint trolley coach and/or motorbus operations)	Trolley coach and motorbus operations combined	Trolley coach (exclusively)	Motorbus (exclusively)	Grand total
1951	82	23	2	1,535	1,642
1952	75	22	2	1,522	1,621
1953	70	24	2	1,510	1,606
1954	65	25	2	1,496	1,588
1955	61	23	1	1,399	1,484
1956	44	22	0	1,261	1,327
1957	40	20	0	1,265	1,325
1958	35	16	0	1,250	1,301
1959	34	13	0	1,225	1,272
1960	31	12	0	1,208	1,251
1961	[1] 18	12	0	1,217	1,247
1962	17	11	0	1,177	1,205
1963	14	10	0	1,162	1,186
1964	14	9	0	1,129	1,152

[1] Companies with 100 percent freight and/or switching operations eliminated as of Jan. 1, 1961.

Source: American Transit Association.

TABLE II.—*Geographical distribution—Number of transit companies and number of transit vehicles, Dec. 31, 1964*

Division and State	Number of transit companies	Number of transit vehicles				
		Rapid transit cars	Surface streetcars	Trolley coaches	Motor-buses [1]	Total transit vehicles
United States:	1,152	9,064	1,560	1,865	49,200	61,689
New England	107	299	344	60	3,300	4,003
Middle Atlantic	292	7,443	863	160	15,735	24,201
East North Central	208	1,322	122	987	9,870	12,301
West North Central	82	----------	52	18	3,640	3,710
South Atlantic	162	----------	----------	----------	6,435	6,435
East South Central	73	----------	----------	----------	1,635	1,635
West South Central	83	----------	35	149	2,720	2,904
Mountain	35	----------	----------	----------	720	720
Pacific contiguous States	107	----------	144	491	4,920	5,555
Pacific noncontiguous States	3	----------	----------	----------	225	225
New England:						
Maine	12	----------	----------	----------	180	180
New Hampshire	7	----------	----------	----------	115	115
Vermont	5	----------	----------	----------	30	30
Massachusetts	46	299	344	60	2,265	2,968
Rhode Island	10	----------	----------	----------	165	165
Connecticut	27	----------	----------	----------	545	545
Middle Atlantic:						
New York	101	6,947	----------	----------	7,710	14,657
New Jersey	87	----------	30	----------	4,150	4,180
Pennsylvania	104	496	833	160	3,875	5,364
East North Central:						
Ohio	66	80	58	370	2,770	3,286
Indiana	36	----------	32	----------	630	662
Illinois	36	1,234	32	525	3,760	5,551
Michigan	35	----------	----------	----------	1,550	1,550
Wisconsin	35	----------	----------	92	1,160	1,252
West North Central:						
Minnesota	25	----------	----------	----------	960	960
Iowa	17	----------	----------	----------	410	410
Missouri	11	----------	52	18	1,810	1,880
North Dakota	7	----------	----------	----------	20	20
South Dakota	3	----------	----------	----------	65	65
Nebraska	7	----------	----------	----------	210	210
Kansas	12	----------	----------	----------	165	165
South Atlantic:						
Delaware	2	----------	----------	----------	90	90
Maryland	16	----------	----------	----------	930	930
District of Columbia	2	----------	----------	----------	1,340	1,340
Virginia	33	----------	----------	----------	1,245	1,245
West Virginia	22	----------	----------	----------	410	410
North Carolina	34	----------	----------	----------	500	500
South Carolina	7	----------	----------	----------	160	160
Georgia	18	----------	----------	----------	725	725
Florida	28	----------	----------	----------	1,035	1,035
East South Central:						
Kentucky	18	----------	----------	----------	395	395
Tennessee	21	----------	----------	----------	645	645
Alabama	22	----------	----------	----------	485	485
Mississippi	12	----------	----------	----------	110	110
West South Central:						
Arkansas	12	----------	----------	----------	175	175
Louisiana	17	----------	35	89	600	724
Oklahoma	10	----------	----------	----------	200	200
Texas	44	----------	----------	60	1,745	1,805
Mountain:						
Montana	4	----------	----------	----------	70	70
Idaho	5	----------	----------	----------	15	15
Wyoming	1	----------	----------	----------	10	10
Colorado	7	----------	----------	----------	335	335
New Mexico	3	----------	----------	----------	70	70
Arizona	5	----------	----------	----------	15	15
Utah	7	----------	----------	----------	160	160
Nevada	3	----------	----------	----------	45	45
Pacific contiguous States:						
Washington	26	----------	----------	131	635	766
Oregon	11	----------	----------	----------	260	260
California	70	----------	144	360	4,025	4,529
Pacific noncontiguous States:						
Alaska	2	----------	----------	----------	15	15
Hawaii	1	----------	----------	----------	210	210

[1] Partially estimated.

Source: American Transit Association.

TABLE III.—*Electric railway track and total miles of motorbus and trolley coach route of the transit industry in the United States, 1940, 1945 to 1964, inclusive (50 States and the District of Columbia)*

As of Dec. 31—	Total miles of railway track			Trolley coach miles of negative overhead wire	Motorbus miles of route round trip
	Surface	Subway and elevated	Total		
1940	18,367	1,242	19,609	1,943	78,100
1945	16,480	1,222	17,702	2,357	90,700
1946	15,490	1,226	16,716	2,388	91,400
1947	13,750	1,226	14,976	2,733	95,600
1948	11,740	1,224	12,964	2,952	96,800
1949	10,700	1,231	11,931	3,385	96,700
1950	9,590	1,223	10,813	3,545	98,300
1951	8,240	1,217	9,457	3,715	100,000
1952	7,309	1,223	8,532	3,773	99,900
1953	6,126	1,226	7,352	3,700	100,300
1954	5,547	1,218	6,765	3,667	99,300
1955	4,976	1,221	6,197	3,466	100,100
1956	4,495	1,251	5,745	3,326	101,000
1957	3,774	1,245	5,019	3,007	102,700
1958	2,600	1,244	3,844	2,723	104,800
1959	2,200	1,245	3,445	2,491	106,600
1960	1,900	1,243	3,143	2,196	108,700
1961	1,355	1,246	2,601	2,017	111,500
1962	1,312	1,245	2,557	1,849	114,300
1963	990	1,246	2,236	1,119	117,400
1964	918	1,255	2,173	986	118,300

Source: American Transit Association.

TABLE IV.—*Distribution by size of city, number of transit companies, number of transit vehicles (Dec. 31, 1964)*

Population range (cities)	Number of transit companies	Number of transit vehicles				
		Rapid transit cars	Surface street cars	Trolley coaches	Motor-buses [1]	Total transit vehicles
500,000 plus	30	9,064	1,082	1,485	20,700	32,331
100,000 to 499,999	133	----------	37	300	12,400	12,737
50,000 to 99,999	135	----------	56	58	6,100	6,214
49,999 or less	432	----------	95	22	5,000	5,117
Suburban and other	422	----------	290	----------	5,000	5,290
Total	1,152	9,064	1,560	1,865	49,200	61,689

[1] Partially estimated.

Source: American Transit Association.

(b) *Age of Facilities*

The age of transit facilities is directly related to maintenance costs and to the degree to which such facilities are used by the public. Obsolete, uncomfortable vehicles and old, poorly maintained stations contribute to the spiral of decreasing demand and increasing costs which faces so many transit companies. Increasing operating expenses prevent many transit operators from building sufficient depreciation reserves to replace equipment and often require borrowing to purchase new equipment. Lenders and equipment companies, in turn, are either unwilling to extend credit or charge high interest

rates because the financial future of these transit companies is so precarious.

Tables V, VI, and VII present data on the inventory and age of transit vehicles over a period of years. To make this data meaningful in any interpretation of transit capital equipment needs, some measurement of the useful lives of transit vehicles must be attempted. In the case of buses, the useful life varies according to the conditions under which they are operated, to economic factors such as the financial condition of the operator, and to the technology existing at the time they were manufactured. Recent improvements in the field of metallurgy, for example, have increased the useful lifespan. Those buses built immediately after World War II are inferior to those produced today in terms of physical endurance and performance. Keeping these variations in mind, however, the useful life of a bus can be roughly estimated to be from 12 to 15 years.

No estimate need be made for streetcars and trolley coaches since these are being abandoned by most systems in favor of buses.

For rapid transit cars, 35 years has been advanced as a rough measure of useful life. Again it may vary depending upon circumstances, especially upon the financial ability of the system to purchase new cars.

Using these criteria, an analysis of table V reveals that approximately one-third of the transit buses in 1964 were beyond their useful lifespans. Roughly, about 1.2 percent of the buses were from 33 to 24 years old; 32.5 percent from 23 to 14 years; 45.7 percent from 13 to 4 years; and 21.6 percent were under 4 years. It is more difficult to analyze the data on rapid transit cars since 10-year breakdowns are not provided. In 1964, 7.8 percent were more than 64 years old; 30.1 percent from 43 to 24 years; 38 percent from 24 to 4 years; and 24 percent less than 4 years old.

TABLE V.—*Age distribution of transit vehicles (as of Dec. 31, 1964)*

Year built	Number of transit vehicles				
	Rapid transit cars [1]	Surface streetcars	Trolley coaches	Motorbuses [1]	Total transit vehicles
Before 1900	0	0	0	0	0
During 1901–20	711	0	0	0	711
During 1921–40	2,730	1,560	171	610	48,691
During 1941–60	3,451		1,694	38,475	
Since 1961	2,172	0	0	10,115	12,287
Total	9,064	1,560	1,865	49,200	61,689

Further breakdown of motorbuses:	
1921–30	0
1931–40	610
1941–50	16,010
1951–60	22,465

[1] Estimated.

Source: American Transit Association.

TABLE VI.—*New passenger equipment delivered to transit companies in the United States, 1940 and 1945 to 1964, inclusive (50 States and the District of Columbia)*

Calendar year	Railway cars			Trolley coaches	Motor-buses	Grand total
	Surface	Subway and elevated	Total			
1940	463	189	652	618	3,994	5,264
1945	332	0	332	186	4,476	4,994
1946	421	0	421	266	6,478	7,165
1947	626	2	628	955	12,079	13,662
1948	478	248	726	1,430	7,009	9,165
1949	273	415	688	680	3,358	4,726
1950	4	199	203	179	2,676	3,058
1951	56	140	196	600	4,552	5,348
1952	19	0	19	224	1,749	1,992
1953	0	0	0	0	2,261	2,261
1954	0	260	260	0	2,225	2,485
1955	0	288	288	43	2,098	2,429
1956	0	376	376	0	2,759	3,135
1957	0	469	469	0	2,021	2,490
1958	0	428	428	0	1,698	2,126
1959	0	210	210	0	1,537	1,747
1960	0	416	416	0	2,806	3,222
1961	0	468	468	0	2,415	2,883
1962	0	406	406	0	2,000	2,406
1963	0	658	658	0	3,200	3,858
1964	0	640	640	0	2,500	3,140

TABLE VII.—*Trends of passenger equipment owned in the United States, 1940 and 1945–64, inclusive (50 States and the District of Columbia)*

As of Dec. 31—	Railway cars			Trolley coaches	Motor-buses	Grand total
	Surface	Subway and elevated	Total			
1940	26,690	11,032	37,722	2,832	35,100	75,654
1945	26,160	10,217	36,377	3,826	49,841	90,044
1946	24,050	9,429	33,479	4,031	52,636	90,146
1947	20,788	9,370	30,158	4,822	57,137	92,117
1948	16,824	9,456	26,280	5,802	58,732	90,814
1949	14,859	9,869	24,728	6,481	57,226	88,435
1950	13,228	9,758	22,986	6,619	57,000	86,605
1951	10,960	9,644	20,604	7,186	57,810	85,600
1952	9,700	9,476	19,176	7,280	56,110	82,566
1953	7,990	9,244	17,234	7,031	54,800	79,065
1954	6,400	9,200	15,600	6,683	54,100	76,383
1955	5,300	9,232	14,532	6,242	52,500	73,274
1956	3,970	9,255	13,225	5,833	51,500	70,558
1957	3,601	9,158	12,759	5,412	51,000	69,171
1958	3,108	9,093	12,201	4,848	50,300	67,349
1959	2,983	9,000	11,983	4,297	49,700	65,980
1960	2,856	9,010	11,866	3,826	49,600	65,292
1961	2,341	9,078	11,419	3,593	49,000	64,012
1962	2,219	8,865	11,084	3,161	48,800	63,045
1963	1,756	8,878	10,634	2,155	49,400	62,189
1964	1,560	9,064	10,624	1,865	49,200	61,689

(c) *Ownership*

Of the 1,152 transit companies in the United States, under 7 percent are publicly owned. Publicly owned systems operate in 16 of the U.S. cities over 250,000 population: Oakland (Alameda-Contra Costa Transit District), Los Angeles, San Francisco, Miami, Chicago, Boston, Detroit, St. Louis, New York, Cleveland, Pittsburgh, Memphis, San Antonio, Dallas, Seattle, and Providence.

Most publicly owned systems are owned by municipalities and operated by them within the city limits and contiguous territory, but about a third are owned by public corporations such as the Alameda-Contra Costa Transit District, the Massachusetts Bay Transportation Authority (Boston), and the Port Authority of Allegheny County (Pittsburgh).

TABLE VIII.—*Distribution by types of ownership, number of transit companies, number of transit vehicles (Dec. 31, 1964)*

Ownership by—	Number of transit companies	Number of transit vehicles				
		Rapid transit cars	Surface street-cars	Trolley coaches	Motor-buses [1]	Total transit vehicles
State government or State agencies	0	0	0	0	0	0
Cities, counties, towns, special districts, public authorities or other local public bodies	77	8,568	882	1,136	19,000	29,520
Private, nonprofit organizations or co-operatives	0	0	0	0	0	0
Proprietary or profitmaking organizations	1,075	496	678	729	30,200	32,169
Total	1,152	9,064	1,560	1,865	49,200	61,689

[1] Estimated.

Source: American Transit Association.

(d) *Current Value*

One indication of the current value of urban mass transportation facilities is gross investment. As of 1964, over $4 billion was invested in the transit industry as a whole, including railway, trolley coach, and motorbus (table IX).

TABLE IX.—*Gross investment of the transit industry as of Dec. 31, 1940, 1945–64, segregated as to mode of service (50 States and the District of Columbia)*

[Thousands of dollars]

Year	Surface railway	Rapid transit	Total railway	Trolley coach	Motor bus	Industry total
1940	$1,574,600	$2,014,000	$3,588,600	$58,700	$451,800	$4,099,100
1945	1,570,000	2,050,000	3,620,000	78,500	569,500	4,268,000
1946	1,456,600	2,050,900	3,507,500	82,400	602,900	4,192,800
1947	1,279,100	2,050,900	3,330,000	97,800	656,100	4,083,900
1948	1,060,000	2,051,000	3,111,000	120,300	675,100	3,906,400
1949	998,000	2,112,000	3,110,000	139,300	697,100	3,946,400
1950	913,000	2,147,000	3,060,000	146,400	718,000	3,924,400
1951	811,000	2,186,000	2,997,000	164,400	743,700	3,905,100
1952	801,000	2,191,000	2,992,000	174,200	749,500	3,915,700
1953	780,000	2,200,000	2,980,000	172,200	753,600	3,905,800
1954	692,000	2,250,000	2,942,000	166,900	759,600	3,868,500
1955	616,000	2,286,000	2,902,000	161,900	762,600	3,826,500
1956	577,000	2,303,000	2,880,000	149,900	772,500	3,802,400
1957	435,000	2,385,000	2,870,000	143,000	785,700	3,798,700
1958	334,000	2,497,000	2,831,000	139,000	777,700	3,747,700
1959	296,000	2,560,000	2,856,000	125,000	796,700	3,777,700
1960	259,000	2,636,000	2,895,000	117,000	817,000	3,829,000
1961	235,000	2,732,000	2,967,000	115,000	837,000	3,919,000
1962	229,000	2,813,000	3,042,000	106,000	854,000	4,002,000
1963	175,000	2,901,000	3,076,000	70,000	879,000	4,025,000
1964	165,000	2,979,000	3,144,000	65,000	897,000	4,106,000

Source: American Transit Association.

B. Costs and Charges

1. REVENUES AND COSTS

No analysis of transit costs can be meaningful without consideration of the changes in transit use. Prior to World War II, the peak of transit traffic was reached in 1926. In that year, over 17 billion passengers were carried by all modes of urban mass transit in the United States (table X). Following 1926, changes in our society brought about an increase in the use of private transportation and a corresponding decrease in mass transit ridership. Automobiles became cheaper and more plentiful and roads improved. As urban areas expanded, the private automobile became more useful as a flexible, rapid means of transportation. Between 1935 and 1960, urban population increased about 60 percent, estimated automobile travel in urban areas (in miles) increased by 170 percent, while mass transit rides declined about 25 percent. This trend of decreasing use of mass transit facilities has continued to the present despite a period during World War II when restrictions were placed on the use of the private automobile. The declining volume of passengers was accompanied by a decline in transit operating revenues, as shown in table XI.

Long-Term Trend of Traffic

Table X.—*Total passengers carried on transit lines of the United States*

[In millions]

Year	Electric railways			Trolley coaches	Motor-buses	Total
	Rapid transit	Surface	Total			
1912	1,041	11,109	[1] 12,150	----------	----------	12,150
1920	1,792	13,770	15,562	----------	----------	15,562
1925	2,264	12,924	15,188	----------	1,484	16,672
1926	2,350	12,895	15,245	----------	2,009	17,254
1930	2,559	10,530	13,089	16	2,481	15,586
1935	2,236	7,286	9,522	96	2,625	12,243
1940	2,382	5,951	8,333	542	4,255	13,130
1945	2,698	9,426	12,124	1,298	9,946	23,368
1946	2,835	9,027	11,862	1,354	10,247	23,463
1947	2,756	8,096	10,852	1,398	10,374	22,624
1948	2,606	6,506	9,112	1,558	10,759	21,429
1949	2,346	4,839	7,185	1,691	10,193	19,069
1950	2,264	3,904	6,168	1,686	9,447	17,301
1951	2,189	3,101	5,290	1,658	9,227	16,175
1952	2,124	2,477	4,601	1,666	8,901	15,168
1953	2,040	2,036	4,076	1,587	8,280	13,943
1954	1,912	1,489	3,401	1,387	7,643	12,431
1955	1,870	1,207	3,077	1,223	7,269	11,569
1956	1,880	876	2,756	1,163	7,062	10,981
1957	1,843	679	2,522	1,003	6,903	10,428
1958	1,815	572	2,387	843	6,540	9,770
1959	1,828	521	2,349	749	6,498	9,596
1960	1,850	463	2,313	657	6,425	9,395
1961	1,855	434	2,289	601	5,993	8,883
1962	1,890	393	2,283	547	5,865	8,695
1963	1,836	329	2,165	413	5,822	8,400
1964	1,877	289	2,166	349	5,813	8,328

[1] From U.S. Census of Electrical Industries; remaining figures are American Transit Association estimates.

TABLE XI.—*Trend and distribution of transit operating revenue in the United States by types of service, 1940 and 1945–64, inclusive (50 States and the District of Columbia)*

[In millions]

Calendar year	Railway			Trolley coach	Motorbus	Grand total
	Surface	Subway and elevated	Total			
1940	$328.3	$128.3	$456.6	$25.5	$256.7	$738.8
1945	560.1	149.4	709.5	71.2	605.5	1,386.2
1946	543.6	157.5	701.1	74.5	626.4	1,402.0
1947	510.4	156.6	667.0	79.3	649.5	1,395.8
1948	474.6	191.7	666.3	92.8	733.8	1,492.9
1949	402.5	218.0	620.5	114.4	760.5	1,495.4
1950	361.7	216.4	578.1	124.1	753.9	1,456.1
1951	318.9	214.7	533.6	134.1	808.9	1,476.6
1952	279.7	213.9	493.6	149.8	862.3	1,505.7
1953	250.6	239.5	490.1	153.5	873.6	1,517.2
1954	204.2	269.2	473.4	143.9	858.8	1,476.1
1955	175.5	264.3	439.8	133.2	857.7	1,430.7
1956	139.4	271.4	410.8	130.0	879.7	1,420.5
1957	115.3	267.6	382.9	117.5	889.7	1,390.1
1958	99.1	266.5	365.6	103.2	885.2	1,354.0
1959	93.0	272.2	365.2	91.0	924.9	1,381.1
1960	87.6	281.8	369.4	81.9	955.9	1,407.2
1961	79.9	285.7	365.6	78.7	945.4	1,389.7
1962	73.3	293.0	366.3	76.0	961.2	1,403.5
1963	61.2	287.4	348.6	56.2	985.8	1,390.6
1964	55.6	295.8	351.4	46.4	1,010.3	1,408.1

Source: American Transit Association.

Changes occurred in these years also in the use of transit facilities during the day. Due to an increasing separation of residential and employment centers, greater use of the automobile for recreation and shopping, and the postwar shift from a 6- to a 5-day workweek, mass-transit riding has become highly concentrated in the 4-hour period of each working day Monday through Friday when persons commute to and from their places of employment. This concentration of ridership in a brief period of time is one of the main reasons for continuing high costs in the transit industry despite an overall reduction in the number of passengers. Equipment and manpower needed for the peak hours are not used to their greatest capacity during the off-peak period.

Table XII shows a deteriorating financial picture for mass transit since the war. A striking change has been the decline in the ratio of operating income to gross operating revenue. This ratio declined from 10.77 percent in 1945 to 0.5 percent in 1958. It rose again from 1959 to 1962 but fell in 1963 and 1964 when operating deficits occurred.

One of the largest items accounting for an increase in operating expenses has been labor. In many cities the cost of labor has increased 100 percent in this period. The cost of replacement parts and fuel is also about double what it was before World War II. Part of the labor and fuel costs are due to traffic congestion, not met by corresponding increase in passenger revenue. It is estimated that delays in downtown traffic absorb at least 18 percent of the total vehicle running time.

TABLE XII.—*Results of transit operations in the United States, 1940, 1945 to 1964, inclusive (50 States and the District of Columbia)*

[Dollar amounts in thousands]

Year	Operating revenue	Payroll	Operating expenses except payroll	Total operating expenses	Net revenue	Taxes	Operating income	Payroll percent of operating expenses	Percentage distribution (percent of operating revenue)					
									Payroll	Other operating expenses	Total operating expenses	Net revenue	Taxes	Operating income
1940	$738,800	$360,600	$238,860	$599,460	$139,340	$62,870	$76,470	60.15	48.81	32.33	81.14	18.86	8.51	10.35
1945	1,386,200	634,700	436,980	1,071,680	314,520	165,240	149,280	59.22	45.79	31.52	77.31	22.69	11.92	10.77
1946	1,402,000	715,500	418,020	1,133,520	268,480	129,400	139,080	63.12	51.03	29.82	80.85	19.15	9.23	9.92
1947	1,395,800	792,600	450,540	1,243,140	152,660	105,270	47,390	63.76	56.78	32.28	89.06	10.94	7.54	3.40
1948	1,492,900	831,300	516,260	1,347,560	145,340	101,530	43,810	61.69	55.68	34.58	90.26	9.74	6.80	2.94
1949	1,495,400	843,100	498,810	1,341,910	153,490	89,350	64,140	62.83	56.38	33.36	89.74	10.26	5.97	4.29
1950	1,456,100	837,000	462,890	1,299,890	156,210	89,590	66,620	64.39	57.48	31.79	89.27	10.73	6.15	4.58
1951	1,476,600	874,100	460,490	1,334,590	142,010	95,820	46,190	65.50	59.20	31.18	90.38	9.62	6.49	3.13
1952	1,505,700	905,300	467,830	1,373,130	132,570	102,610	29,960	65.93	60.13	31.07	91.20	8.80	6.81	1.99
1953	1,517,200	915,300	458,710	1,374,010	143,190	97,910	45,280	66.62	60.33	30.23	90.56	9.44	6.45	2.99
1954	1,476,100	897,200	443,440	1,340,640	135,460	90,280	45,180	66.92	60.78	30.04	90.82	9.18	6.12	3.06
1955	1,430,700	866,300	414,510	1,280,810	149,890	93,970	55,920	67.64	60.55	28.97	89.52	10.48	6.57	3.91
1956	1,420,500	854,300	420,600	1,274,900	145,600	89,690	55,910	67.01	60.14	29.61	89.75	10.25	6.31	3.94
1957	1,390,100	842,300	422,840	1,265,140	124,960	88,000	36,960	66.58	60.59	30.42	91.01	8.99	6.33	2.66
1958	1,354,000	833,300	436,110	1,269,410	84,590	77,810	6,780	65.64	61.54	32.21	93.75	6.25	5.75	.50
1959	1,381,100	834,400	435,490	1,269,890	111,210	85,440	25,770	65.71	60.42	31.53	91.95	8.05	6.19	1.86
1960	1,407,200	857,300	432,550	1,289,850	117,350	86,660	30,690	66.47	60.92	30.74	91.66	8.34	6.16	2.18
1961	1,389,700	856,400	439,370	1,295,770	93,930	77,200	16,730	66.09	61.62	31.62	93.24	6.76	5.56	1.20
1962	1,403,500	878,100	427,900	1,306,000	97,500	77,800	19,700	67.24	62.56	30.49	93.05	6.95	5.54	1.41
1963	1,390,600	892,300	420,260	1,312,560	78,040	978,920	[1] 880	67.98	64.17	30.22	94.89	5.61	5.68	----------
1964	1,408,100	916,900	425,680	1,342,580	65,520	77,910	[1] 12,390	68.29	65.12	30.23	95.35	4.65	5.53	----------

[1] Deficit.

Source: American Transit Association.

In 1964, transit companies paid $78 million in taxes, approximately 57 percent of which were Federal and 43 percent State, county, and local. It is estimated that about 25 percent of all taxes paid by transit companies are of the franchise type. Frequently amounting to from 2 to 5 percent of gross revenues regardless of the financial position of the company, these were levied by municipalities when transit companies had a monopoly of local transportation and were taxed to pay for the privilege of using the city streets. They are retained in many instances, although the private automobile now offers direct competition to mass transit.

2. USER CHARGES

Rising costs and declining patronage made it necessary for transit systems to raise fares. Tables XIII and XIV show that the median fare increased from 7 cents in 1944 to 20 cents in 1963 in cities of 25,000 population and over. In 1944, no fare was over 10 cents. By 1963, 35 percent of the transit systems charged 25 cents and 32 percent, 20 cents for a single zone of travel.

TABLE XIII.—*Percentage distribution of cash fares in effect in U.S. cities having a population of 25,000 or more,[1] selected dates, 1944–63*

Cash fare (cents) [2]	Dec. 31, 1944	Sept. 1, 1950	Apr. 15, 1955	Sept. 15, 1960	Aug. 22, 1963
35	0	0	0	0	([3])
30	0	0	0	1.07	3.65
25	0	0	0	17.38	35.83
20	0	0	11.11	36.27	32.52
15	0	8.25	53.66	35.41	21.39
10	43.77	68.69	24.32	3.43	3.30
5	33.01	8.01	.21	0	0
Other	23.22	15.05	10.70	6.44	3.11
Total	100.00	100.00	100.00	100.00	100.00

[1] Each city system is counted as a unit. If 2 or more independent systems operate in a city, each is counted separately.
[2] Fares are separate fares for 1 zone of travel.
[3] Since August 1963, Akron and Youngstown, Ohio, have moved to 35-cent fares.

Source: American Transit Association.

TABLE XIV.—*Median and modal cash fares on public transportation lines in U.S. cities of 25,000 and over, selected years, 1944–63*

[In cents]

Year	Median fare	Most common fare
1944	7	10
1948	10	10
1950	10	10
1952	10	10
1954	15	15
1956	15	15
1958	15	15
1960	20	20
1961	20	20
1962	20	[1] 20–25
1963	20	25

[1] 34.22 percent of fares at each level.

Source: Data gathered by the American Transit Association.

C. Trend of Capital Outlays

No figures are available for capital outlays for mass transit facilities during the 1946–65 period with the exception of the expenditures made by State and local governments (listed in table XV).

Under the 1964 Urban Mass Transportation Act which first made Federal funds available for mass transit facilities and equipment, 44 projects have been approved from the passage of the act to the end of July 1966. These permit Federal capital grants of almost $157 million for transit facilities to be matched by local and State funds of $106 million.

Table XV.—*Capital outlays for transit facilities by State and local governments*

[In millions]

Year:	*Amount*	Year—Continued	*Amount*
1952	$67	1959	$102
1953	52	1960	94
1954	62	1961	120
1955	81	1962	90
1956	109	1963	168
1957	120	1963–64	155
1958	134	1964–65	242

Source: Bureau of the Census, "Governmental Finances," various issues.

D. Needs and Capital Requirements

Rapid population growth and increasing urbanization in the United States will require greatly augmented expenditures for mass transportation facilities. It is estimated that U.S. population will reach 250 million by 1980 and 350 million by 2000. In 1980, 75 percent of the U.S. population will be living in urban areas comprising only 2 percent of the land area. By that year, 40 urban complexes of over 1 million each will contain 140 million people.

The Institute of Public Affairs in a study completed in 1962 for the Housing and Home Finance Agency Administrator and the Secretary of Commerce estimated that mass transit needs (including commuter railroad as well as rapid transit and bus systems) would amount to $9.8 billion for the following decade. About $7.6 of this would be needed for commuter rail and rapid transit facilities.

The Department of Housing and Urban Development updated these estimates in 1966. It foresaw the capital needs of urban transportation from 1966 to 1975 as $10.9 billion, including $8.6 billion for rail facilities authorized or planned, $1 billion for possible future rail facilities, and $1.3 billion for bus replacements. The latter does not take into account bus system expansion or the replacement of such facilities as shops and administrative facilities. The American Transit Association estimates the normal number of bus replacements each year as in the neighborhood of from 2,500 to 3,000.

The following estimates were made of the major metropolitan rail transit system capital needs from 1966 to 1975: Atlanta, $329 million; Baltimore, $531 million; Boston, $590 million; Chicago, $930 million; Cleveland, $60 million; Los Angeles, $900 million; New York, $2,500 million; Philadelphia, $506 million; San Francisco, $1,230 million; Seattle, $111 million, and Washington D.C., $950 million. Table

XVI compiled by the American Transit Association gives details on some of the rapid transit and commuter railroad projects already authorized or in prospect at the present time.

It is difficult to break down capital needs on a yearly basis since so much depends upon the timing of the contemplated projects. HUD estimates, however, that almost $2 billion will be required in the next 3 years for the capital needs of the major metropolitan rail transit systems alone.

Sufficient knowledge of future conditions is also lacking to make a determination of how much of the capital outlays will be obtained from operating revenues and how much from Federal, State, and local government sources.

TABLE XVI.—*Rapid transit projects authorized or in prospect, urban transit industry*

System	Number of cars, cost	System cost and improvements
Allegheny Port Authority (Pittsburgh).		Studying the conversion of Castle Shannon streetcar line to rapid transit.
Atlanta	375 cars; $29,200,000	66-mile system. Estimated cost; $29,200,000.
Chicago Transit Authority	180 under construction by Pullman-Standard; $19,000,000.	$45,000,000 for new projects exclusive of cars (left). Extension of our John F. Kennedy (Northwest) Expressway. Long range needs $300,000,000.
Cleveland Transit Authority	30 cars; $2,200,000	$13,200,000 total. Extension to Hopkins International Airport.
Massachusetts Bay Transportation Authority.	300; $22,500,000	$225,000,000 authorized for projects. Haymarket Sq. to Reading, Mass., an extension at $53,000,000. 11½ miles, Boston-Quincy-Braintree, the Old Colony Route. Conversion of Highland Branch from PCC cars to rapid transit.
Milwaukee		Special mass transit study committee formed. Talk of buying abandoned North Shore or developing rail transit.
New York City Transit Authority.	200 cars on bid, 600 cars on order, Budd Co.; $68,800,000.	Plans to buy an average of 200 cars per year. Various extensions proposed. DeKalb-Chrystie-Sixth Ave. tunnels $100,000,000. Manhattan-Queens tunnel (proposed), $86,000,000.
PATH (Trans-Hudson)	162 on order, St. Louis Car; $17,000,000; 50 optional.	Multi-million-dollar program to modernize physical, electrical equipment. Has option to take 50-plus additional cars for use in northern New Jersey connecting service.
Philadelphia	300 at least	Voters approve $87,330,000 bond issue to extend Broad St. subway. Sepact (Southeastern Pennsylvania Transportation Compact) plans to modernize 216.8 route miles of commuter lines for $103,200,000—modern cars, upgraded physical property.
San Francisco (BARTD)	450 cars; $71,000,000	75-mile system, $792,000,000.
Seattle		Puget Sound regional transportation study will recommend an overall transit plan.
Southern California Rapid Transit District (SCRTD, Los Angeles).	800 to 900; $69,000,000	58 miles proposed, $694,000,000.
Washington, D.C.	600 cars	24.9 miles, $431,000,000. Revised plan.

Source: Modern Railroads, January 1965.

Chapter 14

Airport Facilities*

A. Nature and Composition of Facilities

1. Description of Facilities

(a) *Physical Characteristics*

There are approximately 9,500 civil aircraft landing facilities in the United States composed of airports, heliports, and seaplane bases. The national airport system which is considered a key to our national aviation system is composed of approximately one-third of these, plus some additional planned facilities for a total of 4,106. Over 90 percent of this total are airports, as distinguished from heliports and seaplane bases. Although the airports comprising the national system range across the entire spectrum in size, physical characteristics, and service provided, each one has the same common function, i.e., to provide an area for the safe takeoff and landing of aircraft. In size, they range from as small as 20 acres up to 10,000 acres.

The runway orientation and configuration are probably the most variable of the physical characteristics. The orientation of a runway is primarily related to the direction, intensity, and duration of the surface winds and, to a lesser extent, to the topography and soil conditions of the site. Thus, a runway can be orientated in practically any compass heading. The configuration of the runway system in addition to being related to surface winds also has an effect on airport capacity. The configuration of the runway system can be a single runway layout or a multirunway layout. The multirunway configuration can be two or more intersecting runways, two parallel runways, or any combination of these. Each runway has an area surrounding it which is designated to be cleared of obstructions to permit safe ingress and egress of aircraft.

A taxiway system is normally provided to permit ground maneuvering of aircraft between runway and apron. Needless to say, more complex runway configurations require correspondingly more complex taxiway systems. Although the paved runways and taxiways are considered adequate for all aircraft traffic, the area between the taxiways and runways is graded to standards which minimize damage to aircraft in the event of inadvertent or accidental maneuver of the aircraft off of the paved surfaces.

The taxiway system can serve one multipurpose apron or several separate single-purpose aprons, such as passenger, cargo, parking, servicing, hangar, or holding. Such facilities as passenger terminals, cargo terminals, and hangars are contiguous to these aprons.

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*Prepared by Federal Aviation Agency, Airports Service, System Planning Division, with minor editing by committee staff.

Each terminal area is served by access roads and parking areas designed to accommodate the various vehicles attracted to and used at the airport.

The airports comprising the national system serve both air carrier aviation and general aviation. General aviation is the term applied to that part of civil aviation engaged in pleasure, instructional, and commercial and business flying other than air carrier. The extent of activities within this segment of civil aviation precludes listing all the purposes and missions it fulfills.

Airport capacity is usually measured in terms of the number of air operations per unit of time. An air operation is defined as the takeoff or landing of one airplane. The runway system is therefore the major controlling element of the airport facility complex which influences airport capacity. In this context, a single runway has a capacity of from 140,000 to 150,000 annual operations depending upon the type of aircraft involved. Airport capacity can be increased by the construction of additional runways. The relative orientation of the runways in the airfield configuration greatly influences the increased capacity realized by the construction of additional runways. For instance, adding a runway to a 1 runway airport may increase the capacity to only 160,000 annual operations if the 2 runways intersect near their midpoints. If, on the other hand, the 2 runways intersect at their ends and the operations are away from the intersection 100 percent of the time, the capacity is increased to between 230,000 and 270,000 annual operations depending on the type of aircraft involved. The optimum two runway configuration for capacity is referred to as open-parallel runways. In this instance, the runways are separated at least 5,000 feet with the passenger terminal between the runways. The capacity for this scheme ranges from 300,000 to 400,000 annual operations depending on the type of aircraft involved. There are many variations of the examples cited with corresponding varying capacities.

(b) *Standards of Performance*

The standards to which airports in the national system are designed and constructed depend on the type of aircraft used to provide the service desired. These aircraft range from small single-engine, piston-powered general aviation aircraft weighing less than 12,500 pounds, to large multiengine turbojet, high-performance aircraft currently weighing up to 325,000 pounds. The runway length provided for these aircraft at sea level and 59° F. ranges from approximately 1,500 feet to as much as 10,500 feet. These lengths are increased for elevation and temperature above the standards of sea level and 59° F. The pavement strength of the entire airfield and the runway length are predicated on the specific critical airplane in the group of aircraft for which the airport is designed. The remaining standards, i.e., runway and taxiway widths and clearances, traverse and longitudinal grades, and approach clearances, are in turn related to the runway length provided. Visual aids including controls and power supply are provided to permit continuance of operations under adverse weather conditions.

2. EXISTING CAPITAL PLANT IN THE UNITED STATES

(a) *Distribution of Facilities*

As of mid-1965, 9,514 airports, seaplane bases, and heliports had been reported to the Federal Aviation Agency; and by December 1965, this number increased to 9,547. The individual State distribution of the reported facilities in mid-1965, and in December 1965, are provided in table I. State distribution of these facilities by population size of city is not available for the mid-1965 reported facilities; however, it is available for the December 1965 total facilities and is shown in table II.

The annual number of airports, seaplane bases, and heliports reported to this Agency from 1927 to date is included in table III. The increasing number of facilities reported from year to year should not be construed to mean that the additional number, in total, were constructed during that year. In many cases, a facility may have been in operation for several years and not reported to the Agency. Only when it is initially reported by the owner, operator, or manager, and/or first inspected by a representative of this Agency, is it recorded and included in the Agency statistics.

TABLE I.—*Number of airports, seaplane bases, and heliports, United States, Puerto Rico and Virgin Islands—Distribution by State and ownership, July and December 1965*

State	Number facilities, July 1965			Number facilities, December 1965			Ownership unknown
	Total	Publicly owned	Privately owned	Total	Publicly owned	Privately owned	
Aalbama	115	72	43	113 (3)	72	41	0
Alaska	549	400	149	535 (4)	392	142	1
Arizona	183	78	105	181 (7)	79	102	0
Arkansas	117	56	61	120 (2)	57	63	0
California	625	252	373	638 (29)	237	401	0
Colorado	163	61	102	163 (5)	57	105	1
Connecticut	88	14	74	82 (5)	12	70	0
Delaware	19	3	16	18 (0)	3	15	0
District of Columbia	5	5	0	4 (1)	4	0	0
Florida	258	119	139	266 (15)	106	160	0
Georgia	158	77	81	157 (2)	77	80	0
Hawaii	48	18	30	46 (2)	16	30	0
Idaho	178	118	60	171 (7)	113	58	0
Illinois	318	77	251	322 (9)	65	257	0
Indiana	159	49	110	152 (6)	48	104	0
Iowa	212	72	140	215 (3)	77	138	0
Kansas	260	107	153	263 (0)	106	157	0
Kentucky	59	42	17	60 (3)	44	16	0
Louisiana	193	57	136	181 (3)	54	127	0
Maine	138	46	92	137 (2)	46	91	0
Maryland	77	17	60	79 (4)	14	65	0
Massachusetts	127	36	91	118 (9)	29	89	0
Michigan	235	114	121	241 (5)	115	126	0
Minnesota	240	111	129	237 (2)	112	125	0
Mississippi	147	64	83	150 (2)	65	85	0
Missouri	229	70	159	248 (9)	70	178	0
Montana	186	111	75	185 (6)	108	77	0
Nebraska	195	85	110	266 (5)	82	184	0
Nevada	76	36	40	74 (3)	35	39	0
New Hampshire	39	10	29	41 (0)	14	26	1
New Jersey	132	19	113	128 (4)	17	111	0
New Mexico	114	52	62	112 (3)	52	60	0
New York	324	56	268	322 (8)	54	268	0
North Carolina	167	46	121	170 (3)	47	123	0
North Dakota	170	66	104	173 (2)	67	106	0
Ohio	401	55	346	399 (7)	54	345	0
Oklahoma	196	91	105	193 (4)	88	105	0
Oregon	187	78	109	183 (10)	77	106	0
Puerto Rico	20	14	6	17 (2)	10	7	0

See footnote at end of table.

TABLE I.—*Number of airports, seaplane bases, and heliports, United States, Puerto Rico and Virgin Islands—Distribution by State and ownership, July and December 1965*—Continued

State	Number facilities, July 1965			Number facilities, December 1965			Ownership unknown
	Total	Publicly owned	Privately owned	Total	Publicly owned	Privately owned	
Pennsylvania	475	64	411	462 (10)	63	399	0
Rhode Island	14	7	7	11 (1)	5	6	0
South Carolina	99	43	56	95 (1)	43	52	0
South Dakota	98	57	41	102 (1)	60	42	0
South Pacific	5	4	1	5 (0)	4	1	0
Tennessee	109	53	56	107 (4)	52	55	0
Texas	833	214	619	838 (15)	210	628	0
Utah	68	50	18	69 (1)	51	18	0
Vermont	38	12	26	37 (0)	13	24	0
Virginia	112	36	76	112 (3)	37	75	0
Virgin Islands	2	2	0	2 (0)	2	0	0
Washington	214	110	104	203 (16)	97	106	0
West Virginia	53	15	38	54 (1)	15	39	0
Wisconsin	202	84	118	204 (2)	87	117	0
Wyoming	85	42	43	86 (2)	42	44	0
Total	9,514	3,637	5,877	9,547 (253)	3,556	5,988	3

NOTE.—The June 1965 total facilities includes, as facilities, 253 undesignated and unmarked helicopter landing areas which are located at airports. These undesignated areas have been deducted from the December 1965 totals, and are indicated in parentheses should their use be required for determining trends

TABLE II.—*Distribution of airposts, seaplane bases, and heliports by population size of associated city, December 1965*

State	50,000 and over	100,000 to 499,999	50,000 to 99,999	10,000 to 49,999	1,000 to 9,999 [1]	Under 1,000 [1]	Unknown [2]
Alabama	2	5	2	19	66	19	0
Alaska	0	0	0	10	31	211	283
Arizona	4	9	0	21	65	60	22
Arkansas	0	3	4	16	72	23	2
California	67	43	27	146	224	96	35
Colorado	4	3	5	12	67	47	25
Connecticut	2	9	4	23	40	2	2
Delaware	0	1	0	2	12	2	1
District of Columbia	4	0	0	0	0	0	0
Florida	25	31	2	50	91	54	13
Georgia	3	12	2	38	84	17	1
Hawaii	1	0	0	2	12	6	25
Idaho	0	0	1	16	47	60	47
Illinois	10	14	15	56	138	63	26
Indiana	6	10	4	44	64	15	9
Iowa	0	2	6	18	112	49	28
Kansas	1	19	0	41	112	74	16
Kentucky	4	2	1	19	30	1	3
Louisiana	4	18	2	37	81	29	10
Maine	0	2	1	10	61	34	29
Maryland	12	0	1	20	16	20	10
Massachusetts	8	15	7	37	36	12	3
Michigan	15	19	5	22	110	56	14
Minnesota	7	3	0	20	120	66	21
Mississippi	1	3	0	26	86	34	0
Missouri	9	7	6	22	102	83	19
Montana	0	0	3	11	63	75	33
Nebraska	0	7	1	12	104	102	40
Nevada	0	5	4	1	19	38	7
New Hampshire	0	0	2	7	25	5	2
New Jersey	11	10	0	36	37	15	19
New Mexico	0	5	1	25	32	47	2
New York	37	16	6	58	126	49	30
North Carolina	0	17	4	60	80	6	3
North Dakota	0	0	1	11	57	62	42
Ohio	41	32	4	68	151	74	29
Oklahoma	10	9	1	29	102	40	2
Oregon	2	3	3	25	63	61	26
Puerto Rico	3	1	2	9	1	1	0

See footnotes at end of table.

—*Distribution of airports, seaplane bases, and heliports by population size of associated city, December 1965*—Continued

State	50,000 and over	100,000 to 499,999	50,000 to 99,999	10,000 to 49,999	1 000 to 9,999 [1]	Under 1,000 [1]	Unknown [2]
Pennsylvania	18	35	14	62	208	100	25
Rhode Island	1	0	0	5	3	2	0
South Carolina	0	11	2	16	56	7	3
South Dakota	0	1	1	9	43	40	8
South Pacific	0	0	0	1	0	0	4
Tennessee	4	14	1	21	51	16	0
Texas	55	40	13	129	417	163	21
Utah	0	5	1	5	38	12	8
Vermont	0	0	0	6	17	12	2
Virginia	2	6	9	32	31	22	10
Virgin Islands	0	0	0	2	0	0	0
Washington	6	10	1	29	78	72	7
West Virginia	0	2	4	11	20	9	8
Wisconsin	2	7	1	20	96	35	43
Wyoming	0	0	0	6	36	27	17
Total	381	466	174	1,433	3,833	2,225	1,035

[1] Requested breakdown of population group 2,500 to 9,999 and under 2,500 is not available.
[2] Privately owned facilities which serve only the owner or small group; therefore, the actual population is unknown.

TABLE III.—*Recorded airport facilities, 1927–65*

Year (Dec. 31):	*Number reported airports, seaplane bases, and heliports*
1927	1,036
1930	1,782
1933	2,188
1936	2,342
1939	2,280
1942	2,809
1945	4,026
1946	4,490
1947	5,759
1948	6,414
1949	6,484
1950	6,403
1951	6,237
1952	6,042
1953	6,760
1954	6,977
1955	6,839
1956	7,028
1957	6,412
1958	6,018
1959	6,426
1960	6,881
1961	7,715
1962	8,804
1963	8,818
1964	9,490
1965	9,547

(b) *Ownership Pattern*

The individual State totals of publicly and privately owned airports, seaplane bases, and heliports reported in mid-1965 and in December 1965, are included within table I. A publicly owned facility is one owned by State governments, State agencies, cities, counties, towns, special districts, public authorities, or other local public bodies, and the Federal Government. A privately owned facility is one owned by private, nonprofit organizations and cooperatives, proprietary or profitmaking organizations and individuals.

Private airports (5,988 in number) constitute 63 percent of the Nation's total airport facilities. Of the 3,556 public airports in operation, only a small percentage is owned and operated by State governments or State agencies. Counties, cities, towns, public authorities, or other metropolitan or local public bodies own, operate, or lease for operation by far the larger percentage of publicly owned airports.

Federal Government ownership and operation of airports is very limited. The two airports used by air carriers serving the Nation's Capital are owned and operated as Federal airports. Employees of the airport management at these two airports are Federal employees.

The current value, calendar year 1965, of publicly owned airport afcilities including real estate is estimated to be $5 billion.

B. Cost and User Charges

1. CONSTRUCTION AND OPERATING COSTS

The range of typical initial capital costs of airport construction is indicated in table IV. The construction costs are identified by type of airport facility, and are estimated both in total amount and on the basis of an accepted standard unit of measure. For most facilities this unit of measure is the cost per linear foot, per square foot, or per square yard. Costs for terminal air traffic control (ATC) facilities and navigational visual aids are estimated as total facility costs. Typical costs are shown for four types of airports in table IV in order to present the range of both scope and cost. Also, two ranges of facilities have been included for airports used by airlines and for those used by general aviation exclusively. All facilities are normally expected to have at least a 20-year long-time durability and are considered to be permanent facilities. This is consistent with the policy and procedures followed for other public work facilities.

The range of typical annual airport maintenance and operation expenses are identified by the type of airport facility in table V and, thus, can be directly associated with the cost breakdown of table IV. Operating expenses have been given as a separate item for those facilities where this expense represents a significant outlay relative to the total maintenance and operating costs. For example, major operating expenses are associated with electrical utility for lighted runway and taxiway facilities and for salaries of personnel operating ATC facilities.

Table IV.—*Range of typical airport construction costs*

[Historical dollar costs]

AIRPORTS USED BY AIRLINES

Airport facilities	Large		Small	
	Total	Per unit	Total	Per unit
Landing area:				
Runway (lighted)	$1,000,000–$8,000,000	[1] $200–$800	$500,000–$2,000,000	[1] $100–$500
Taxiway (lighted)	500,000–1,000,000	[1] 75–150	300,000–700,000	[1] 50
Aprons	500,000–2,000,000	[2] 9	50,000–150,000	[2] 6
Aircraft hangar facilities	500,000–5,000,000	[3] 5–25	200,000–500,000	[3] 2–15
Terminal area:				
Building (administration)	10,000,000–20,000,000	[3] 50–75	2,000,000–5,000,000	[3] 25–50
Auto parking and ground access	100,000–200,000	[2] 2–4	50,000–100,000	[2] 2–4
Servicing facilities (airport)	100,000–200,000	[3] 10–25	50,000–100,000	[3] 5–15
Terminal ATC facilities	900,000	----------	450,000	----------
Navigational visual aids	[4] 1,095,000	----------	375,000	----------

See footnotes at end of table.

TABLE IV.—*Range of typical airport construction costs*—Continued

AIRPORTS USED BY GENERAL AVIATION ONLY

	Large (public)		Small (private)	
	Total	Per unit	Total	Per unit
Landing area:				
Runway (lighted)	$500,000–$1,000,000	[1] $100–$300	$90,000–$500,000	[1] $30–$150
Taxiway (lighted)	300,000–700,000	[1] 50	10,000	[1] 25
Aprons	50,000–150,000	[2] 6	5,000–10,000	[2] 2–4
Aircraft hangar facilities	100,000–500,000	[3] 2–5	([4])	([4])
Terminal area:				
Building (Administration)	100,000–500,000	[3] 15–35	([4])	([4])
Auto parking and ground access	10,000–50,000	[2] 2–4	1,000–5,000	[2] 1–4
Servicing facilities (airport)	20,000–50,000	[3] 5–10	([4])	([4])
Terminal ATC facilities	340,000		([4])	([4])
Navigational visual aids	85,000		7,000	

[1] Per linear foot.
[2] Per square yard.
[3] Per square foot.
[4] Not available.

TABLE V.—*Range of typical annual airport maintenance and operation costs*

AIRPORTS USED BY AIRLINES

Airport facilities	Large		Small	
	Total	Per unit	Total	Per unit
Landing area:				
Runway (lighted):				
Maintenance	$5,000–$10,000	[1] $1.00	$2,000–$5,000	[1] $0.50
Operation	2,000–5,000	[1] .50	1,000–3,000	[1] .30
Taxiway (lighted):				
Maintenance	3,000–7,000	[1] .50	1,000–3,000	[1] .25
Operation	3,000–7,000	.50	1,000–3,000	[1] .30
Aprons:				
Maintenance	2,000–5,000	[2] .10	500–1,000	[2] .05
Operation	5,000–10,000	[2] .10–.50	1,000–3,000	[2] .10–.25
Aircraft hangar facilities:				
Maintenance and operation	10,000–15,000	[3] 1.00–2.00	5,000–10,000	
Terminal area:				
Building (administration):				
Maintenance and operation	25,000–50,000	[3] 1.00–2.00	10,000–15,000	
Auto parking and ground access, maintenance and operation	5,000–10,000	[3] 5.00–0.25	2,000–5,000	[2] .05–.15
Servicing facilities (airport) maintenance and operation	10,000–25,000	[3] 1.00–2.00	5,000–10,000	
Terminal ATC facilities:				
Maintenance	100,000		75,000	
Operation	200,000		125,000	
Navigational visual aids, maintenance and operation	100,000		50,000	

See footnotes at end of table.

TABLE V.—*Range of typical annual airport maintenance and operation costs*—Continued

AIRPORTS USED BY GENERAL AVIATION ONLY

Airport facilities	Large (public)		Small (private)	
	Total	Per unit	Total	Per unit
Landing area:				
Runway (lighted):				
Maintenance	$2,000–$5,000	[1] $0.50	$800	[1] $0.25
Operation	1,000– 3,000	[1] .30	900	[1] .30
Taxiway (lighted):				
Maintenance	1,000– 3,000	[1] .25	200	[1] .25
Operation	1,000– 3,000	[1] .30	300	[1] .30
Aprons:				
Maintenance	500– 1,000	[2] .05	150	[2] .05
Operation	1,000– 3,000	[2] .10–.25	150–500	[2] .05–.25
Aircraft hangar facilities, maintenance and operation	2–000– 5,000		(4)	(4)
Terminal area:				
Building (administration), maintenance and operation	5,000–10,000		(4)	(4)
Auto parking and ground access maintenance and operation	500– 1,000	[2] .05–.15	100–500	[2] .05–.10
Servicing facilities (airport) maintenance and operation	2,000– 5,000		(4)	(4)
Terminal ATC facilities:				
Maintenance	15,000		(4)	(4)
Operation	75,000		(4)	(4)
Navigational/visual aids: Maintenance and operation	15,000		2,000	

[1] Per linear foot.
[2] Per square yard.
[3] Per square foot.
[4] Not available.

Annual maintenance and operation expenses vary widely depending upon the degree of maintenance assumed under the individual leasing policy of the owner, and on the degree of services required. At large metropolitan airports the public services constituting annual maintenance and operating expenses extend to police controls, passenger information, operation of nurseries, first-aid stations, etc. Frequently, at small community airports, the only expense to the community is the mowing of the grass. To a very large degree the expenses of the owning public agency depend upon its leasing policy. For example, many small communities have a commercial, rent-paying tenant who sells gas, offers flight services, and takes care of what maintenance and operating burdens the owning municipality incurs. At most publicly owned (i.e., municipal) airports, there is an annual budget for total expenses.

2. USER CHARGES

The range of typical average user charges is indicated in table VI These charges are identified by type of facility used and on the basis of typically accepted fees, admission, lease payments and rentals found within the industry. Included within table VI is an indication of the nonapplicability of particular services at one type of airport or another.

TABLE VI.—*Range of typical airport user charges*

Airport facilities	Airports used by airlines		
	Large		Small per unit
	Total	Per unit	
Landing area, landing fee	$100,000 to $150,000 at 6 to 18 each.	(Air carrier: 15 to 35 cents) (1,000 pounds gross maximum weight.)	$1 to $25 per takeoff or landing.
Aircraft service area:			
Hanger fees	$50,000 to $200,000		
Single-engine aircraft		$75 to $100 per month	$50 to $75 per month.
Multiengine light		$100 to $150 per month	$75 to $100 per month.
Multiengine heavy		$150 to $200 per month	$100 to $200 per month.
Terminal area:			
Tie-down fee		$1 to $20 each	$1 to $5 each.
Building concession space rental.	$200,000 to $250,000	$6 to $12 per square foot per year.	$3 to $9 per square foot per year.
Building administration space rental.	$150,000 to $200,000	$2 to $9 per square foot per year.	$1 to $6 per square foot per year.
Observation deck fee		10 to 25 cents per person.	Free.
Ground transportation support.	$150,000 to $200,000		
Vehicle parking fee		25 to 50 cents per hour	25 cents per hour.
Aviation activities:			
Aircraft rental (available)		$50-100/hour (heavy)	$25 to $50 per hour (light).
Flight instruction fee		(1)	$10 to $20 per multi-engine.
Ground school fee		(1)	$40 each.
Industrial facility rental	$150,000 to $200,000		
Total user charge revenue	$0.5 to $1 million		

Airport facilities	Airports used by General Aviation only	
	Large (public)	Small (private)
	Per unit	*Per unit*
Landing area, landing fee	$5 each	Free.
Aircraft service area:		
Hangar fees:		
Single-engine aircraft	$50 to $75 per month	$10 to $25 per month.
Multiengine light	$75 to $100 per month	$20 to $50 per month.
Multiengine heavy	$100 to $150 per month	$30 to $17 per month.
Terminal area:		
Tie-down fee	$1 each	Free.
Building concession space rental	$3 to $9 per SF per year	$1 to $6 per SF per year.
Building administration space rental	$1 to $3 per SF per year	(1).
Observation deck fee	Free	(1).
Ground transportation support		
Vehicle parking fee	Maximum 25 cents per hour	Free.
Aviation activities:		
Aircraft rental (available)	$15 to $25 per hour (large)	$10 to $15 per hour (small).
Flight instruction fee	$5 to $10 per single engine	(1).
Ground school fee	$20 each	(1).
Industrial facility rental		

[1] Not available.

There is evidence of a trend within the industry to record both costs and revenues in a fiscal accounting system which lends itself to determining the extent user charges are employed to pay for all or part of the services used. There is growing acceptance of the concept that airport user charges should be directly related to the measured costs of providing facilities used. This has not been the case in the past. Hopefully, the planned expenditures will be offset by revenues from user charges.

Only a relatively few public airports have been found to be truly operated on a self-sustaining financial basis. The reasons for this are manifold and complex. However, there are at least two notable causes for such inability. First, the predominant judgment of communities

to directly subsidize reasonable airport operating costs in return for the commerce attracted to the community. Second, the fact that most airports' fees are governed by their comparability to those charged by others, rather than being based upon the airports' factual operating expense.

Long-term self-sustaining airport operation depends upon achievement of that necessary traffic level which will recover the airport's expense through the assessment of reasonable user fees. Throughout the Nation there exist the "haves" and "have nots." Self-sustaining airport operations appear possible through assessment of appropriate user fees at most major terminal cities. Should Federal-aid cease to such airports, it is generally believed that the communities would exercise the wisdom necessary to continue their airports by adjusting such fees as necessary. Such airports are few in number, as illustrated by the fact that only five major airports accommodate nearly 20 percent of all airline flights. More critical is the question of whether the thousands of other communities can or would respond financially.

It is highly unrealistic to expect large public facilities to collect user charges exceeding the sum of prorated operating and capital costs. In those instances where privately owned facilities are operated on a self-sustaining basis with reasonable return on investment, it can usually be expected that there is some attracting force which establishes the level of demand. This may be superior service or even nonaviation related activities.

Under the Federal Aid Airport Program (FAAP), the Federal Government shares in the costs of land acquisition and construction for certain limited basic operational facilities and safety related items (namely, runways, taxiways, airfield lighting, service equipment buildings, etc.). The funds for FAAP are appropriated out of the general tax resources. For State and local governments, general tax resources and general obligation borrowings are used.

A large percentage of airport development projects has been accomplished based on local bond issues. The credit standing of local agencies, coupled with income tax exemptions for bond purchasers, have made this form of capital financing attractive. In addition, there has emerged a requirement on the part of local taxpayers to insist that airport development be financed by revenue bonds. Without the pledge of the total resources of the community, investors and purchasers of these bonds require evidence that the projected revenues to retire the bonds are reasonable and attainable. Moreover, to make such bonds marketable it is frequently necessary to encumber the airport with obligations to the bondholders relative to operatnig practices, rates and charges, etc. It is noteworthy that in some instances the principal users (airlines) have agreed to higher landing fees (user charges) in order to make the financing of much needed airport expansion attractive to bond purchasers, and to help sponsors raise their 50 percent share of funding under the FAAP.

C. Trends of Capital Outlays

ANNUAL TRENDS

Annual expenditures for airport facilities constructed inplace are indicated in table VII. The trend of expenditures is shown as a percentage change from year to year. Prior to 1952, amounts were

published only in aggregate and thus are not available. For 1947 through 1958, FAAP expenditures are shown in table VIII as Federal intergovernmental expenditures. (Flow of funds from tax revenue resources of one level of government to another are designated intergovernmental expenditures and revenues).

Expenditures for airports are influenced by the volume of traffic, by the continuing development of improved aircraft, and by more efficient ways of handling passengers and freight. The volume of traffic, in turn, is dependent upon the rate and nature of the Nation's economic growth, population growth and its regional distribution, and the types and values of commodities transported by air. The change in rate of expenditure reflects development in the state-of-the-art of the aviation industry—the introduction of turbojet airplanes, for example.

Total expenditures by level of government are given in table IX. That portion of total annual expenditures reported to be capital outlay is indicated in table X. Similarly, that portion designated for construction expenditure only is shown in table XI. The proportion accounted for by each level of government is also shown in each of these tables. Similar data are not available for private, nonprofit organizations and cooperatives, nor for proprietary or profitmaking organizations.

TABLE VII.—*Annual expenditures for publicly owned airports*

[Dollars in millions]

Year (December 31)	Total expenditures all governments	Percentage change (trend)
1952	$352	
1953	385	+9.4
1954	372	−3.4
1955	359	−3.5
1956	540	+50.4
1957	508	−5.9
1958	524	+3.1
1959	733	+39.9
1960	842	+14.9
1961	1,065	+26.5
1962	1,082	+1.6
1963	1,097	+1.4
1963 to 1964	1,109	+1.1
1964 to 1965	1,198	+8.0

Source: Bureau of the Census Governmental Finances, various issues.

TABLE VIII.—*Finances of publicly owned airports expenditures under the Federal-aid airport program* [1]

Fiscal year:	*Federal Government expenditures (intergovernmental) (millions)*	Fiscal year—Continued	*Federal Government expenditures (intergovernmental) (millions)*
1947	----	1957	$20.6
1948	$5.1	1958	42.9
1949	30.4	1959	56.6
1950	33.2	1960	57.1
1951	30.4	1961	64.8
1952	32.8	1962	57.9
1953	27.0	1963	51.5
1954	17.5	1964	65.3
1955	8.4	1965	70.6
1956	16.5	1966 (estimated)	75.0

[1] For capital improvements.

Source: Federal Aviation Agency.

TABLE IX.—*Finances of publicly owned airports expenditures by level of government*

[Dollars in millions]

Year	Total all governments	Federal Government	Percent of total	State government	Percent of total	Local government	Percent of total
1959	$733	$425	58.0	$24	3.3	$284	28.7
1960	842	500	59.4	26	3.1	316	37.5
1961	1,065	643	60.4	36	3.4	386	36.2
1962	1,082	709	65.5	35	3.2	338	31.2
1963	1,097	736	67.1	31	2.8	330	30.1
1963 to 1964	1,109	750	67.6	40	3.6	319	28.8
1964 to 1965	1,198	783	65.4	46	3.8	369	30.8

Source: Bureau of the Census Governmental Finances, various issues.

TABLE X.—*Total capital outlay for publicly owned airports*

[Dollars in millions]

Year	Total all governments	Federal Government	Percent of total	State government	Percent of total	Local government	Percent of total
1959	$340	$110	32.4	$20	5.9	$210	61.7
1960	422	179	42.4	19	4.5	224	53.1
1961	543	229	42.2	27	5.0	287	52.8
1962	456	203	44.5	26	5.7	227	49.8
1963	428	203	47.4	21	4.9	204	47.7
1963 to 1964	393	175	44.5	26	6.6	192	48.9
1964 to 1965	371	110	29.6	35	9.4	226	61.0

Source: Bureau of the Census Governmental Finances, various issues.

TABLE XI.—*Airport construction expenditures only*

[Dollars in millions]

Year	Total all governments	Federal Government	Percent of total	State government	Percent of total	Local government	Percent of total
1959	$302	$96	31.8	$19	6.3	$187	61.9
1960	331	112	33.8	17	5.2	202	61.0
1961	433	140	32.3	27	6.3	266	61.4
1962	374	145	38.8	24	6.4	205	54.8
1963	310	125	40.3	21	6.8	164	52.9
1963 to 1964	279	97	34.8	25	9.0	157	56.2
1964 to 1965	312	81	26.0	34	10.9	197	63.1

Source: Bureau of the Census Governmental Finances, various issues.

TABLE XII.—*Revenue charges for air transportation*

[Dollars in millions]

Year	Total all governments	Federal Government	Percent of total	State government	Percent of total	Local government	Percent of total
1959	$128	$1	0.8	$5	3.9	$122	95.3
1960	150	3	2.0	7	4.7	140	93.3
1961	171	3	1.8	8	4.7	160	93.5
1962	210	7	3.3	10	4.8	193	91.9
1963	232	3	1.3	13	5.6	216	93.1
1963 to 1964	238	4	1.7	15	6.3	219	92.0
1964 to 1965	264	4	1.5	16	6.1	244	92.4

Source: Bureau of the Census Governmental Finances, various issues.

In recent years there has been a gradual annual increase in the outlay of FAAP funds for the growing number of development projects. This upward trend can be attributed to the constant need for more airport facilities to keep pace with the continuing growth of all types of aviation activity. Of the total annual capital outlays, about 90 percent is accounted for by projects sponsored by State agencies or by cities, counties, towns, or other local public bodies; the other 10 percent by projects developed and controlled by the Federal Government, including those airports located in or adjacent to national parks. About 35 of the 50 States have a grant-in-aid program for airports, but this source accounts for a small share of the total financing—only as much as 25 percent of project costs. Accordingly, the burden in most instances becomes a municipal burden.

Airport revenues collected by each level of government is shown in table XII. Specific information on other possible sources of financing such as gifts, bequests, donations, fund-raising drives, etc., is not available.

During the period 1947–65, the combined capital outlay of Federal and sponsor funds for eligible items of public airport development under the Federal-aid airport program, including the acquisition of land, amounted to approximately $1,669 million. Federal Government expenditures by year are shown in table VIII. The Federal portion obligated was $825 million, programed for over 6,000 projects at over 2,000 airports. The local funding amounting to $848 million does not include additional sponsor funds provided for items ineligible for Federal participation, such as terminal buildings, hangars, parking lots, and other items not related to operational safety. During the period 1956–66, sponsor requests exceeded actual Federal allocations by an average of $86 million a year. In addition, it is estimated that approximately $1.5 billion in real property assets, based on GSA and War Assets Administration records, were conveyed to local sponsors under the Surplus Property Act of 1944, as amended.

Local and State governments financed 76 percent of all airport development accomplished during the 5-year period, 1960–64. With regard to the source of capital financing, the percentages were 68 percent local funds, 8 percent State funds, and 24 percent Federal funds.

A recent survey of a fairly representative cross-section of airport management indicates that the percentage distribution of the total amount of airport capital financing was as follows: (1) approximately 13 percent general obligation bonds; (2) 68 percent revenue bonds; and (3) 19 percent from "other" sources. Airport revenue bond financing in excess of $91 million occurred at large hub airports and only $75,000 at lesser hub airports; in fact, the lowest airline activity airports (nonhub) resorted wholly to sources other than bond financing. Specific data on tax exempt municipal bonds and capital flotations in security markets in amounts and percentages by year are not available.

The 13,000 members of the National League of Cities indicated in their statement of national municipal policy for 1965 that they lack the financial capability for airport improvement and development. While the inability to financially respond is most acute at the intermediate and lesser sized municipalities, frequently large hub municipal-

ities are also unable to respond. Airport facilities are classified by the league as being of national significance and essential to the economy and commerce of the United States and, as such, warrant a permanent long-term Federal responsibility for financial support.

D. Needs and Prospective Capital Outlays

Airport facility development needs have been forecast for the period 1966–69 in the total amount of $1.96 billion. Of this amount, approximately $760 million (39 percent) is required for terminal building or terminal area development—work which is not eligible for Federal aid. The balance of $1.2 billion relates to needed development which is eligible for Federal aid. During the 4-year period, matching Federal aid approximating $300 million is expected to be available. Thus, the residual local and State financial burden will approximate an additional $600 million during this period.

Forecast data indicates that most major airports are acutely aware of the development needed to accommodate larger capacity aircraft of the future. Such aircraft will be introduced in quantity during the 1970–75 time period. The capital outlay requirements for FAAP eligible airport development are estimated at over $3 billion during the 10-year period 1966–75. Based on the assumption that work not eligible for Federal aid will continue to constitute approximately 40 percent of the total, it is estimated that the total capital outlay requirements for publicly owned airport development needs will approach $5 billion during this decade (see table XIII). Privately owned airports will require another $1 billion.

The key forecast factors considered in the projection of these capital outlay requirements are:

Over 179 million scheduled airline passengers annually by 1975—almost double today's figures.

Hours flown in general aviation aircraft to reach 30 million annually in 1975—an 85-percent increase over that recorded in 1965.

Transition from piston to turbine aircraft by 1970, alone, resulting in extending service from 112 airports at present to 346.

Introduction of supersonic transport, vertical short takeoff and landing, and larger capacity passenger-carrying aircraft in the latter half of this 10-year period requiring the construction and/or expansion of appropriate airport facilities.

An estimated $670 million FAAP eligible airport development cost requirement during the immediate 2-year period 1966–67; with a cumulative requirement of over $1.4 billion for the 5-year period 1966–70.

Attendant with the projected growth and technological advances in the field of aviation, the assumption that the continued FAAP capital outlay requirements for airport development and improvements over the following 5-year period (1971–75) will be equivalent to at least the preceding 5 years plus a 2-percent per annum construction cost increase.

Table XIII provides a summary of the estimated 1966–75 airport development capital outlay requirements by year. These estimates reflect aviation needs and are not a projection of probable expenditures.

Using the 1960 census as the basis, 57 percent of the estimated requirements is attributable to cities with populations of 50,000 or more; 38 percent to cities of 2,500 to 50,000; and 5 percent to cities, towns, and rural areas with populations under 2,500.

TABLE XIII.—*Publicly owned airport development capital outlay requirements, 1966–75*

[In millions]

Fiscal year	FAAP eligible requirements	Total development requirements	Source of funding	
			Federal [1]	Local and State
1966	$330	$475	$75	$400
1967	340	500	75	425
1968	255	500	75	425
1969	275	485	75	410
1970	260	480	75	405
1971	300	490	75	415
1972	300	495	75	420
1973	310	505	75	430
1974	320	520	75	445
1975	320	525	75	450
Total	3,010	4,975	750	4,165

[1] Assuming no change in FAAP funds of $75,000,000 annually.

NOTE.—Estimates of capital outlay.

As in the past, required annual capital outlays will be financed primarily by various levels of government, and to only a minor extent by private organizations. Expenditures by local and State governments for airport development have approximated a relatively stable 0.5 percent of their total annual expenditures for all governmental functions. Local and State governments financed 76 percent of all airport development accomplished during the 5-year period 1960–64, with the remaining 24 percent financed by the Federal Government.

Assuming that no change occurs in the amount of available FAAP funds ($75 million annually), it is estimated that the local and State governments' contribution must increase to approximately 80 percent of the total capital outlay required over the 1966–75 period. Using past experience as a guide, the estimated sources of financing these prospective capital outlays are as follows: revenue bonds—$3,330 million; general obligation bonds—$645 million; Federal Government grant assistance—$750 million; and other sources (State, bank loans, operational funds, tax levies, et cetera)—$250 million.

The ability to float bond issues which pledge future airport revenues to their retirement is, as noted previously, almost exclusively limited to a relatively few of the Nation's major airports. General obligation bond issues are usually possible at large and medium hub airports, but rarely possible at small and nonhub airports which generate from 0.25 percent to less than 0.05 percent of the total annual U.S. passenger traffic. The latter type of airports is almost totally dependent upon "other sources" for financing their needed airport development.

Small hub airports, which are concentrated in metropolitan areas ranging in population from 100,000 to 500,000 possess limited ability

to financially respond to their needed airport development, but are nevertheless faced with federally eligible development needs generally comparable to those of medium hub airports. The situation at non-hub airports is even more severe. The ability of such local governments to totally respond to their development needs is very doubtful.

It is obvious that the total estimated capital outlay requirements will exceed the amount that can be supplied by local and State funds. In addition to increasing direct Federal aid, a system of Federal loans might be made available to local and State governments to enable an orderly and timely development of the Nation's system of civil airports. It would enable development to proceed which would otherwise be delayed or not accomplished because of local government inability to arrange for the required capital financing.

In summary, private finances have not been available to supply the total capital expenditures necessary to build and improve airports on the general sustained basis required by civil aviation. States, municipalities, and other local political units alone have been unable to carry the entire capital burden attendant upon the provision of an adequate system of national airports. Federal, State, and municipality sharing of development costs distributes such costs to beneficiaries in as reasonably an equitable fashion as may be found in any system of public financing. It imposes a one-payment burden upon persons outside of the State in which the airport is located (Federal share), upon State residents a two-payment burden (Federal-State shares), and upon residents of the municipality a three-payment burden (Federal-State-local shares).

CHAPTER 15

Marine Port Facilities*

A. NATURE AND COMPOSITION OF PORTS AND TERMINAL FACILITIES

1. DESCRIPTION OF PORTS AND TERMINAL FACILITIES

(a) *General Physical Characteristics—Structures and Equipment*

A port is a shelter-harbor where marine terminal facilities are provided. The facilities consist of piers, wharves, and slips at which ships berth while loading or unloading cargo; cranes and other mechanical handling equipment which keep the cargo flowing between ship and terminal; transit sheds, warehouses, and other storage areas where goods may be stored for shorter or longer periods while awaiting distribution or sailing; and tracks and roadways which provide the access to and clearance from the terminal facility. Thus the terminal must be served by railroad, highway, or inland waterway connections. In brief, the harbor is a water area affording a natural or artificial haven for ships. Only when it has been developed for transacting business between ship and shore does a harbor become part of a port. Therefore, a port normally consists of a harbor plus marine terminal facilities.

A marine terminal is that part of a port or harbor which provides berthing, cargo handling, storage areas, and railroad and roadway clearance facilities. Terminal facilities are all those arrangements and systems, mechanical or otherwise, which make easy transference of passengers and commodities between ship and shore.

The three most common types of marine terminals, based on use of facility and the service they perform, are freight or cargo terminals where traffic is mainly mixed general cargo and a few passengers carried by freighters, passenger terminals where only passengers are embarked or disembarked with their baggage along with small amounts of lightweight cargo, and bulk cargo or specialized terminals where such products as petroleum, grain, coal, ore, and miscellaneous dry and liquid bulk cargoes are stored and handled. A fourth type of specialized facility is the container terminal which is increasing in number and importance and is specially designed for the accommodation of containerships and the handling and storage of van-sized containers in connection with the ocean transportation of containerized cargo.

Physically, a marine terminal may consist of only a single pier or wharf or it may comprise a number of piers and wharves grouped together and operated as a unit. Usually, the terminal includes open or covered storage facilities, or a combination of both, and often the entire facility is enclosed by a fence.

*Prepared by the Maritime Administration, U.S. Department of Commerce, with minor editing by committee staff.

In the United States, except for the specialized facilities for tanker vessels, there are two basic ship berthing facilities: (1) the simple straight pier or so-called finger pier, and (2) the marginal wharf or quay. A pier type of structure projects into a body of water at an angle with the shoreline normally permitting the berthing of vessels on the two sides of the pier and if the structure is sufficiently wide at the head of the pier as well. The wharf type of structure parallels the shoreline and provides berthing for vessels at its offshore face only.

(b) *Services Rendered*

Commercial areas: The port provides the whole range of services and the various kinds of accommodations which are usually grouped under the heading of terminal facilities for ships, passengers, and cargoes. The most important of all ship servicing elements are the berthing facilities provided at marine terminal facilities. Adequate berthing facilities in a port serve the demands of shipowners and steamship operators for piers and wharves at which to berth their ships and work cargo with safety, economy, and dispatch. Berthing facilities should be backed up by adequate transit sheds, warehouses, open storage areas, and sufficient mechanical cargo handling equipment to meet the needs of the entire marine terminal complex.

Other terminal facilities necessary for the servicing of ships include outfitting berths, repair berths, and bunkering berths. The common utilities available at these and other berths are electricity, fresh water, steam, and compressed air. Finally, specialized terminal facilities serve the needs of special purpose ships and their cargoes. These include petroleum storage and pipeline systems for loading and discharging bulk petroleum products, grain elevators for transferring bulk grain, loading and unloading equipment with conveyor belt systems and car dumper facilities for handling bulk coal and ore, wharf cranes fitted with grab buckets for handling miscellaneous bulk cargoes, conveyor systems for handling bananas and other delicate fruits, and swift handling arrangements for moving frozen meats and and produce between ship and cold storage facilities.

A port of reception may be illustrated as follows: Imported goods are first landed on the wharf apron from the ship; moved to the transit shed at shipside where they are checked, tallied, sorted, and inspected by customs; they are then transferred to a storage warehouse from where all or only part of the goods may be transported out of the port area by railroad, motor truck, lighter, barge, or coastwise vessel. The marine passenger terminal provides facilities for accommodating passenger ships and the ocean passenger traffic through the port. This passenger trade through the port requires terminals designed with certain special features for expediting baggage handling and customs inspection and other facilities such as restaurants, restrooms, offices for conducting immigration formalities, and port health requirements.

Most port administrative agencies have control over waterfront industrial site areas. The port authorities have developed so-called industrial zones for the purpose of encouraging industry participation in port expansion programs. These zones and the industrial plants which locate there are often served by modern port and terminal facilities as well as by connecting highways, railroads, electrical facili-

ties, utilities, et cetera. Many ports construct general or special purpose buildings for long-term lease to manufacturing and commercial firms. A small port generally reserves the waterfront area for its own public use, giving industrial leases in the immediate backland, together with constructing or providing such services needed for access to shipside, as pipeline, roadway, or rail spurs.

Agrarian interests of the port require specialized terminal facilities for receiving, storing, and shipping their products. If the commodities are bulk grains for export, the port must have a public grain elevator complete with berthing accommodations for ships and barges, loading spouts for transferring grain to ships, marine legs for unloading barges, grain storage bins, and a rail car and truck dumper system. Special facilities are also needed in the port for handling fresh fruits, produce, animal and dairy products, including refrigerator ships, cold storage plants, and refrigerated rail cars and trucks. Pipeline delivery systems and storage tanks are special facilities for liquid bulk vegetable products.

Most ports have set aside and developed certain areas of the harbor for the accommodation of yachts, small boats, and fishing vessels. These facilities afford shelter for small craft and provide the necessary mooring arrangements, boat slips, and marine railways or ramps for launching, drydocking, and removing boats from the water.

In a number of ports, and at outport locations, there are terminal facilities owned and operated by the Department of Defense. These include Army ports of embarkation, Navy operating bases, and miscellaneous installations such as ammunition piers and petroleum depots.

(c) *Quantitative Standards of Performance*

The practical operating capacity of a marine terminal is the volume of cargo which can be handled onto and through the terminal's precincts with reasonable efficiency and with only infrequent congestion. Generally, an ocean terminal's capacity is limited by any one of three distinct and independent functions: (1) the movement of cargo into or out of rail cars, trucks, and barges; (2) the transit storage of cargo at the terminal; and (3) the movement of cargo into or out of vessels.

At U.S. ports, the function dominating the practical operating capacity of a commercial marine terminal is the capacity for moving cargo into or out of vessels berthed at the terminal. This capacity is basically the product of two components. First is the cargo handling rate expressed in long-tons per day per berth which can be reasonably attained; second, the number of days in a year that the berths can be occupied under normal operating conditions.

Where a terminal contains a large number of berths, the occupancy per berth and the efficiency and capacity under these conditions can be high. At the other extreme, where a public terminal has only one or two berths, ship arrivals cannot be matched nearly as well with ship departures. Sailing shcedules can be more closely coordinated in the case of private terminals. Since the use which can be made of each berth is greater at terminals having a large number of berths,

the operating capacity of a terminal increases at a greater rate than the proportional increase in the number of berths.

Recorded observations in 1956–57 at large modern terminals in Pacific coast ports of the United States indicate an annual performance figure of 94,000 tons per berth for general cargo. In 1955–56, at a principal Atlantic coast port, performance records of both antiquated as well as the most modern berthing facilities shows that the average amount of cargo handled per berth per year was 59,444 tons. In 1957, the annual average volume of general cargo handled per berth at the same port increased to 63,055 tons. Considering all three U.S. coastal regions, an estimate of 75,000 tons of general cargo per berth per year was considered to be a fair average for the base year 1960.

It is expected that during the next 25 years improved conditions should result in an increase of general cargo handling efficiency. Accordingly, it is estimated that the handling rate at terminals on the Atlantic, gulf, and Pacific coasts will increase by 5,000 tons per berth for each 5-year period up to 81,000 tons per berth by 1966 and as high as 100,000 tons per berth by 1985.

It is estimated that the average annual tonnage capability of a Great Lakes berth would be about 20 to 25 percent less than the 75,000 tons per berth estimate for the three ocean coasts, or approximately 60,000 tons per berth annually for base year 1960. It is estimated that Great Lakes general cargo capacity will increase from the estimated 60,000 tons per berth per year in 1960 to 78,000 tons in 1966, thus reaching nearly the same berth capacity estimated for ocean coast ports for the same year.

A bulk petroleum berthing facility which is capable of loading and/or discharging petroleum products at a rate of 5,625 barrels or more per hour is considered to have a maximum capacity of 15,000 tons per 24-hour day. This is based on the assumption that the average T2 tanker can be loaded and/or discharged in one 24-hour day. By averaging the number of berths with a capability of handling less than 5,625 barrels per hour, it is estimated that each such berth has a daily maximum capacity of 9,500 tons.

Based on the number of petroleum berths and annual total capacity of 1,642.5 million tons estimated in base year 1960, the annual petroleum tonnage capacity of the two classes of petroleum berths on three ocean coasts is 3.83 million tons for a berth of 15,000 tons per day capacity (15,000×70 percent ×365), and an average of 2.42 million tons for a berth of 9,500 tons per day capacity (9,500×70 percent ×365).

The annual average petroleum tonnage capability on the Great Lakes is calculated to be 1.59 million tons per berth of 9,500 tons per day capacity (9,500 × 70 percent × 240 days).

It is estimated that, based on the storage capacities of the individual grain elevators on the Atlantic coast, an average annual minimum turnover of 5.6 times or a minimum volume of some 250 million bushels is required to keep the port elevators at a profitable level of operation. On the gulf coast these figures are 5.8 and 180 million bushels, respectively. Assuming an average turnover of grain through

the elevator of 5.7 times per year and based on elevator storage capacity of approximately 160 million bushels, the minimum annual handling for profitable operations on all three ocean coasts would be approximately 24.5 million tons or an average of about 400,000 tons per berth.

It was estimated that the 1960 annual capacity of coal berths on the three ocean coasts approximated 357.7 million tons (1.4 million tons × 70 percent to obtain effective vessel working time × 365 days). The total of 357.7 million tons divided by the total number of berths equals an annual average of 8.7 million tons per berth. The 1960 annual capacity of all coal berths on the Great Lakes was 285 million tons (1.7 × 70 percent × 240 days of navigation season). The total of 285 million tons divided by the total number of berths equals an annual average of 3.57 million tons per berth.

On the basis of New York's brief operating experience, it appears that the practical and effective capacity of a container berth for an operation like that of the Sea-Land Service, Inc., is about 500,000 tons per year. The Sea-Land terminal operations in the port of New York have reflected a containerized general cargo rate of 280 tons per gang-hour as compared to the approximate 15 tons per gang-hour normally handled on a conventional break-bulk cargo ship.

(d) *Qualitative Standards of Performance*

In general, port facilities are more than adequate on a quantitative basis to serve the maritime industry in times of peace and during war or crisis. Many are not adequate on a qualitative basis due to the current requirements imposed by technological developments in both sea and land transport. However, substantial numbers of these antiquated terminals are in the process of modernization or removal for new, modern, facilities.

In the past 17 years (Jan. 1, 1946–Dec. 31, 1962), a total of some $1,619,600,000 has been spent on piers, wharves, and docks alone in all U.S. ports for handling of bulk and general cargoes. This total figure was expended for waterside facilities only. It does not include many other construction projects in the broad field of port development which have also been built at these harbors, such as barge terminals, shipyards, harbor floating equipment, ferries, bridges, tunnels, expressways, airports, railroad yards, and other transportation facilities.

In the foreseeable future, there is no sign that this nationwide port building and modernization program will diminish in tempo. Impressive long-range building plans continue to be projected at seaboard ports.

In the economical design of piers and wharves an estimate of the commercial life of a structure is of considerable importance.

Some port engineers consider that it is not profitable to spend money for permanence of piers and wharves in excess of that required to give them a life of about 40 years. As few as 25 years has been allowed as the commercial life of wharf structures in some ports. On the other hand, there are ports where construction has been based on a life of 100 years. However, it is seldom advisable to make the total

initial cost of building a pier or wharf very large by installing a facility with a life longer than 50 years. There is no doubt that a port structure built to last over 50 years is cheaper in the long run, and requires smaller annual amortization and depreciation than with only a 25-year commercial life, because the period of amortization is longer and the longer lived structure more durable.

Currently, based on the commercial life of U.S. port facilities, the average life of pier and wharf structures has been estimated to be 48 years. The average life of other facilities has been calculated to be 46.5 years for transit sheds and storage warehouses; 43.5 years for cold storage plants, grain elevators, and bulk handling facilities; and 40 years for roadways, paving, and pier or wharf utility systems. The combined average life of all U.S. port structures is calculated to be 45.8 years.

2. EXISTING CAPITAL PLANT IN THE UNITED STATES

(a) *Number of Facilities*

As of mid-1962, there were some 2,100 marine terminal facilities or structures providing about 4,200 deepwater berths of all categories located in 170 U.S. ocean ports on the Great Lakes, and Atlantic, gulf, and Pacific coasts, including Alaska and Hawaii.

The 2,100 port terminal facilities do not represent all existing port berthing structures in the United States, but only those marine terminals which can accommodate oceangoing vessels alongside a pier or wharf with a minimum berthing depth of 20 feet or more in ports on the 3 ocean coasts, and 18 feet or more in ports on the Great Lakes. These facilities are the most significant ones from the standpoint of trade and commerce and make up the backbone of U.S. port facilities which serve the U.S. merchant fleet and foreign shipping throughout the world.

In addition to the 2,100 terminals selected, there are substantial numbers of marine port facilities located outside established port limits, on rivers, bays, canals, and connecting waterways.

Besides deep-draft berthing facilities for accommodating oceangoing vessels, there are innumerable shallow-draft facilities used to berth tugboats, barges, lighters, fishing vessels, yachts, harbor craft, and other types of light-draft floating equipment.

Military water terminals are a separate category of port facility and comprise a substantial number of individual pier and wharf structures which provide some 1,000 deep-draft berths on the 3 ocean coasts of the United States, not including Alaska and Hawaii. These include berthing facilities for handling ammunition, petroleum, and general cargo at military installations located within the immediate port area as well as those located outside the port limits such as isolated sites on the coast or at some distance inland on a river or other waterway.

(b) *Distribution of Facilities by State*

Thirty States account for nearly 170 primary ocean ports and over 2,100 individual marine terminal facilities. The distribution of these port terminal structures by State is contained in the following tabulation.

Distribution of port terminal facilities by State

State	Number of ports	Total number of terminals	Number and type of terminal						
			General cargo (shedded)	Open (no shed)	Bulk liquid	Grain	Coal	Ore	Other bulk
New York	6	334	163	91	35	17	6	1	21
California	21	237	105	85	31	5		2	9
Texas	10	157	64	31	56	3			3
Washington	11	132	45	51	21	7	1	1	6
Louisiana	4	113	46	36	25	3		1	2
Wisconsin	5	99	14	30	10	14	19	7	5
Florida	13	93	34	29	24				6
Ohio	8	91	10	29	6	5	16	13	12
Michigan	8	90	8	31	12		15	3	21
Maryland	1	89	20	48	10	3	1	1	6
Massachusetts	6	77	22	29	21		4	1	
Pennsylvania	5	75	34	19	13	3	5	1	
Virginia	4	68	17	26	12	2	6		5
Oregon	8	68	10	30	15	5		1	7
New Jersey	8	54	4	21	27				2
Illinois	2	46	10	21	2	9	1	2	1
Minnesota	2	44	8	18	1	6	3	5	3
Hawaii	9	41	31	7	3				
Alaska	15	29	13	12	4				
Alabama	1	29	6	13	6	1		1	2
North Carolina	2	23	8	4	8	1			2
Georgia	2	23	9	12	2				
Indiana	2	22		11	10	1			
South Carolina	3	21	8	8	1	1		1	2
Rhode Island	1	19	3	7	7		2		
Maine	3	18	6	4	6		1		1
Connecticut	3	13	1	6	5		1		
Mississippi	2	7	3	4					
New Hampshire	1	5		3	1		1		
Delaware	2	4	1	1	2				
Total	168	2,121	703	717	376	86	82	41	116

(c) *Distribution of Facilities by Size of Port City*

Out of a total of over 2,100 selected marine terminal facilities divided among nearly 170 ocean port cities in the United States, as few as 15 of them in the largest population group account for 46.9 percent or roughly one-half of the total terminal facilities in the country.

In descending order of population range, the next group of port cities number 27 and account for 23.1 percent or nearly one-fourth of the total terminal facilities.

The next three groupings of port cities, taken together in descending order of population range, total 87 ports and account for 27.7 percent of the total terminal facilities.

Based on descending order of population range, the last group of port cities number 39 and account for only 2.3 percent of the total capital plant.

Distribution of port terminal facility by size of port city (national summary)

	Number of ports	Number of facilities	Percent of total capital plant
Port city population:			
500,000 or more	15	995	46.9
100,000 to 499,999	27	490	23.1
50,000 to 99,999	19	215	10.1
10,000 to 49,999	45	294	13.9
2,500 to 9,999	23	78	3.7
2,500 or less	39	49	2.3
Grand total	168	2,121	100.0

(d) *Age Distribution of Facilities*

The date of construction was available for only 396 out of a total of 2,121 marine terminal facilities. Therefore, based on the number and percentage of the 396 terminals which were built during each of the required time frames and applying these percentages to the total of 2,121 terminal facilities, an estimate was obtained of the number of the total facilities built within 5 selected time periods.

Accordingly, the age distribution of the 2,121 marine terminal facilities which comprise the principal deep-draft berthing facilities on the Great Lakes and the three ocean coasts of the United States, including the States of Alaska and Hawaii, are presented in the following tabulaton:

Age distribution of port facilities [1]

	Number built (actual)	Percent of total (estimate)	Number built (estimate)
Date of construction:			
Before 1900	4	1.0X2,121	21
1900–20	70	17.7X2,121	375
1921–40	88	22.2X2,121	471
1941–60	192	48.5X2,121	1,029
Since 1961	42	10.6X2,121	225
Total	396		2,121

[1] Combined average age of pier and wharf structures is estimated to be 24.6 years.

(e) *Ownership of Facilities*

In the management and administration of U.S. seaports, there is a wide variation in the powers and duties exerted by local port authorities whose activities may vary with the functions performed, the size of the port, the number of functions to be performed, the size of the staff to be employed, and the scope of the port's legal jurisdiction. In some ports, practically all terminal facilities are owned and operated by railroads or other private interests and the local port authority performs only perfunctory administrative and regulatory functions. In the opposite extreme, practically all facilities are publicly owned and operated under the control of the port authority.

Local government agencies still appear to be the dominant form of port administration and own some 70 percent of the publicly owned port facilities in the United States. On the other hand, State government agencies own some 30 percent of the publicly owned port facilities. However, the greatest number of port facilities in the United States are privately owned and operated by profitmaking organizations. Among the private proprietorships there are a small number of private nonprofit organizations and cooperatives which own and operate only a very insignificant number of port terminal facilities. The nonmilitary agencies of the Federal Government make up the final class of proprietors and account for the ownership of only a small percentage of the total port facilities. A summary breakdown of the number and proportion of port facilities owned by the several classes of owners is tabulated, as follows:

Ownership of port facilities

	Number of terminals (estimate)	Percent of U.S. total (estimate)
Type of ownership:		
Private (profitmaking organizations)	1,359	64.1
Local government agencies	499	23.5
State government agencies	214	10.1
U.S. Government agencies (nonmilitary)	43	2.0
Private (nonprofitmaking organizations)	6	0.3
Total	2,121	100.0

(f) *Value of Facilities*

As of the end of 1965, the (then) current value of all categories of port terminal facilities and structures is estimated to be about $3.4 billion.

The probable original cost (new) of the entire capital plant was determined by working backward from present estimated value of all types of port terminal structures. The combined average age of all port terminal structures was estimated to be 24.6 years and thus 1941 became the base year for original or new cost. The construction cost index for December 1965, was converted to base year 1941, i.e., 1941 equals 100, and from the adjusted cost index the estimated original or new cost of facilities in 1941 was determined.

Three general values were estimated: (1) Cost new or original cost; (2) 1965 replacement cost; and (3) 1965 actual cash value, as follows:

Cost new (estimated)	$1,886,700,000
1965 replacement cost (estimated)	6,792,100,000
1965 actual cash value (estimated)	3,396,100,000

B. Costs and User Charges

1. CONSTRUCTION COSTS AND OPERATING COSTS OF PORT TERMINAL FACILITIES

(a) *Typical Construction Costs*

Based on acceptable engineering cost estimates of various port facility structures, the range of current typical construction costs for different types of port terminal facilities are tabulated, as follows:

Type of terminal (single berth)	1965 average cost per linear foot of berthing (estimated)	1965 average total unit cost of construction (estimated)
General cargo facilities:		
General cargo (shedded)	$3,500	$2,500,000
General cargo and open (unshedded)	2,800	2,000,000
Specialized facilities:		
Bulk liquid (petrol and other)	1,400	1,000,000
Dry bulk (all types)	5,700	4,000,000
Container	2,800	2,000,000

(b) *Maintenance and Operation Expenses*

Maintenance and Renewals: Based on records spanning a 17-year period, January 1, 1946 to December 31, 1962, the following table shows the range of annual modernization and rehabilitation expenses

incurred by various ports in the United States. These expenditures include all additions, replacements, improvements, and restorative work to existing facilities which do not result in additional new berths.

Average annual modernization and rehabilitation expenses in selected ports of the United States by coastal region

[In thousands of dollars]

Coastal region	General cargo facilities (shedded and open)	Specialized facilities (dry, liquid bulk, and container)	Total annual expenses (all facilities)
Great Lakes	331	1,432	1,763
Atlantic coast	7,146	3,084	10,230
Gulf coast	1,827	1,284	3,111
Pacific coast (including Alaska and Hawaii)	3,035	889	3,924
Total	12,339	6,689	19,028

Maintenance and operating: The cost of maintenance in a sampling of representative ports of the United States is estimated to be about 37.5 percent of all operating costs. Direct operating expenses make up the principal part of all operating expenses, and most of the payroll expenses relate to direct operations. Operating expenses are estimated to be about 62.5 percent of total port expense.

2. USER CHARGES

(a) *Port Operating Revenues*

As a public agency, a port authority must depend upon its own resources and those of the State or local government unit which sponsors it. The port's own resources include its income and loans based on expected income and in some cases taxes which it may levy over an area designated as a special tax district.

Port management must seek sufficient revenues to sustain the operation of a successful port enterprise. The principal revenues obtained by a port are derived as a result of providing and performing certain normal functions such as maintenance of publicly owned marine terminal facilities, leasing of publicly owned facilities, dredging slips along publicly owned wharves, collection of port dues and charges, promotion of traffic through the port, construction and replacement of facilities, and similar functions. It is conceded that a port authority is entitled to levy charges which at least attempt to defray over a period of time the costs of performing any of these normal functions.

An earlier study which was made of the port revenues [1] of some 30 representative ports of the United States showed that the average percentage distribution of total income was as follows:

	Percent
Wharfage, dockage, tollage, etc	27.7
Other terminal services	35.5
Rentals and leases	24.7
Other operating means	12.1
Total	100.0

[1] In addition to these so-called port/terminal operating revenues, there are miscellaneous port dues and charges such as harbor dues, pilotage fees, towage charges, and quarantine dues which are not normally included under said operating revenues.

(b) *Adequacy of Port Operating Revenues*

Ratemaking has become a difficult and very important aspect of port management. The reward for efficient ratemaking in terms of attracting trade and yet producing a good level of revenue is very significant. There are limits to what can be done with port fees, and dues, such as harbor dues, etc., and, as stated, these revenues do not normally accrue to terminal owners and operators. In some ports more can be done in regard to special services such as fumigation, compressing, and elevation. Warehousing rates are by necessity related to warehouse rates for the community as a whole. Switching rates are subject to regulation by the State's public utility commission and the Interstate Commerce Commission. But much can be done with dockage, wharfage, terminal services, including service charges and rentals. Adequate charges are sometimes made difficult because of the competition of railroad-owned terminals and industrial terminals, who derive their principal revenue from other sources such as line hauls, sale of end products, etc.

Revenues derived by the port authority from the operation of its terminals and waterfront facilities are applied to the payment of the cost of operation and administration including interest on bonds or other evidences of indebtedness. Usually any balance in favor of the port authority is paid to the treasurer to be used for the purpose of providing a sinking fund or special reserve fund with which to pay at or before maturity all bonds and/or notes or other evidences of indebtedness. In some instances where port revenues are insufficient to pay the cost of operation, administration, special reserve fund requirements, interest on bonds, and similar costs of operation, a special local or State tax may be levied, subject to local or State limitations and regulations, on all taxable property within the territorial limits of the local port jurisdiction in an amount sufficient to meet the deficiency. There are very few ports where user charges exceed the sum of prorated operating and capital costs.

(c) *Financing Costs of Port Operations and Improvements*

Expenditures could be financed through increased harbor fees, local or State taxes, or through borrowing. It has become rather common practice to set up general port funds into which all revenues, taxes, and appropriations go and out of which capital and operating needs are met. Special reserve funds may be set up by a port. Many ports have (1) a leased wharf fund; (2) a harbor improvement bond fund; and (3) a harbor maintenance and development fund.

As a general statement, practically all public port authorities in the United States today are extended some form of local public aid. Such aid may be in the form of direct appropriations, general obligation bonds of the city or State, taxes levied in behalf of the port, and the assignment of actual or potential tax means as security for port bonds and other certificates of indebtedness. There is a growing trend toward the financing of general cargo facilities with revenue bond issues as against general obligation bonds. This has largely been made possible by the ability of the public body to pledge addi-

tionally the revenues from facilities originally built by general obligation bond issues which have been amortized.

A local public port body is in an enviable position to build a public terminal operated for all users on a tariff basis. In contrast, where construction is by private interests, lending institutions would require guaranteed income from the facility in the form of a long-term lease, which usually indicates a single user for a single purpose. Moreover, public bodies can borrow at lower interest costs because the interest income on their obligations is tax exempt.

Practically all new general cargo port terminal construction in the United States today is undertaken by local public authorities, whereas bulk and industrial and other specialized terminals are normally provided by private interests for their own, nonpublic, use. There is no general demand for any Federal financial assistance with respect to the latter facilities.

It is estimated that 6 percent of the costs of port facilities and structures are met out of general tax resources and bond borrowings of State and local government units. Informatively, 36 percent of such costs are met by the port revenues of said government units; 50 percent by private interests and the balance by State grants and Federal Government loans and grants.

C. Trend of Capital Outlays for Port Development

1. ANNUAL CAPITAL EXPENDITURES

Total port development expenditures for the Great Lakes and the three ocean coasts of the United States, including the States of Alaska and Hawaii, during the 17-year period January 1, 1946 through December 31, 1962, were $1,619,600,000. This reflects an increase of $400,249,000 or 33 percent over the $1,219,351,000 expended during the 14½-year period ending June 30, 1960.

The rate of capital expenditures for port development purposes has accelerated remarkably in the last 10 years. In comparison with the 10-year period immediately following the end of World War II, the overall yearly average expenditure has risen from $62.9 million to $95.4 million during the 1960's.

The regional pattern and emphasis of expenditures for port development have remained relatively constant, maintaining, for the most part, the historic relationships among port areas.

The annual rate of port development expenditures in the United States continues its overall upward trend, and ports are continuing to carry out a vigorous program of modernization and expansion. It should be noted too that announced plans for future development in almost every port area indicate that this program of construction and rehabilitation promises to continue for some time to come.

The following table gives a summary breakdown of port development expenditures by coastal region in the United States. Annual data are shown in the succeeding table.

Trend of capital outlays for port terminal facilities in the United States by coastal region Jan. 1, 1946 to Dec. 31, 1962

[In millions of dollars]

Coastal region	Number of new general cargo berths added		General cargo facilities (shedded and open)	Specialized facilities (dry, liquid bulk and container)	Total capital outlay (all facilities)
	Shedded	Open			
Great Lakes	40	16	65.7 [1] (3.9)	132.2 [1] (7.8)	197.9 [1] (11.7)
Atlantic coast	129	38	497.3 [1] (29.3)	266.6 [1] (15.7)	763.9 [1] (45.0)
Gulf coast	59	22	151.8 [1] (8.9)	142.6 [1] (8.4)	294.4 [1] (17.3)
Pacific coast (including Alaska and Hawaii)	99	21	249.7 [1] (14.7)	113.7 [1] (6.7)	363.4 [1] (21.4)
Total	327	97	964.5 [1] (56.8)	655.1 [1] (38.6)	1,619.6 [1] (95.4)

[1] Overall annual average capital outlay over 17-year period, Jan. 1, 1946, to Dec. 31, 1962.

Trend of capital outlays for port terminal facilities Jan. 1, 1946 to Dec. 31, 1962, in the United States

Total U.S. capital outlay for port development [1]			Average annual rate of capital outlay (millions of dollars)				
Years	Millions of dollars [2]	Percent gain	Years	Privately owned facilities (64 percent)	Publicly owned facilities (34 percent)	U.S. Government-owned facilities [3] (2 percent)	All facilities (100 percent)
1946-55	629.2		1946-55	49.3	21.4	1.2	62.9
1946-57	887.0	[4] 40.9	1956-57	82.4	43.8	2.8	129.0
1946-60	1,219.3	[5] 37.4	1958-60	85.1	45.2	2.6	132.9
1946-62	1,619.6	[6] 32.8	1960-62	102.5	54.4	3.2	160.1

[1] Includes selected ports of the 3 ocean coasts, Great Lakes, Alaska, and Hawaii.
[2] Accumulative.
[3] Excludes military facilities.
[4] Between 1955 and 1957.
[5] Between 1957 and 1960.
[6] Between 1960 and 1962.

2. DISTRIBUTION OF ANNUAL CAPITAL EXPENDITURES

The following table shows the proportions of capital outlays which are accounted for by the various types of ownership of port terminal facilities in the United States.

Proportions of overall annual average capital outlays accounted for by various types of ownership of port terminal facilities, Jan. 1, 1946 to Dec. 31, 1962

Type of ownership	Annual dollar amounts of average capital outlays (millions of dollars)	Percent distribution of average capital outlays (estimate)
Private (profitmaking organizations)	61.2	64.1
Local government agencies	22.4	23.5
State government agencies	9.6	10.1
U.S. Government agencies (nonmilitary)	1.9	2.0
Private (nonprofitmaking organizations)	.3	.3
Total	95.4	100.0

3. SOURCES OF FINANCING FOR CAPITAL EXPENDITURES

Based on percentage distribution, the following table shows the dollar amounts of capital expenditures proportioned among the various sources of financing for the construction of port terminal facilities.

Proportions of overall annual average capital outlays accounted for by various sources of financing for construction of port terminal facilities, Jan. 1, 1946, to Dec. 31, 1962

Sources of financing	Annual-dollar amounts of average capital outlays (millions of dollars)	Percent distribution of average capital outlays (estimate)
Capital flotations	47.7	50
Port revenues	34.4	36
Tax exempt municipal bond market	4.8	5
Borrowing from Federal Government	2.9	3
Federal Government grant assistance	1.9	2
State grants-in-aid	1.9	2
Appropriations from tax resources	.9	1
Gifts, bequests, donations, fundraising	.9	1
Total	95.4	100

D. NEEDS AND PROSPECTIVE CAPITAL OUTLAYS FOR PORT DEVELOPMENT

1. CAPITAL REQUIREMENTS (1966–75)

The capital requirements for port terminal facilities during the decade 1966–75 are estimated to be $1,281.5 million.

The reason for such a large capital outlay during the next decade can be traced to the substantial numbers of antiquated terminals in the Nation's ports. Many are not adequate on a qualitative basis due to the current and future requirements imposed by technological developments in both sea and land transport. The long-awaited replacement of these outdated terminals is being given new impetus with the disclosure that the major shipping lines are in the need of specialized terminals to fill their needs, particularly with respect to the processing and handling of containers at an extremely rapid pace. The use of containers in the movement of ocean commerce will develop with intensity in the next decade. Today, a noteworthy general port facility building program is underway and several ports have unique long-range master plans to provide additional terminals to meet shipping needs as far in advance as 1980.

Encompassed in these programs are container, general cargo (break-bulk), liquid, and dry bulk, terminals of the most modern design. The container terminals and general cargo terminals are designed with long ship berths, wide aprons, large and more efficient transit sheds, cargo distribution buildings, and generous amounts of open storage space for flexibility of operation, truck and trailer park, and spacious accommodations for the various modes of connecting transportation.

(a) *Factors Upon Which Projection Is Based*

In approaching the means of estimating the projection of prospective capital outlay to meet the needs of the port and shipping industry during the decade 1966–75 it was necessary to construct some commerce projections in order to determine future needs.

The application of projected national indicators such as population growth, income, industrial growth, power consumption, production, natural resources, potential markets, and similar barometers were some of the factors considered in arriving at estimates of future trade. The projections were placed into categories of general cargo, dry bulk, and bulk liquid so as to match the types of marine terminal facilities to accommodate their transshipment.

Utilizing this forecast, calculations were then made to determine the port terminals needed to handle the projected tonnage of break-bulk general cargo, containers, petroleum, grain, coal, ore, and other miscellaneous types of commodities (bananas, chemicals, gypsum, cement, etc.). The number of terminals needed in the various commodity categories and the capital requirements per year are shown in the following table.

Capital requirements for port terminal facilities

[Dollars in millions]

	1966		1967		1968		1969		1970		1971		1972		1973		1974		1975		Total number and cost in 10-year period	
	Number	Cost	Number	Cost	Number	Cost	Number	Cost	Number	Cost	Number	Cost	Number	Cost	Number	Cost	Number	Cost	Number	Cost	Number	Cost
3-OCEAN COASTS																						
General cargo terminals	8	20.2	8	20.6	8	21.2	8	21.9	8	22.5	8	23.2	8	23.8	8	24.6	8	25.3	8	26.1	80	229.2
Container terminals	4	8.0	4	8.2	4	8.5	4	8.7	4	8.8	4	9.0	4	9.3	4	9.7	4	9.8	4	10.2	40	90.2
Petroleums	5	5.0	5	5.2	5	5.3	5	5.5	5	5.6	5	5.8	5	6.0	5	6.1	5	6.3	5	6.5	50	57.3
Grain terminals	1	4.0	1	4.1	1	4.2	1	4.4	1	4.5	1	4.6	1	4.8	1	4.9	1	5.1	1	5.2	10	45.8
Coal terminals	1	4.0	1	4.1	1	4.2	1	4.4	1	4.5	1	4.6	1	4.8	1	4.9	1	5.1	1	5.2	10	45.8
Ore terminals	1	4.0	1	4.1	1	4.2	1	4.4	1	4.5	1	4.6	1	4.8	1	4.9	1	5.1	1	5.2	10	45.8
Other terminals	2	8.0	2	8.2	2	8.5	2	8.7	2	9.0	2	9.3	2	9.6	2	9.8	2	10.1	2	10.4	20	91.6
GREAT LAKES																						
General cargo terminals	2	5.0	2	5.2	2	5.3	2	5.5	2	5.6	2	5.7	2	6.0	2	6.2	2	6.3	2	6.5	20	57.3
Container terminals	2	4.0	2	4.1	2	4.2	2	4.4	2	4.4	2	4.5	2	4.7	2	4.8	2	4.9	2	5.1	20	45.1
Petroleum terminals	2	2.0	2	2.1	2	2.1	2	2.2	2	2.3	2	2.3	2	2.4	2	2.5	2	2.5	2	2.6	20	13.0
Grain terminals	3	12.0	3	12.4	3	12.7	3	13.1	3	13.5	3	13.9	3	14.3	3	14.8	3	15.2	3	15.7	30	137.6
Coal terminals	3	12.0	3	12.4	3	12.7	3	13.1	3	13.5	3	13.9	3	14.3	3	14.8	3	15.2	3	15.7	30	137.6
Ore terminals	3	12.0	2	12.4	3	12.7	3	13.1	3	13.5	3	13.9	3	14.3	3	14.8	3	15.2	3	15.7	30	137.6
Other terminals	3	12.0	3	12.4	3	12.7	3	13.1	3	13.5	3	13.9	3	14.3	3	14.8	3	15.2	3	15.7	30	137.6
Total terminals and cost per year	40	112.0	40	115.5	40	118.5	40	122.5	40	125.7	40	129.2	40	133.4	40	137.5	40	141.4	40	145.8	400	1,281.5

(b) *Estimated Capital Needs for Port Facilities*

The estimated capital needs per year during the decade 1966–75 are shown in the following table:

Year:	*Millions of dollars*	Year—Continued	*Millions of dollars*
1966	112. 0	1971	129. 2
1967	115. 5	1972	133. 4
1968	118. 5	1973	137. 5
1969	122. 5	1974	141. 1
1970	125. 7	1975	145. 8

(c) *Distribution of Capital Outlays for Port Facilities by Size of Port City*

The capital need for cities with populations of 50,000 or more is estimated to be $1,025.8 million; for cities and towns with populations of 2,500 to 49,999 is $226.1 million; and for towns with populations under 2,500 the capital need is estimated to be $29.6 million. A breakdown is shown in the following table.

Distribution of capital requirements for port terminal facility by size of port city (1966–75)

Port city population	Number of ports	Percent of total capital plant	Capital requirements (millions of dollars)
500,000 or more	15	46. 9	600. 5
100,000 to 499,999	27	23. 1	297. 1
50,000 to 99,999	19	10. 1	128. 2
Subtotal, 50,000 or more	61	80. 1	1, 025. 8
10,000 to 49,999	45	13. 9	178. 5
2,500 to 9,999	23	3. 7	47. 6
Subtotal, 2,500 to 49,999	68	17. 6	226. 1
2,500 or less	39	2. 3	29. 6
Grand total	168	100. 0	1, 281. 5

(d) *Distribution of Capital Outlays for Port Facilities by Form of Ownership*

The State governments or State agencies are expected to expend an estimated outlay of $129.4 million; the cities, counties, towns, special districts, public authorities, and other public bodies $301.2 million; and the proprietary or profitmaking organizations $821.4 million during the decade 1966–75. Details are indicated in the following table.

Proportions of estimated capital outlays accounted for by various types of ownership of port facilities (1966–75)

Type of ownership	Percent distribution of total capital outlay	Dollar amounts of total capital outlay (millions of dollars)
Private (profitmaking organizations)	64. 1	821. 4
Local government agencies	23. 5	301. 2
State government agencies	10. 1	129. 4
U.S. Government agencies (nonmilitary)	2. 0	25. 6
Private (nonprofitmaking organizations)	. 3	3. 9
Total	100. 0	1, 281. 5

2. EXPECTED SOURCES OF FINANCING FOR ESTIMATED CAPITAL NEEDS

A significant proportion of the total capital requirements will be spent by State, bistate, city, county, or regional agencies responsible for port development. The public projects will be financed largely by port revenues, revenue bonds, or tax-supported bond issues, with some financing by direct tax levies, and with little Federal participation expected. The sources of financing for the $1,281.5 million may be as follows:

Proportions of estimated capital outlays accounted for by various sources of financing for port development (1966–75)

Sources of financing	Percent distribution of total capital outlay (estimated)	Dollar amoun of total capitals outlay (millions of dollars)
Capital flotations	50	641.0
Port revenues	36	461.2
Tax exempt municipal bond market	5	64.1
Borrowing from Federal Government	3	38.4
Federal Government grant assistance	2	25.6
State grants-in-aid	2	25.6
Appropriations from tax resources	1	12.8
Gifts, bequests, donations, fundraising	1	12.8
Total	100	1,281.5

CHAPTER 16

Public Elementary and Secondary School Facilities*

A. NATURE AND COMPOSITION OF PUBLIC SCHOOLS

1. DESCRIPTION OF FACILITIES

(a) *Physical Characteristics*

Public school facilities are of various types ranging from one-room structures of wooden frame to massive steel-ribbed and masonry buildings. In the cities multistoried structures often touch the sidewalk and provide limited land area for a playground. In the suburbs the average facility occupies only a small proportion of the acreage available and ample space can be found for parking, grass, and several play fields.

TABLE 1.—*Number of acres in the median school site by organizational level for selected decades United States: 1965*

Completion date of original building	Elementary	Combined	Secondary
Before 1920	1	5	3
1940-49	4	10	10
1960-65	10	15	27
Median all sites	3	8	11

Source: George J. Collins, *National Inventory of School Facilities and Personnel, Spring 1962.* Washington, D.C., Department of Health, Education, and Welfare, Office of Education. 1963.

The structural characteristics of permanent school buildings and additions are shown in table 2 for selected periods of construction. The characteristics of school construction reflect the gradual transition from the predominant type of buildings constructed "before 1920" to the more modern look of a slab-on-grade, one-story, masonry outline filled with glass, and more fire resistive than structures of earlier periods. The urban and nonurban school structures were different before 1920 and in the sixties also reflect notable differences. Before 1920, the typical urban school was multistory, masonry, with wooden interiors. In the sixties, it is still multistory, masonry, but more fire resistive. The nonurban schools before 1920, were single story, wooden, and combustible. In the sixties with the great growth in the suburbs, the elementary schools are mainly single story, but utilize steel framing with masonry walls and are more fire resistive. Secondary schools in the suburbs are multistory and otherwise similar to the elementary structures.

(b) *Services Rendered*

School facilities must, above all other considerations, serve the main objective of the educational program—*learning.* Learning in public

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elementary and secondary education is attained by children from as young as 4 years old to as old as 20. Generally most of the population within the ages of 6 to 18 years old is attending public and nonpublic elementary and secondary school facilities. In 1947, the total enrollment in public schools was about 25 million pupils, and by 1965 it was 42 million. An additional 6 million pupils in 1965 attended nonpublic schools.

TABLE 2.—*Number and percent of permanent buildings and additions with selected structural characteristics for the United States: 1962*

Structural characteristic	Total		Before 1920		1920 to 1939		1940 to 1959		After 1959	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Number of permanent buildings and additions	170,726	100.0	29,683	17.4	44,438	26.0	75,233	44.1	20,551	12.0
With basement	50,878	29.8	17,936	10.5	20,132	11.8	10,880	6.4	1,824	1.1
1 story [1]	113,995	66.8	12,246	7.2	23,391	13.7	61,039	35.8	16,811	9.8
Wood outside wall	28,275	16.6	10,431	6.1	8,995	5.3	7,603	4.5	1,052	.6
Masonry outside wall [2]	123,732	72.5	18,429	10.8	32,330	18.9	56,388	33.0	16,295	9.5
Wood framing [3]	57,687	33.8	16,631	9.7	18,052	10.6	19,290	11.3	3,395	2.0
Steel framing [3]	42,656	25.0	2,256	1.3	7,726	4.5	23,871	14.0	8,690	5.1
Masonry framing [3]	51,711	30.3	9,210	5.4	13,469	7.9	23,237	13.6	5,693	3.3
Fire resistive	76,122	44.6	4,024	2.4	13,438	7.9	43,322	25.4	15,133	8.9
Combustible	40,023	23.4	13,522	7.9	12,213	7.2	12,197	7.1	1,877	1.1

[1] Excludes basements.
[2] Includes stone, brick, blocks, or tile.
[3] Framing represents the vertical supporting members of the building.

Source: George J. Collins, *National Inventory of School Facilities and Personnel, Spring 1962*. Washington, D.C., Department of Health, Education, and Welfare, Office of Education. 1963.

TABLE 3.—*Percent of population 3 to 19 years old enrolled in school for the United States: 1947 and 1965*

	3	4	5	6	7 to 9	10 to 13	10 to 15	16 to 17	18 to 19
1947	----	----	53.4	96.4	98.4	98.6	91.6	67.6	24.3
1965	4.9	16.1	70.1	98.7	99.3	99.4	98.9	87.4	46.3

Source: U.S. Department of Commerce, Bureau of the Census, *Current Population Reports* P-20, No 129 and U.S. Department of Health, Education, and Welfare, Office of Education, Samuel Schloss *Enrollment of 3-, 4-, and 5-Year-Olds in Nursery Schools and Kindergartens, 1966*.

(c) *Standards of Performance*

Standards of performance are not available for education on a per capita basis. The ratio of pupils to instructional rooms provides one widely used measure of the adequacy of school facilities. School facilities consist of regular instructional rooms, special instructional rooms, and general-use spaces. The regular instructional rooms are used in elementary schools and in secondary schools for instruction in the subjects not requiring special equipment.

The number of pupils attempting to learn in a room provides one way to measure the current standard of performance. This is the pupil-per-room ratio.

The median number of pupils to a room has been relatively consistent in elementary rooms but secondary rooms are becoming more crowded. (See table 4.) Although there is widespread agreement that small classes provide more opportunities for learning, there is no single acceptable standard. Among the important conditions under which effective learning takes place are: readiness of the pupil, motivation, level of maturity, socioeconomic background, nature of

the subject matter, experience and ability of the teacher, methods of instruction, and others. Judgment of teachers and principals based upon experience with the general level of pupil ability, the responsibility for supervision, and the demands of society, frequently prefer 25 pupils to an instructional group. In team teaching situations, some classes are much larger and others much smaller, depending upon the specific objectives of the instruction. In general, however, the total area needed for conventional teaching and team teaching is similar, when a given level of quality space and enrollment size are held constant.

TABLE 4.—*Median number of pupils in a room for the United States*

	Elementary	Secondary
1961–62 [1]	27.6	26.3
1964–65 [2]	27.4	27.5
Teachers' preference	25.0	25.0

[1] George J. Collins, "*National Inventory of School Facilities and Personnel.*"
[2] George J. Collins, and William L. Stormer, "*Conditions of Public School Plants,*" U.S. Department of Health, Education, and Welfare, Office of Education, Washington, D.C., 1965.

The medians shown in table 4 do not reflect the wide disparities in pupil accommodation in rooms. These disparities are reflected in table 5.

TABLE 5.—*Percent of pupils in selected number of pupils to rooms, Spring 1962*

Number of pupils to rooms:	*Percent of all public school pupils*
Less than 20	14
20 to 29	56
30 to 39	26
40 or more	4

For a nation with 42.1 million pupils in public schools and 1.6 million instructional rooms [1] in use and with half the pupils in rooms exceeding 27 pupils, it would take an additional 180,000 instructional rooms to meet the level of performance preferred by teachers and principals (i.e., 25 pupils to a room).

Table 6 shows the number of additional rooms needed to eliminate overcrowding using five different measures for determining overcrowding.

TABLE 6.—*Number of additional instructional rooms needed to eliminate overcrowding as determined by varying measures of pupil accommodation for the United States: 1965*

	Measure of pupil accommodation	Number of additional rooms needed
Level I:		
Elementary	25 pupils to a room	
Secondary	20 pupils to a room	298,000
Level II:		
Elementary	25 pupils to a room	
Secondary	do	180,000
Level III (median):		
Elementary	27.4 pupils to a room	
Secondary	27.5 pupils to a room	107,000
Level IV:		
Elementary	30 pupils to a room	
Secondary	do	57,000
Local appraisal:		
Elementary	Locally determined	109,000
Secondary	do	

[1] Instructional rooms are designed or remodeled for class instruction and include all regular classrooms, laboratories, and shops.

Another standard of performance is the number of special instructional rooms needed to accommodate the pupil population. The needs for these special instructional rooms in schools to eliminate overcrowded schools, to replace inadequate facilities, and to provide space for program improvements are shown in table 7. The special instructional rooms needed for overcrowding are part of the total number of instructional rooms needed to eliminate overcrowding. (See table 6.) The special instructional rooms needed to replace inadequate rooms [2] are also included in the rooms reported as inadequate in table 8. Program improvements are an additional need from the demand of society to improve education.

TABLE 7.—*Number of special instructional rooms needed in public schools for the United States: 1965*

	Total	Overcrowding	Inadequate	Program improvements	Annual construction rate
Total special instructional rooms	87,000	37,000	30,500	19,500	6,950
Science laboratory	20,500	7,500	8,000	5,000	1,200
Language laboratory	9,000	4,000	3,000	2,000	550
Technical shops	14,000	6,500	4,500	3,000	900
Arts and crafts	12,000	5,000	4,000	3,000	500
Music	19,500	8,500	6,000	5,000	1,200
Homemaking	6,500	2,500	2,500	1,500	800
Kindergarten	5,500	3,000	2,500	(1)	1,800

[1] Does not include needs for Elementary-Secondary Act of 1965.

NOTE.—The above estimates are based mainly on information from school officials in the 1964 survey of school facilities. Major findings from this survey have been reported in the previously referenced publication, *Condition of Public School Plants, 1964-65.*

General-use spaces for libraries, auditoriums, gymnasiums, and cafeterias are also important instructional spaces needed for most schools. Schools with only one or two rooms can most often do without these special facilities, but the average elementary school and the average secondary school require these special spaces. The absence of special spaces is reflected in table 8.

TABLE 8.—*Estimated number and percent of pupils without libraries, auditoriums, gymnasiums, and cafeterias, for the United States, 1965*

General-use facility	Number	Percent
Without libraries	11,800,000	28
Without auditoriums	8,000,000	19
Without gymnasiums	13,000,000	31
Without cafeterias	9,300,000	22

NOTE.—Based on *National Inventory of School Facilities and Personnel, Spring 1962-table 5.*

Table 9 shows the number of general-use spaces needed to eliminate overcrowding, to replace inadequate facilities, and to provide program improvements. Many of the inadequate general-use units are needed to replace combustible structures. There are 5,500 libraries, 2,700 auditoriums, 6,200 cafeterias and 2,000 gymnasiums with combustible fire ratings.

[2] Inadequate rooms are reported for conditions of educational obsolescence, fire and safety, health and sanitary, structural, or population movement.

TABLE 9.—*Number of general-use facilities needed to eliminate overcrowding, to replace inadequate facilities and to improve programs for the United States, 1965*

	Needed facilities	Annual construction rate
Total, general-use	82,500	16,500
Libraries	24,100	4,500
Cafeterias	19,500	6,000
Gyms	21,000	3,600
Auditoriums, little theaters	17,900	2,400

NOTE.—This table shows current needs for special facilities and general-use areas. Cafeteria, gym and auditorium needs are based on accommodating 200 pupils at the elementary level, 400 at the secondary. The need could be reduced if areas were used for dual purposes. Figures in the first column show our present backlog, second column is present annual construction rate.

(d) *Structural Standards of Performance*

Since 1956 the Office of Education has collected and published local evaluations of classrooms, but the significance of these data was occasionally questioned, because the criteria for evaluation varied from place to place. In consequence, the survey, *Condition of Public School Plants 1964–65*,[1] included a number of definitive questions concerning important educational, fire safety, health, structural and environmental conditions of buildings. Data obtained in response to these questions are summarized in table 10. More detail is given in appendix table A, which provides comprehensive State-by-State information on structural condition and educational adequacy of classrooms as reported by local school officials.

As table 10 shows, 88 percent of all classrooms are considered educationally adequate, and the majority of these are in buildings which are structurally sound and in good repair. A substantial minority of these adequate rooms, however, are in deteriorating buildings—21 percent of all rooms in buildings which need repairs, and 15 percent in buildings requiring modernization or major rehabilitation.

TABLE 10.—*Number of rooms used for instructional purposes, by various degrees of adequacy of the buildings, and plans for improving the situation for the United States, 1965*

	Number	Percent
Total number of rooms [1]	1,550,000	100
Total adequate rooms	1,361,300	88
Adequate rooms in building requiring:		
No change	803,700	52
Minor repairs	325,400	21
Modernization or rehabilitation	233,200	15
Total inadequate rooms	182,900	13
Inadequate rooms in building requiring:		
No change	9,800	1
Minor repairs	12,300	1
Modernization or rehabilitation	29,800	2
Rooms in buildings that should be abandoned	103,300	7
Makeshift spaces not counted in above	27,700	2

[1] Because of rounding, items do not add to totals.

The remaining classrooms, comprising 13 percent of the total, should be replaced, either because they are inadequate for educational

[1] George J. Collins and William L. Stormer, *Condition of Public School Plants 1964–65*. Washington, D.C., Department of Health, Education, and Welfare, Office of Education. 1965.

purposes or because they are in structures which should be abandoned. Information on these rooms is summarized in the lower part of table 10.

Table 11 presents information on the numbers of students adversely affected by certain definitive shortcomings in public school buildings. Each category is accompanied by an estimate of the number of classrooms required to overcome the deficiency, but it should be noted that these estimates are not additive, because the categories are not mutually exclusive.

TABLE 11.—*Classroom conditions in the public schools, 1965* [1]

Problem	Number of pupils adversely affected	Number of classrooms needed
1. Overcrowded classrooms (30 or more pupils per room)	12,645,000	57,000
2. Overcrowded classrooms (over national average, 27 pupils per room)	19,187,000	107,000
3. No electrical service	64,000	2,000
4. No water piped into building	185,000	9,000
5. Need heating	2,036,000	84,000
6. Built before World War I	5,131,000	200,000
7. Temporary, makeshift or offsite classrooms	2,135,000	78,000
8. Extensive structural deterioration	1,308,000	52,000
9. Using outdoor privies	518,000	19,000

[1] 50 States, District of Columbia, plus 4 outlying areas.

NOTE.—The above figures are related to 1964–65 enrollments. They do not reflect the need for additional classrooms to accommodate new public school enrollments which will increase from 42,800,000 in 1965 to 46,000,000 in 1970.

2. EXISTING CAPITAL PLANT IN THE UNITED STATES

(a) By mid-1965, there were 1,550,000 classrooms in public schools. In addition to the classrooms, the general-use facilities numbered approximately 213,800.

TABLE 12.—*Estimated number of general use facilities for the United States 1965*

	Number
General facilities	213,800
Centralized school libraries	52,300
Auditoriums	24,100
Cafeterias or lunchrooms	46,000
Gymnasiums	27,700
Combination facilities	42,500
Auditoriums	(40,200)
Cafeterias	(21,100)
Gymnasiums	(30,500)
Other multipurpose rooms	21,200
School plants with no general facilities	16,000

NOTE.—Based on national inventory of school facilities and personnel, 1962, table 18.

(b) *Distribution of Facilities by State*

The distribution of school plants, buildings, rooms and pupils among the States and outlying areas is reported in table 13.

(c) *Distribution by Population Size*

The Office of Statistical Standards of the Bureau of the Budget has listed 219 standard metropolitan statistical areas (SMSA's). An SMSA is a county or a group of contiguous counties which contain at least one city of 50,000 or more inhabitants, or "twin" cities with combined population of at least 50,000.

TABLE 13.—*Number of school plants, buildings, rooms, and pupils in urban, urban fringe, and areas outside SMSA's, by State for the United States, 1964–65*

State	Urban schools				Urban fringe schools				Areas outside SMSA schools			
	Plants	Buildings	Rooms	Pupils	Plants	Buildings	Rooms	Pupils	Plants	Buildings	Rooms	Pupils
Alabama	295	636	6,802	208,707	298	675	5,389	141,422	1,223	2,267	15,720	395,693
Alaska									189	259	1,850	43,057
Arizona	86	188	2,688	75,561	242	581	6,718	169,026	274	550	4,353	108,711
Arkansas	64	97	1,318	31,993	146	234	2,564	67,460	700	1,634	11,105	258,681
California	1,616	5,266	40,712	1,330,413	2,990	9,564	67,157	1,938,704	1,076	3,642	21,954	502,431
Colorado	190	308	4,698	146,899	350	641	6,301	162,619	542	895	7,104	149,489
Connecticut	207	340	5,080	131,154	718	1,171	15,273	371,719	22	50	589	12,792
Delaware	21	21	663	15,383	61	133	1,928	47,497	79	140	1,483	36,587
District of Columbia	171	303	4,890	137,302								
Florida	840	2,010	23,220	670,961	19	56	501	14,365	751	1,754	15,528	396,479
Georgia	362	725	8,894	267,343	268	783	6,690	178,162	1,301	2,131	22,298	586,938
Hawaii	116	288	4,157	119,027					79	148	1,600	35,644
Idaho	37	58	701	19,500	1	6	35	368	399	649	5,990	137,564
Illinois	718	1,126	21,634	661,525	1,701	3,500	30,601	787,807	1,845	3,154	23,861	504,358
Indiana	344	768	9,968	288,686	532	1,031	9,019	239,482	1,113	2,033	20,052	482,032
Iowa	202	347	4,826	127,260	218	318	2,923	75,495	1,452	2,348	20,723	446,341
Kansas	188	409	4,044	113,503	195	462	4,018	99,654	1,769	2,550	17,439	23,812
Kentucky	91	156	2,319	62,384	169	314	4,290	113,149	1,681	2,442	16,833	430,775
Louisiana	335	811	9,143	237,349	218	498	4,865	129,248	918	2,151	18,076	403,317
Maine	44	47	600	16,960	142	233	1,474	35,490	734	945	6,199	150,444
Maryland	210	343	6,275	185,916	427	924	11,075	300,310	495	807	8,280	232,551
Massachusetts	513	632	9,981	253,666	1,332	1,855	24,986	607,957	86	121	1,314	30,807
Michigan	728	1,158	16,233	522,815	1,573	3,092	30,548	820,909	1,596	2,407	17,659	457,287
Minnesota	215	377	4,438	126,110	405	610	10,639	267,968	1,640	2,606	17,873	392,571
Mississippi	38	96	1,310	32,509	33	80	656	21,062	918	1,914	18,726	515,669

Missouri	297	486	6,919	202,271	479	1,005	9,916	245,938	1,306	2,460	17,141	367,600
Montana	46	72	1,088	29,171	46	84	394	6,350	957	1,284	7,087	140,666
Nebraska	153	275	2,920	88,936	97	174	1,429	29,404	2,254	2,723	12,889	228,716
Nevada	102	180	2,409	68,940					93	163	1,101	20,365
New Hampshire	23	35	458	12,932	169	326	2,309	55,758	215	329	2,391	55,333
New Jersey	223	288	7,136	186,556	1,218	2,156	28,377	690,489	616	935	10,308	286,335
New Mexico	70	214	2,260	59,500					540	1,004	8,039	182,115
New York	1,264	1,791	49,027	1,409,318	1,750	2,897	45,762	1,201,883	924	1,945	23,297	530,679
North Carolina	213	526	5,473	148,006	197	537	4,470	120,855	1,679	3,934	35,104	880,645
North Dakota	15	22	390	10,005	31	51	318	5,008	790	1,069	6,635	136,544
Ohio	737	1,197	22,902	636,154	1,445	3,253	35,857	940,200	1,467	2,503	24,286	606,648
Oklahoma	215	557	5,489	152,699	287	681	4,434	105,674	1,335	2,562	15,781	310,678
Oregon	145	330	3,660	95,419	257	640	5,075	114,855	773	1,504	10,120	224,446
Pennsylvania	627	930	16,487	473,704	2,372	3,506	42,561	1,092,712	1,432	1,912	20,241	533,818
Rhode Island	61	70	1,343	33,568	282	387	4,610	118,263				
South Carolina	140	229	3,176	88,060	197	450	4,369	123,234	844	1,470	15,606	415,448
South Dakota	23	37	494	14,576	43	49	204	4,083	1,795	2,158	7,809	147,115
Tennessee	238	425	6,839	184,494	364	758	7,125	194,175	1,503	2,591	17,425	448,903
Texas	1,118	2,179	30,885	848,444	1,060	2,226	23,400	552,493	1,903	4,303	37,196	764,315
Utah	92	186	2,467	65,126	186	376	4,258	128,205	262	443	3,465	75,496
Vermont									483	612	3,723	81,266
Virginia	285	449	7,160	197,128	350	662	7,913	214,385	1,169	2,132	19,196	513,420
Washington	263	624	6,179	175,579	471	1,060	10,411	257,605	736	1,466	12,403	281,928
West Virginia	243	413	3,380	90,470	113	209	1,130	31,240	1,451	2,162	12,513	316,593
Wisconsin	207	346	5,492	161,440	518	1,025	8,429	209,164	1,421	2,432	18,533	436,393
Wyoming									387	604	4,517	89,555
Canal Zone									19	40	504	12,532
Guam									17	18	407	11,782
Puerto Rico									1,782	3,851	12,843	557,107
American Samoa									49	49	224	7,020
Total	14,453	28,396	388,651	11,215,445	23,988	49,296	500,423	13,031,867	49,111	86,278	657,419	15,697,512
Percent of totals	16.5	17.3	25.1	28.1	27.4	30.1	32.4	32.6	56.1	52.6	42.5	39.3

NOTE.—Item responses do not add to exact totals because of rounding and the use of separate computer for State and National totals.

The report in table 13 separates the data into:

(1) Urban or central cities—that is, Detroit, Pontiac, and Dearborn within the SMSA;

(2) Urban fringe the remaining schools within the SMSA's, and

(3) The areas outside the SMSA's.

The separation between urban and urban fringe areas is of special interest to public education, because it reveals that crowding of pupils is greatest in urban centers. This is illustrated by the tabulation below.

TABLE 14.—*Number and percent of pupils in rooms with 30 or more pupils by urban, urban fringe, and areas outside SMSA's, 1965*

Area	Pupils	Percent
Urban	4,300,000	42
Urban fringe	2,900,000	25
Outside SMSA's	3,200,000	23

The approximate distribution of pupils and rooms among six size classifications of population is a further refinement of the data reported in table 13.

TABLE 15.—*Estimated number of rooms by population size of city for the United States, and outlying areas, 1964–65*

	Rooms
Total	1,550,000
Cities with population of—	
500,000 or more	167,300
100,000 to 499,999	221,300
50,000 to 99,999	125,900
10,000 to 49,999	294,500
2,500 to 9,999	157,400
Under 2,500	583,600

(d) An analysis of the structural characteristics of the 93,000 public school facilities surveyed in the *National Inventory of School Facilities and Personnel: Spring 1962* reveals that generally three periods of construction are significant—before 1920, 1920–40, and after 1940. The investment in public school facilities is relatively new. More than one-half of the schoolrooms were constructed since World War II. Data are summarized in table 16.

TABLE 16.—*Estimated number and percent of instructional rooms in permanent buildings by date of completion for the United States, spring 1965*

	Number	Percent
Data of completion: Total [1]	1,550,000	100
Before 1920	214,000	14
1920 to 1929	242,000	16
1930 to 1939	161,000	10
1940 to 1949	103,000	7
1950 to 1959	513,000	33
1960 to 1965	317,000	20

[1] Because of rounding items may not add to total.

NOTE.—Based on *National Inventory of School Facilities and Personnel, 1962, table 8.*

(e) *Ownership*

Public school facilities are legally owned by the State and held in trust by public school districts created by the State educational agencies. In an inventory of 93,000 public schools conducted in 1962, school officials reported 98.5 percent of the schools as publicly owned. This includes schools owned by public authorities and leased to public schools. The remainder (1.5 percent) of the schools are not owned by public school districts or authorities, but are used as instructional facilities.

(f) *Estimated Current Value*

The estimated current value of public school facilities is $58 billion, but the replacement value at current costs would be $80 billion.

B. Costs and User Charges

1. CONSTRUCTION COSTS AND OPERATING COSTS

(*a*) During 1965, based on an analysis of projects reported in *School Management*, construction costs per classroom ranged from $11,000 to $135,000. There is substantial variation among States, reflecting both climatic differences, which are related to type of construction, and other differences, related to wage differentials and other factors. Within States, costs vary among urban, suburban, and rural communities; they also reflect factors such as the number and type of classrooms in a project, structural characteristics, equipment, and functional qualities, such as air conditioning, thermal controls and wall or floor coverings. National average data are summarized in table 17. Averages for each State are given in appendix table B.

TABLE 17.—*Number of projects, rooms, and cost per classroom and per pupil for the United States, 1964*

Grade level	Number of projects	Number of rooms	Cost per classroom	Cost per pupil
Elementary:				
New	1,158	20,513	31,600	1,178
Additions	1,517	8,970	32,400	1,100
Secondary:				
New	859	22,190	47,600	1,811
Additions	1,417	10,353	48,800	1,911
All construction	4,951	62,026	40,300	1,505

NOTE.—Estimates are based on reports of project costs by individual school districts. They are intended to be all-inclusive; that is, to include land, site development, architects fees, construction, and initial equipment. However, variations in reporting practices and other factors are known to result in omission of indeterminate amounts, especially with respect to land and equipment.

Source: *School Management* "Current Trends in School Facilities," July 1965, p. 111.

(*b*) For the 1965–66 school year the budgeted maintenance expenditures for the United States were $610 million. The average maintenance expenditure per pupil was $15. Maintenance for schools includes salaries and expenditures for keeping grounds, buildings, and equipment in a reasonable condition of efficiency either through repairs or replacement of property.

The budgeted expenditures for operations were $1.8 billion for the 1965–66 school year. The average operating cost per pupil was about $43 per pupil. Operating costs cover activities concerned with keeping the physical plant open and ready for use. They include cleaning, heating, lighting, and care of grounds, but do not include repairs or replacement of facilities or equipment.

It might be supposed that larger schools could be operated more efficiently and that per pupil costs for maintenance and operation would decline as the size of the school plant increased. Instead, it appears that the use of part-time employees and the practice of contracting for services largely equalize per pupil expenditures for these purposes among schools of varying size. There is, however, a substantial relationship between total educational expenditures and expenditures budgeted for maintenance and operation. Data summarized in table 18 provide evidence of this relationship and reveal large variations which are not apparent from averages.

TABLE 18.—*Variation in budgeted expenditures for maintenance and operations, 1965–66*

Total district expenditure per pupil	Expenditure per pupil for—	
	Maintenance	Operation
$200 or less	$7.84	$15.75
$201 to $250	9.96	24.77
$251 to $300	13.28	32.21
$301 to $350	15.68	37.39
$351 to $400	19.71	44.45
$401 to $450	22.71	51.16
$451 to $500	23.85	57.13
$501 or more	37.47	78.78

2. USER CHARGES

(*a*) Funds for the construction of facilities are obtained from State (20 percent), local (72 percent), local authorities (7 percent), and Federal taxes (1 percent). Current educational expenses, including those for maintenance and operation, are obtained from tax funds collected by State (39 percent), local (57 percent), and Federal (4 percent). Pupils and their parents do not pay user charges but are subject to the same general taxes as the general population. When public authorities purchase school facilities, local school districts usually pay fees for lease of the building equal to the payments for bonded indebtedness incurred by the public authority to construct the school. When the bonds are paid the school districts are given the school.

(*b*) *Extent user charges cover expenses.*—Pupils pay no direct charges that cover annual debt services or operations and maintenance expenses. Rental fees paid by community groups seldom provide

more than the cost of utilities, cleaning, and custodial service; and quite often not even these three essentials.

(*c*) The cost of facilities is generally obtained from general obligations bonds. In the following section a breakdown by source of funds will be reported.

C. Trend of Capital Outlay

1. 1946–65

During the 20-year period, fiscal 1946 through fiscal 1965, the construction of elementary and secondary school facilities has multiplied many times; $111 million was spent in 1946 and $3.5 billion was spent in 1965. There has been constant construction to meet the needs of increased enrollment and replacement of obsolete facilities. The increases in construction were most rapid immediately after the war and as the postwar babies entered school in the early 1950's. Since 1956 the number of classrooms constructed each year has ranged between 65,000 to 72,000 with the 10-year average being 68,000. Some of the fluctuation in the rooms constructed and expenditures is caused by the construction of large secondary schools which take more than 1 year to complete. Consequently the rooms are usually reported in the year of completion, not necessarily the year when the debts or expenditures are incurred.

2. PROPORTION OF ANNUAL OUTLAYS

All construction reported was for local school districts. A very small fraction of 1 percent were Federal schools.

3. SOURCE OF FINANCING CAPITAL OUTLAYS

Most of the financing (about 80 percent) during the period has been by local school districts (see table 18). Most of this has been by the sale of bonds. During the later years of the 1940's the States began to recognize the financing problems and made some significant contributions in the area of financing school construction. It must be noted that nearly half the State contributions have been in the form of loans or advances, with the burden of repayment still on the local school district. School building authorities have accounted for nearly $200 million a year of public elementary and secondary school construction. Approximately another $200 million a year is coming from current taxes and accumulative building funds. The items of gifts and private construction appear to be insignificant in the total picture; however, they undoubtedly may be very significant to the individual school districts involved.

TABLE 19.—*Capital outlay and tax-exempt bonds sold for public elementary and secondary school facilities for the United States: 1946–66*

[Dollar amounts in millions]

Fiscal year ending June 30	Classroom units constructed	Expenditures	Expenditure by source				Tax exempt bonds sold
			State	Public authority	Local school district	Federal grant Public Law 815	
Totals 1946–65	1,089,674	$44,794	$5,421	$2,956	$35,373	$991	$34,927
1946	(3,900)	111	(*)	(*)	(110)		302
1947	(7,000)	205	(*)	(*)	(200)		395
1948	(13,500)	412	(*)	(*)	(400)		476
1949	(21,000)	664	(*)	(*)	(650)		370
1950	(30,900)	1,014	43	(*)	(950)		854
1951	(38,900)	1,316	124	21	1,167	4	986
1952	(44,600)	1,563	194	66	1,260	43	957
1953	(55,100)	1,995	208	218	1,451	118	1,451
1954	(58,800)	2,200	180	204	1,711	105	1,667
1955	60,005	2,310	163	130	1,896	121	1,634
1956	63,283	2,607	196	211	2,111	89	1,804
1957	68,660	2,982	247	334	2,334	67	1,870
1958	72,070	3,062	327	242	2,424	69	2,420
1959	69,453	2,539	324	(200)	1,941	74	1,948
1960	69,400	2,823	370	161	2,226	66	2,195
1961	72,214	2,864	(370)	(120)	2,315	59	2,357
1962	72,089	2,987	372	125	2,448	42	2,568
1963	65,300	2,700	(372)	240	2,035	53	2,274
1964	69,300	3,116	526	177	2,391	22	2,569
1965	(65,200)	(3,524)	(705)	(257)	(2,533)	29	2,823
1966	(69,000)	(3,800)	(700)	(250)	(2,820)	(30)	(2,967)

NOTES

1. Includes only schools operated by local school districts.
2. Items are taken from various reports and publications in the Office of Education.
3. Items in parentheses are estimates.
4. Items not available are indicated by an asterisk.

D. NEEDS AND PROSPECTIVE CAPITAL OUTLAYS

(*a*) Capital outlay requirements for public elementary and secondary schools during the decade 1966–75 reflect three components:

(1) Replacement of dilapidated and obsolete facilities and elimination of overcrowded classrooms.

(2) Accommodation of new enrollment, which is expected to grow by about 6 million students during the decade.

(3) Provision of arrangements to offer innovative services and supplementary programs which will broaden and deepen the range of educational experiences available to all and to insure that wherever feasible pupils from all races and walks of life attend school together.

Although there is no universally accepted standard of adequacy for school facilities, the first two of these components can be expressed in terms of numbers of classrooms required. These should insure, at a minimum, that the most seriously outmoded and unsafe school buildings are replaced and that present and future pupils can be accommodated without serious overcrowding. With a rapidly migrating population, the total elimination of local—and temporary—overcrowding is probably not feasible. In general however, it is assumed, for purposes of these estimates, that no significant proportion of the pupil population should be housed in facilities more crowded than the present median, which is between 27 and 28 pupils per room. The average accommodation will, of course, be somewhat lower.

It is more difficult to estimate, in terms such as classrooms or square feet, the facilities needed to insure a better balanced and richer educational program, and the opening of more equal opportunities for disadvantaged children. In some cases, much can be accomplished simply by using more carefully selected—and frequently more expensive—sites for new schools. In other cases, progress may be sought through the development of a network of supplementary education centers, perhaps accompanied by changes in the attendance areas of schools served by those centers. In many situations, however, especially in the large cities, the achievement of educational goals may require more substantial departures from traditional patterns of school organization. In many instances it will probably require acquisition of large amounts of city land and development of educational parks—a solution now being seriously studied by several cities. Precise estimates of required expenditure are difficult because solutions will vary so greatly from community to community. It is known, however, that only large outlays will provide satisfactory conditions in most situations. Available evidence tends to indicate that the estimates included here are definitely conservative.

Capital outlay requirements for the decade are estimated as shown below:

	Million
Replacement of outmoded and unsafe facilities and reduction of overcrowding (400,000 classrooms)	$20. 6
Accommodation of new enrollment, including an allowance for migration (350,000 rooms)	16. 2
Improvement of education programs and extension of opportunities for disadvantaged pupils	5. 0
Total	41. 8

In the above summary, facility needs have been translated into dollar expenditures, by assuming an average cost of $49,000 per classroom. It will be necessary to allow for a higher cost:

(i) If there is further increase in construction costs beyond the recent rate of about 3 percent per year; or

(ii) If the construction of a substantial proportion of the needed facilities must be postponed to the latter part of the decade. For several reasons, including the long planning time required for effective rehabilitation of urban systems, it seems likely that some postponements will occur, but no precise year-by-year estimates of future school building can be made.

(b) *Distribution of Capital Outlays by Size of Community*

Only the roughest estimates of this distribution are possible. On the one hand, the urban fringe areas are expected to grow most rapidly. On the other hand, needs for replacement of facilities are generally greatest in the central cities and, to a lesser extent, in communities outside of standard metropolitan statistical areas. In fact, it appears that each of these three sectors should account for about one-third of the school building activity during the decade.

(c) *Spending Agencies for Capital Outlays*

The overwhelming majority of projected capital outlays will be expended by cities, counties, towns, and other local districts, responsible for operation of public schools. A small proportion—perhaps as much as 6 percent—will be expended by school building authorities.

APPENDIX TABLE A

U.S. Government Office of Health, Education, and Welfare, 1964 survey of school plants—Table 1; inflated counts, February 1965—Rooms used for instructional purposes by various degrees of adequacy of building and/or room by plans for improving the building situation, and additional rooms needed to reduce overcrowding

	Total number of rooms in use		Inadequate rooms designed for instruction in buildings requiring—								Makeshift rooms used for instruction		Adequate rooms designed for instruction in buildings requiring					
			No changes		Minor repairs		Modernization or rehabilitation		That should be abandoned				No changes		Minor repairs		Modernization or rehabilitation	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Alabama	28,039	1.81	408	1.45	316	1.13	1,006	3.59	4,284	15.28	699	2.49	11,686	41.68	5,927	21.14	3,714	13.24
Alaska	1,850	.12	5	.26	8	.42	52	2.81	219	11.84	55	2.95	1,086	58.68	291	15.74	135	7.30
Arizona	13,695	.88	8	.06	38	.27	188	1.38	816	5.96	260	1.90	9,093	66.40	1,557	11.37	1,735	12.67
Arkansas	15,000	.97	228	1.52	118	.79	673	4.49	1,753	11.69	296	1.97	5,413	36.09	2,909	19.40	3,610	24.06
California	130,606	8.43	418	.32	698	.53	2,228	1.71	6,743	5.16	1,734	1.33	92,910	71.14	14,721	11.27	11,155	8.54
Colorado	18,118	1.17	87	.48	92	.51	329	1.82	1,076	5.94	375	2.07	11,585	63.94	2,468	13.62	2,106	11.62
Connecticut	20,982	1.35	75	.36	62	.30	214	1.02	1,059	5.04	477	2.28	11,706	55.79	4,267	20.34	3,121	14.87
Delaware	4,111	.27	58	1.40	27	.64	101	2.45	0	0	119	2.90	1,867	45.42	847	20.60	1,093	26.59
District of Columbia	4,891	.32	8	.16	16	.32	36	.73	417	8.53	408	8.35	1,524	31.17	1,194	24.42	1,287	26.33
Florida	39,309	2.54	211	.54	569	1.45	992	2.52	2,574	6.55	1,090	2.77	19,006	48.35	9,625	24.49	5,240	13.33
Georgia	37,207	2.40	234	.63	128	.34	574	1.54	2,539	6.82	1,006	2.70	18,495	49.71	9,102	24.46	5,128	13.78
Hawaii	5,799	.37	11	.19	24	.41	195	3.36	1,036	17.87	34	.59	1,924	33.18	1,318	22.72	1,256	21.66
Idaho	6,842	.44	89	1.31	114	1.67	206	3.01	867	12.68	149	2.18	2,503	36.59	1,650	24.12	1,262	18.45
Illinois	75,979	4.90	674	.89	471	.62	735	.97	3,448	4.54	1,442	1.90	39,099	51.46	17,667	23.25	12,444	16.38
Indiana	40,356	2.60	263	.65	392	.97	606	1.50	3,915	9.70	626	1.55	19,234	47.66	9,172	22.73	6,147	15.23
Iowa	28,468	1.84	274	.96	494	1.73	456	1.60	1,983	6.97	906	3.18	14,200	49.88	6,347	22.29	3,808	13.38
Kansas	25,118	1 62	445	1.77	351	1.40	266	1.06	1,447	5.76	367	1.46	13,826	55.04	4,523	18.01	3,893	15.50
Kentucky	23,443	1.51	288	1.23	229	.98	733	3.13	2,805	11.97	696	2.97	8,926	38.08	5,126	21.87	4,639	19.79
Louisiana	31,966	2.06	68	.21	351	1.10	452	1.42	1,128	3.53	714	2.23	18,426	57.64	6,760	21.15	4,068	12.73
Maine	8,309	.54	82	.98	132	1.59	160	1.93	908	10 92	205	2.47	3,395	40.86	1,998	24.05	1,429	17.19
Maryland	25,692	1.66	97	.38	84	.33	470	1.83	1,380	5.37	684	2.66	13,883	54.04	4,926	19.17	4,169	16.23

Massachusetts	36,390	2.35	386	1.06	441	1.21	741	2.04	2,187	6.01	1,341	3.68	15,296	42.03	8,387	23.05	7,612	20.92
Michigan	64,542	4.16	457	.71	536	.83	1,396	2.16	2,428	3.76	938	1.45	33,556	51.99	14,417	22.34	10,812	16.75
Minnesota	33,044	2.13	276	.84	614	1.86	614	1.86	2,314	7.00	569	1.72	16,900	51.14	7,660	23.18	4,096	12.40
Mississippi	20,921	1.35	249	1.19	255	1.22	396	1.89	1,013	4.84	566	2.71	12,268	58.64	4,385	20.96	1,789	8.55
Missouri	34,081	2.20	127	.37	317	.93	634	1.86	2,958	8.68	763	2.24	17,871	52.44	5,646	16.57	5,765	16.92
Montana	8,602	.55	76	.88	45	.52	185	2.15	833	9.68	172	2.01	4,471	51.98	1,367	15.89	1,453	16.89
Nebraska	17,304	1.12	119	.69	218	1.26	448	2.59	1,379	7.97	294	1.70	8,171	47.22	4,330	25.02	2,344	13.55
Nevada	3,531	.23	1	.03	6	.18	49	1.39	154	4.35	60	1.70	2,781	78.76	241	6.82	238	6.75
New Hampshire	5,161	.33	13	.25	51	.98	74	1.44	396	7.68	147	2.85	2,559	49.59	1,053	20.41	867	16.81
New Jersey	45,906	2.96	97	.21	295	.64	457	1.00	2,491	5.43	1,160	2.53	20,302	44.23	12,859	28.01	8,244	17.96
New Mexico	10,111	.65	26	.25	68	.67	197	1.95	1,136	11.24	176	1.74	4,668	46.17	2,590	25.71	1,240	12.26
New York	118,139	7.62	819	.69	359	.30	2,784	2.36	9,354	7.92	2,728	2.31	59,577	50.43	20,136	17.04	22,381	18.94
North Carolina	45,065	2.91	343	.76	500	1.11	1,782	3.96	4,473	9.92	1,370	3.04	16,678	37.01	10,421	23.12	9,497	21.08
North Dakota	7,413	.48	94	1.27	99	1.33	151	2.04	581	7.84	216	2.91	3,380	45.60	1,809	24.40	1,084	14.62
Ohio	83,165	5.37	480	.58	597	.72	1,220	1.47	3,587	4.31	1,223	1.47	48,406	58.20	19,596	23.56	8,057	9.69
Oklahoma	25,773	1.66	158	.61	360	1.40	635	2.46	1,281	4.97	540	2.10	12,067	46.82	6,184	24.00	4,548	17.64
Oregon	18,855	1.22	158	.84	150	.80	353	1.87	1,112	5.90	396	2.10	9,927	52.65	3,888	20.62	2,871	15.22
Pennsylvania	79,492	5.13	410	.52	220	.28	1,002	1.26	5,205	6.55	1,410	1.77	40,469	50.91	17,151	21.58	13,625	17.14
Rhode Island	5,920	.38	24	.40	24	.41	137	2.32	349	5.90	237	4.01	2,671	45.12	1,623	27.42	855	14.44
South Carolina	23,187	1.50	140	.61	238	1.03	267	1.15	1,052	4.54	457	1.97	10,517	45.36	6,222	26.84	4,294	18.52
South Dakota	8,565	.55	111	1.29	121	1.41	330	3.85	829	9.68	272	3.18	2,917	34.06	2,297	26.82	1,688	19.71
Tennessee	31,328	2.02	160	.51	214	.68	1,057	3.37	3,104	9.91	501	1.60	13,533	43.20	7,315	23.35	5,444	17.38
Texas	92,031	5.94	139	.15	266	.29	627	.68	3,507	3.81	821	.89	52,919	57.50	24,005	26.08	9,745	10.59
Utah	10,097	.65	145	1.44	165	1.63	382	3.78	563	5.57	516	5.11	4,693	45.48	2,254	22.32	1,481	14.67
Vermont	3,723	.24	22	.59	16	.43	165	4.43	591	15.87	135	3.63	1,640	44.07	334	8.98	819	22.00
Virginia	34,409	2.22	194	.56	158	.46	345	1.00	2,621	7.62	735	2.14	20,280	58.94	4,660	13.54	5,417	15.74
Washington	29,142	1.88	236	.81	210	.72	165	.57	2,281	7.83	576	1.98	15,980	54.84	5,583	19.16	4,110	14.10
West Virginia	17,085	1.10	139	.81	380	2.22	566	3.31	1,527	8.94	286	1.67	6,182	36.18	4,383	25.66	3,622	21.20
Wisconsin	32,558	2.10	108	.33	146	.45	566	1.74	1,816	5.58	683	2.10	18,990	58.32	6,654	20.44	3,595	11.04
Wyoming	4,522	.29	12	.27	43	.94	54	1.19	396	8.75	130	2.87	1,990	44.01	1,437	31.77	461	10.20
Grand total	1,550,024	100	9,842	.63	12,264	.79	29,823	1.92	103,286	6.66	32,479	2.10	803,669	51.85	325,422	20.99	233,238	15.05
50 States and District of Columbia	1,535,809	99.08	9,749	.63	11,826	.77	28,455	1.85	101,915	6.64	31,763	2.07	801,323	52.18	321,289	20.92	229,490	14.94
Outlying parts	14,216	.92	93	.66	438	3.08	1,368	9.62	1,371	9.65	716	5.04	2,347	16.51	4,134	29.08	3,748	26.36
Canal Zone	504	.03	0	0	8	1.59	3	.60	62	12.30	10	1.98	187	37.10	77	15.28	157	31.15
Guam	408	.03	0	0	17	4.12	16	3.82	25	6.13	19	4.71	68	16.69	125	30.60	138	33.93
Puerto Rico	13,155	.85	89	.68	413	3.14	1,349	10.26	1,241	9.44	670	5.10	2,023	15.38	3,932	29.89	3,436	26.12
American Samoa	149	.01	4	2.68	0	0	0	0	43	28.86	17	11.41	69	46.31	0	0	16	10.74
Virgin Islands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX TABLE B

Average expenditure per classroom in public elementary and secondary schools by State for the United States, 1964

State	Elementary		Secondary	
	New	Addition	New	Addition
Alabama	19,700	23,500	32,600	25,200
Alaska	49,000	31,500	71,400	60,400
Arizona	20,500	20,400	26,100	16,000
Arkansas	22,000	26,000	29,000	37,000
California	38,100	36,400	51,200	58,000
Colorado	38,400	28,000	50,200	63,000
Connecticut	50,000	46,000	48,400	51,000
Delaware	46,000	6,200	78,000	125,000
Florida	21,000	25,000	38,000	37,000
Georgia	22,000	21,300	29,100	38,000
Hawaii	35,200	28,200	47,300	39,400
Idaho	30,000	29,000	44,000	42,100
Illinois	63,000	44,100	97,000	88,400
Indiana	36,200	38,000	51,000	53,000
Iowa	29,000	25,400	37,300	37,200
Kansas	29,000	26,000	39,000	56,400
Kentucky	22,200	21,000	24,400	47,000
Louisiana	18,300	60,000	34,000	69,000
Maine	39,400	31,400	31,400	76,300
Maryland	45,000	38,000	48,400	65,200
Massachusetts	49,100	39,000	54,100	52,000
Michigan	34,000	31,000	54,000	43,000
Minnesota	34,200	38,400	51,000	54,000
Mississippi	29,300	21,000	38,400	24,200
Missouri	43,000	32,200	41,400	47,000
Montana	27,100	25,000	66,000	63,400
Nebraska	36,900	32,500	42,200	36,200
Nevada	20,500	22,500	33,800	54,300
New Hampshire	30,600	29,500	21,600	80,100
New Jersey	38,600	41,800	56,900	62,400
New Mexico	21,400	23,100	42,200	24,100
New York	53,000	49,300	60,600	48,800
North Carolina	23,600	18,700	36,400	38,300
North Dakota	39,300	36,000	42,200	44,400
Ohio	34,200	29,300	42,900	51,100
Oklahoma	18,000	20,800	35,000	26,300
Oregon	32,700	32,900	62,800	31,600
Pennsylvania	49,300	43,900	69,800	65,700
Rhode Island	35,600	29,500	46,000	28,500
South Carolina	20,500	22,200	41,000	36,600
South Dakota	33,700	10,600	43,100	34,000
Tennessee	15,000	20,300	39,300	43,400
Texas	21,400	22,300	35,100	35,100
Utah	41,200	29,900	47,700	48,800
Vermont	35,000	18,600	44,700	61,500
Virginia	59,700	26,800	39,900	27,100
Washington	39,500	36,000	47,700	57,800
West Virginia	20,200	20,400	85,500	23,100
Wisconsin	35,400	35,100	45,400	60,200
Wyoming	20,600	15,000	35,000	40,200

Source: *School Management:* "Trends: A State-by-State Examination of Dollars Spent for School Construction for 4 Years," July 1965, pp. 112-137.

CHAPTER 17

Nonpublic Elementary and Secondary School Facilities*

A. NATURE AND COMPOSITION OF NONPUBLIC SCHOOLS

1. DESCRIPTION OF FACILITIES

(a) *Physical Characteristics*

The predominant type of school building used for nonpublic schools is fire resistive (52 percent), multistory (56 percent), masonry exterior (79 percent), with steel (34 percent) or masonry framing (27 percent).

Nonpublic schools can be subdivided into church related, and nonchurch related or private. Church-related schools are predominantly Roman Catholic. Roman Catholic schools are generally located in the more populated areas of the Nation and the profile of physical characteristics described above is greatly influenced by the large number of Roman Catholic schools. Some Roman Catholic, other church-related schools, and private schools are located in the typical "preparatory" school setting of multiple building campuses with large acreage. This is evident from the large number of acres in the mean as compared to the median size of site for nonpublic schools. (See table 1.)

TABLE 1.—*Number of acres in the median non-public-school site by organizational level for selected periods for the United States, 1965*

	Elementary	Combined	Secondary
Before 1920	1	2	7
1940-49	2	5	8
1960-65	3	6	14
Median, all sites	2	4	10
Mean, all sites	5	26	50

Source: Based on George J. Collins, "*National Inventory of School Facilities and Personnel, Spring 1962.*" Washington, U.S. Department of Health, Education, and Welfare, Office of Education, 1964.

(b) *Services Rendered*

Nonpublic schools serve the Nation in a free society by providing several choices to parents in fulfilling the requirements of compulsory education outside of public education. For some, these choices may favor a school where religion is taught, or the quality of education provides for smaller class size and a greater emphasis on individual instruction, or a chance to live in a total school environment away from home. In another sense, nonpublic schools serve the State in providing schools which eliminate the necessity of providing additional public schools. Nonpublic schools serve the population from ages 3 to 19 years with nursery, kindergarten, elementary, secondary, and postsecondary or preparatory educational programs (see table 2).

*This chapter was prepared by Dr. George J. Collins, National Center for Educational Statistics, Office of Education, Department of Health, Education, and Welfare, with minor editing by committee staff.

TABLE 2.—*Fall enrollment by organizational level of public and nonpublic schools for the United States, 1965–66*

	Total		Elementary [1]		Secondary [2]	
	Number	Percent	Number	Percent	Number	Percent
1965	48,744,000	100	31,716,000	65.1	17,028,000	34.9
Public	42,144,000	86.4	26,416,000	54.2	15,728,000	32.3
Nonpublic	6,600,000	13.5	5,300,000	10.9	1,300,000	2.7

[1] Elementary includes nursery and kindergarten schools.
[2] Secondary includes postsecondary or preparatory schools.

Source: Samuel Schloss, "*Fall 1965 Statistics of Public Schools*"; and Kenneth A. Simon, "*Digest of Educational Statistics*"; Washington, U.S. Department of Health, Education, and Welfare, Office of Education, 1966.

(c) *Standards of Performance*

Standards of performance are not available on a per capita basis. The ratio of pupils to instructional rooms provides one widely used measure of the adequacy of school facilities. The median number of pupils in a room for elementary schools is 39.2 and for secondary schools, 25.4 pupils. The comparable medians for public schools are 27.6 for elementary and 26.3 for secondary school pupils. The wide disparity in pupil accommodations in nonpublic schools is shown in table 4. Especially noteworthy is the comparison between public and nonpublic schools in the proportions of pupils accommodated in classrooms with 40 or more pupils.

TABLE 4.—*Estimated number and percent of pupils in a room of public and nonpublic schools for the United States, 1965*

	Nonpublic		Public	
	Number	Percent	Number	Percent
Less than 20	891,000	13.5	5,978,000	14.2
20 to 29	1,405,800	21.3	23,576,000	56.0
30 to 39	1,900,800	28.8	10,904,000	25.9
40 or more	2,402,400	36.4	1,632,000	3.9

Source: Based on *National Inventory of School Facilities and Personnel, Spring 1962*. Washington, U.S. Department of Health, Education, and Welfare, Office of Education, 1964.

Table 5 shows the number of additional rooms needed to eliminate the crowded conditions in nonpublic schools using varying kinds of pupil accommodation. As this table makes clear, the overwhelming majority of additional rooms needed to eliminate overcrowding are for Roman Catholic schools.

TABLE 5.—*Number of additional instructional rooms needed to eliminate overcrowding in nonpublic school as determined by varying measures of pupil accommodation for the United States, 1965–66*

	Total nonpublic	Roman Catholic	Other church related	Private
Level I Elementary, 25 pupils; secondary, 20 pupils.	81,000	78,000	2,200	800
Level II (public median) Elementary, 27.6 pupils; secondary, 26.3 pupils.	55,200	53,700	1,100	400
Level III Elementary, 30 pupils; secondary, 30 pupils.	41,400	40,400	700	300

Source: Based on *National Inventory of School Facilities and Personnel, Spring 1962.*

Another standard of performance is the number of general-use rooms needed to accommodate the pupil population. Table 6 shows the estimated number and percent of pupils without four types of general-use spaces.

TABLE 6.—*Estimated number and percent of pupils in nonpublic schools without libraries, auditoriums, gymnasiums, and cafeterias for the United States, 1965–66*

General-use facility	Number of pupils	Percent
Without libraries	2,442,000	37
Without auditoriums	1,914,000	29
Without gymnasiums	2,366,000	51
Without cafeterias	2,112,000	32

Source: Based on *National Inventory of School Facilities and Personnel, Spring 1962.*

The number of general-use facilities needed to replace combustible structures and eliminate overcrowding is shown in table 7.

TABLE 7.—*Number of general-use facilities needed to eliminate overcrowding and to replace inadequate facilities in nonpublic schools for the United States, 1965–66*

General-use facilities	Combustible	Major renovation or replacement	Overcrowding	Total	Annual construction rate
Total	3,200	9,050	33,000	45,250	18,400
Libraries	850	2,300	10,500	13,650	4,600
Cafeterias	700	2,200	8,100	11,000	2,000
Gymnasiums	200	550	7,000	7,750	1,100
Auditoriums	450	1,500	7,400	9,350	2,200
Combination	400	1,000	----	1,400	4,300
Multipurpose	600	1,500	----	2,100	2,200

NOTE.—This table is based on the number of combustible and overcrowded facilities reported in the *National Inventory of School Facilities and Personnel, Spring 1962.* The need is based on accommodating 200 pupils in elementary schools and 400 pupils in secondary schools. The need could be reduced if areas were used for multiple purposes.

(d) *Structural Standards of Performance*

Nonpublic schools were using about 227,000 instructional rooms in the school year 1965–66. About 8,400 were improvised or makeshift and about 9,500 were nonpermanent. (See table 8.) About 79,700 rooms or 36 percent of the nonpublic school rooms are combustible, constructed before 1920, makeshift, or nonpermanent.

TABLE 8.—*Number and percent of rooms in public and nonpublic schools for the United States, 1965*

	Nonpublic		Public	
	Number	Percent	Number	Percent
Total (unduplicated)	79,700	34.2	397,500	25.6
Completed before 1920	51,300	23.6	214,000	14.0
Combustible	15,900	7.3	155,000	10.0
Makeshift or improvised	9,400	3.7	32,500	2.1
Nonpermanent	9,500	4.2	46,000	2.9

NOTE.—About 7,400 rooms are both combustible and completed before 1920 in nonpublic schools and about 50,000 public school rooms are in each category. Based on the *National Inventory of School Facilities and Personnel.*

Many of the structures completed before 1920 could be remodeled or renovated; some should be abandoned. Public school officials reported 233,000 rooms or 15 percent needed major remodeling or renovation and 182,000 rooms or 13 percent were inadequate or should be abandoned. (See table 10 of chapter 16 on public elementary and secondary school facilities.)

There is every reason to believe that nonpublic schools would exceed the percentages for public schools in each of these categories for renovations and inadequate rooms with nearly 10 percent more rooms in older buildings than public schools. (See table 8.)

2. EXISTING CAPITAL PLANT IN THE UNITED STATES

(a) It is estimated that in 1965–66 there are 227,000 instructional rooms in nonpublic schools. In addition to the instructional rooms there are 38,600 general-use facilities (see table 9).

TABLE 9.—*Estimated number of general-use facilities in nonpublic schools for the United States, 1965–66*

	Number
Total	40,300
Centralized school libraries	9,800
Auditoriums	5,600
Cafeterias	8,500
Gymnasiums	2,700
Combination facilities [1]	6,900
Auditoriums	(6,800)
Cafeterias	(3,200)
Gymnasiums	(4,900)
Other multipurpose rooms	6,800

[1] Facilities with more than 1 function; i.e., auditorium-cafeteria.

(b) *Distribution of Facilities by State*

Table 10 shows the estimated distributions, by State, of pupils, school plants, and classrooms in 1965–66. Data in this table have been updated to take account of estimated growth since the 1962 inventory.

TABLE 10.—*Estimated number of school plants, schools, pupils, and rooms in nonpublic schools for the United States, 1965–66*

	School plants	Schools	Pupils	Rooms
Total	16,600	19,000	6,600,000	227,000
Alabama	150	180	33,000	1,520
Alaska	30	35	3,000	250
Arizona	120	140	35,000	1,270
Arkansas	80	100	13,000	650
California	1,140	1,285	432,000	15,250
Colorado	170	190	45,500	1,800
Connecticut	290	320	121,000	4,980
Delaware	40	55	20,000	750
District of Columbia	60	75	26,500	1,100
Florida	310	380	96,500	3,700
Georgia	90	110	25,500	1,200
Hawaii	80	105	29,500	1,150
Idaho	50	60	10,500	380
Illinois	1,240	1,290	189,500	17,900
Indiana	460	490	150,000	4,850
Iowa	430	510	108,000	4,150
Kansas	270	290	54,500	2,350
Kentucky	330	370	98,000	3,670
Louisiana	300	500	151,500	5,130
Maine	140	160	37,500	1,650
Maryland	300	360	138,500	4,700
Massachusetts	630	750	282,000	9,850
Michigan	920	1,120	367,000	11,850
Minnesota	570	630	183,000	6,480
Mississippi	60	85	19,000	850
Missouri	560	590	187,000	6,550
Montana	90	100	23,500	960
Nebraska	300	330	62,500	2,420
Nevada	20	20	4,500	140
New Hampshire	110	140	38,500	1,520
New Jersey	560	640	324,000	9,900
New Mexico	120	150	28,500	1,170
New York	1,620	1,870	922,000	28,800
North Carolina	150	175	22,000	1,200
North Dakota	100	115	23,000	1,020
Ohio	870	940	433,000	14,400
Oklahoma	120	145	22,000	1,220
Oregon	170	190	39,000	1,600
Pennsylvania	1,160	1,280	658,000	20,600
Rhode Island	130	170	54,500	1,980
South Carolina	60	75	16,000	700
South Dakota	90	100	22,000	920
Tennessee	150	180	34,000	1,750
Texas	530	610	164,000	6,060
Utah	30	40	8,000	310
Vermont	60	60	20,000	850
Virginia	180	220	58,500	2,730
Washington	230	290	61,500	2,380
West Virginia	80	290	18,500	780
Wisconsin	830	870	282,000	9,080
Wyoming	20	20	4,500	530

Source: Based on George J. Collins' "*National Inventory of School Facilities and Personnel*," spring 1962. Washington: U.S. Department of Health, Education, and Welfare, Office of Education, 1964. (See text.)

(c) *Distribution by Population Size*

An estimate of the approximate distribution of rooms among the six size classifications is reported in table 11. In comparison with the distribution of public schools, a significantly larger proportion of nonpublic schools is located in large cities.

TABLE 11.—*Estimated number of rooms in nonpublic schools by population size of city for the United States, 1965–66*

Population of cities	Rooms	Percent
Total	227,000	100.0
500,000 or more	51,000	22.5
100,000 to 499,999	58,000	25.6
50,000 to 99,999	36,000	15.9
10,000 to 49,999	41,000	18.1
2,500 to 9,999	9,000	4.0
Under 2,500	32,000	14.1

(d) *Completion Date of Rooms*

An analysis of structural characteristics of school buildings indicates that three periods of construction are significant: Before 1920, 1920–40, and after 1940. More than one-half (57 percent) of the rooms in use in nonpublic schools have been completed since World War II. For public schools during this same period there were 60 percent. The investment in nonpublic school facilities parallels public school construction with two exceptions. For the period of construction before 1920, nonpublic schools have 21 percent of their classrooms in use today, while public schools have only 14 percent. The numerical difference shows public schools with 214,000 rooms in use today and nonpublic 48,000, which have been in use for over 45 years.

From the construction period between 1920–39 public schools obtained 26 percent of their rooms, while nonpublic schools have 21 percent.

TABLE 12.—*Estimated number and percent of instructional rooms in permanent buildings of nonpublic schools by date of completion for the United States, 1965–66*

Date of completion	Number	Percent
Total	227,000	100
Before 1920	48,000	21
1920 to 1929	32,500	14
1930 to 1939	16,000	7
1940 to 1949	19,000	8
1950 to 1959	66,000	29
1960 to 1966	45,500	20

(e) *Ownership*

Less than 1 percent of the 16,600 school plants are on school sites owned by public authorities. More appropriately, the ownership of non-public-school facilities may be divided by Roman Catholic, other church-related schools, and private school plants (see table 13). A school plant may house one or more schools, such as an elementary school (grades kindergarten to 8) and a high school (9 to 12). Thus, there are approximately 19,000 nonpublic schools in 16,600 school plants.

TABLE 13.—*Estimated number of non-public-school plants by religious affiliation for the United States, 1965–66*

Classification	Number	Percent
Total	16,600	100.0
Roman Catholic	12,000	72.1
Other church related	3,200	19.5
Private	1,300	7.7
Not reported	100	.7

NOTE.—Enrollment distributions are different: Roman Catholic is 90 percent.

(f) *Estimated Current Value*

The estimated current value of non-public-school facilities is $5.7 billion, but the replacement value at current costs would be $9 billion. The computation for current value is based on an expenditure of $40,000 per classroom constructed in 1964 with a 2.5-percent reduction, according to the Boeckh Construction Index. The value of classrooms completed over 40 years ago, however, is corrected to $15,000. Consequently, the values of those rooms completed from 1920 to 1930 are also adjusted proportionately to correspond with the correction factor needed for rooms that have been in use over 40 years (table 14). This correction adds $418 million to the value of non-public-school facilities.

TABLE 14.—*Estimated value of non-public-school facilities, 1965–66*

	Boeckh	Adjusted	Rooms	Total value
Total			227,000	$5,739,500,000
Before 1920	9,000	$15,000	48,000	720,000,000
1920 to 1930	12,000	16,000	32,600	520,000,000
1930 to 1940	17,000	17,000	16,000	272,000,000
1940 to 1950	22,500	22,500	19,000	427,500,000
1950 to 1960	30,000	30,000	66,000	1,980,000,000
1960 to 1966	40,000	40,000	45,400	1,820,000,000

B. COSTS AND USERS COSTS

1. CONSTRUCTION COST AND OPERATION COSTS

(a) *Construction Cost*

Available information on the cost of nonpublic school facilities is fragmentary. It may be assumed that the range in cost is similar to that reported in the chapter on public elementary and secondary schools and that variations among States are also similar to those shown in appendix table B of that chapter. There is good evidence, from discussions with nonpublic school officials, that facilities costs for nonpublic schools are moderately lower than those for public schools at the same grade levels. This is mainly because nonpublic schools have usually provided somewhat smaller sites, have depended more heavily on multistory construction and have provided less costly amenities, such as lavatories. Secondary facilities are more costly than elementary; and in recent years, a pronounced trend in

Catholic schools toward concentration on the development of secondary education has resulted in an average cost per classroom for all school construction which is somewhat higher in the nonpublic than in the public sector.

(b) *Maintenance and Operating Expenditures*

Comprehensive information on the cost of maintaining and operating nonpublic school facilities is not available. It is assumed that expenditures approximate those reported in the chapter on public school facilities. However, because, on the average, a larger number of nonpublic school pupils are accommodated in a classroom, it is probable that per pupil expenditures for these purposes are somewhat lower in nonpublic schools.

2. USER CHARGES

(*a*) and (*b*) Although many pupils are accepted in nonpublic schools on full or partial scholarships, the majority pay tuition and fees, which range from a few dollars to several thousand dollars a year. There is no precise information available on the proportion of nonpublic educational expenditures which are met from charges to students, but it is known that these charges almost invariably leave a deficit to be met from other sources. Whether the deficit should be allocated to maintenance and operating expense and debt service or to other essential educational costs is largely an arbitrary matter.

(*c*) At the present time, costs of nonpublic elementary and secondary facilities are not met to any significant degree from tax resources or general obligation borrowings of State and local government units.

C. Trend of Capital Outlay

1. 1940–65

The nonpublc schools like the public schools, have made an enormous effort to accommodate the huge postwar increase in the school-age population; and from 1940–50 to 1960–66, the average annual expenditure for nonpublic elementary and secondary facilities increased more than 600 percent. (See table 15.) Expressed as a proportion of new public school classrooms, however, the rooms constructed for nonpublic schools declined from an average of 18 percent in the decade of the forties to 9 percent in the period 1960–66. For a considerable period, the average number of nonpublic classrooms completed each year has remained relatively constant, but costs have continued to rise substantially, both because of the increasing emphasis on secondary school construction and also because of the continuing increase in building costs.

Table 15.—*Estimated capital outlay for nonpublic elementary and secondary school facilities, 1946–65*

[Dollar amounts in thousands]

Year	Rooms constructed			Expenditures		
	Total	Annual	Percent of public	Total	Annual	Percent of public
1940-49	19,000	1,900	18	$427,500	$42,750	
1950-59	66,000	6,600	13	1,980,000	198,000	9
1960-66	45,400	6,500	9	1,820,000	260,000	11

2. SPENDING AGENCIES FOR CAPITAL OUTLAYS

Funds from local, State, and Federal Governments to nonpublic schools are estimated as very small. Public ownership of 0.7 percent of the nonpublic school sites, however, was reported in the National Inventory of School Facilities and Personnel conducted by the Office of Education in the spring of 1962. The number of profitmaking institutions is also very small. It is estimated that about 98 percent of the funds for capital outlays shown in table 15 were accounted for by nonprofit organizations.

3. SOURCE OF FINANCING FOR CAPITAL OUTLAYS

Financing of capital construction for nonpublic schools is primarily from gifts. However, mortgages are used in some instances, and loans are also provided from higher echelons of church-related institutions.

D. Needs and Prospective Capital Outlays

1. CAPITAL REQUIREMENTS

Establishment of facility standards and decisions about capital outlay for nonpublic schools are the responsibility of the organizations which operate those schools. It might be assumed that it would be possible to generalize at least about the Catholic schools, which account for 90 percent of the nonpublic enrollment. However, control of these schools has been largely decentralized and standards are known to vary greatly.

In this section, mainly to facilitate comparison between the public and private sectors, the present median pupil accommodation in the *public* schools will be used as the basis for estimates. It cannot be assumed, however, that this basis is or will be accepted as a standard by nonpublic school officials. It should be noted, furthermore, that ability to finance the necessary capital outlay usually represents only the first step toward achieving smaller classes in schools which now accommodate large numbers of pupils in each room. This is because the number of pupils per room often corresponds closely to the number of pupils per teacher. The amortized per pupil cost of additional classrooms is by no means small, but it is substantially less than the cost of the teachers required to staff the rooms. For all of these reasons, estimates of capital outlay requirements given here should be recognized as primarily for purposes of illustration.

In the decade 1956 through 1965, estimated enrollments in nonpublic schools increased from about 4.4 million to about 6.6 million. In the decade through 1975, the anticipated increase will be much smaller: current Office of Education projections place the 1975 enrollment at about 7 million.

Hence, it appears possible that the nonpublic schools may be able to make some inroads during this decade on their very large backlog of accumulated needs. It must be anticipated, however, that a substantial backlog will still remain at the end of the decade, unless these schools can develop new sources of financing.

Total estimated needs for the decade are summarized below:

	Number of classrooms
(*a*) Replacement and renovation of dilapidated and obsolete facilities [1]	64,000
(*b*) Elimination of present overcrowding	55,000
(*c*) Accommodation of added enrollment, including allowance for migration	30,000
Total	149,000

[1] This estimate assumes that all makeshift, nonpermanent, combustible, and off-site rooms plus half of the remaining rooms built prior to 1920 would be replaced. It also assumes that of the 171,000 existing rooms which would remain in use, 34,000 would be completely renovated. The new classroom equivalent of these renovated facilities is estimated as 8,500 rooms.

The outlay required for these facilities at current estimated building costs for nonpublic schools—about $40,000 per classroom—would be approximately $6 billion.

No confident predictions can be made about actual future construction of nonpublic classrooms. During the decade 1956 through 1965, under extraordinary enrollment pressures, construction averaged about 6,600 rooms per year. However, resources of the schools are known to be severely strained, and it is unlikely that they will be able to continue building at this rate. Without assistance from new sources of funds, it appears likely that average annual construction will not exceed 6,000 rooms.

If construction in 1966–75 approximates 6,000 classrooms annually, total outlay during the decade, assuming a cost increase of 3 percent per year, would be about $2.8 billion.[1] The backlog of unmet needs remaining at the end of the decade (on the basis from which these needs have been estimated here) would be about 89,000 rooms, or—at costs projected to 1975—between $4.5 and $5 billion.

2. DISTRIBUTION BY POPULATION SIZE OF COMMUNITY

It is impossible to estimate closely the future distribution of capital outlay by size of community. Nonpublic school students, at present, are very heavily concerntrated in urban areas. Hence, a program aimed primarily at replacing obsolete buildings and reducing *existing* overcrowding would require the bulk of the construction in the cities. However, enrollment increases, as in the public schools, are expected to be mainly in the suburbs and the needs of these new pupils are likely to receive priority in allocation of limited funds. The distribution below is presented with the proviso that any estimate represents little more than a guess:

	Percent
SMSA's—Urban	30
SMSA's—Urban fringe	45
Outside SMSA's	25
Total	100

3. SPENDING AGENCIES FOR CAPITAL OUTLAYS

Barring some unforeseen development in the pattern of school organization, the overwhelming majority (i.e., 98 percent or more) of expenditures for capital outlay will be by private nonprofit organization.

[1] This reflects an estimated average cost over the decade of nearly $47,000 per classroom. See pp. 365, 366 for a discussion of construction cost differences between public and nonpublic schools.

Chapter 18

Area Vocational School Facilities *

A. Nature and Composition of Facilities

1. Introduction [1]

In a broad sense, all education contributes to vocational competency, and as our technology grows in complexity, the basic general education requirements for successful employment in most fields are increasing far more rapidly than could have been anticipated even a decade or two ago. But as occupations become more specialized, as well as more demanding, the broad general accomplishments of the standard high school curriculum constitute less and less a sufficient qualification for satisfying employment, and more and more are only a necessary prerequisite for the acquisition of specific occupational skills. Unless these implications of a changing job market are recognized and reflected in an educational system which can anticipate future needs, the plight of today's high school dropout may increasingly become the plight of tomorrow's high school graduate.

More and more, in other words, we are moving into an era of vocational specialization for all. However, while it is clear that the physician, the architect, the lawyer, and the international expert, for example, receive specific occupational preparation in their specialized graduate schools, the term "vocational education" has not traditionally been used to refer either to such professional training nor to the advanced, although still only partially specialized, liberal arts programs leading to a baccalaureate degree. As it is now commonly defined, vocational education refers to all formal occupationally specialized *subprofessional* instruction, which may be offered as part of a regular secondary or postsecondary educational program or may be especially designed for those who have dropped out of school or have been long absent from formal educational activities. The student may be youth or adult, and the student's goal in such training may be either initial entry into or advancement within the chosen occupational field.

With this very broad definition, it is clear that the field of vocational education potentially encompasses part of the formal education for all of the great majority of Americans who do not complete baccalaureate programs. Thus, it is not suprising that the Federal support for vocational education, which is distributed through the States, goes ultimately to about two-thirds of the public secondary

* Prepared by Program Planning and Development Branch, Division of Vocational and Technical Education, Bureau of Adult and Vocational Education, U.S. Office of Education, with minor editing by committee staff.

[1] This section is intended primarily to define the scope and limitations of this chapter.

schools in the country, to most of the public community and junior colleges, and even to many of the 4-year institutions of higher education. Table 1, which summarizes data reported by the States, provides a 20-year record of enrollments in programs receiving this support.

TABLE 1.—*Enrollment in vocational education classes*

[In thousands]

Fiscal year	Total [1]	Adult	Postsecondary	Secondary	Persons with special needs
1945	2,013	609	466	939	----
1946	2,228	715	525	987	----
1947	2,509	854	609	1,045	----
1948	2,836	1,210	522	1,105	----
1949	3,096	1,373	560	1,163	----
1950	3,365	1,521	596	1,247	----
1951	3,363	1,475	562	1,326	----
1952	3,166	1,326	475	1,365	----
1953	3,100	1,218	444	1,438	----
1954	3,165	1,313	362	1,490	----
1955	3,314	1,389	396	1,529	----
1956	3,413	1,456	399	1,558	----
1957	3,522	1,523	385	1,613	----
1958	3,629	1,577	388	1,664	----
1959	3,701	1,642	343	1,717	----
1960	3,768	1,686	341	1,741	----
1961	3,856	1,725	348	1,783	----
1962	4,073	1,825	329	1,919	----
1963	4,217	1,908	359	1,950	----
1964	4,566	2,025	400	2,141	----
1965	5,431	2,379	[2] 207	2,819	[3] 26
1966 [4]	5,790	2,514	580	2,696	([5])
1967 [4]	6,368	2,786	726	2,857	([5])

[1] Detail may not add to total because of rounding.
[2] Apprentice enrollment included under adult. Prior to fiscal year 1965, apprentices are shown under postsecondary.
[3] Represents enrollment in adult and remedial programs for prevocational training in basic skills.
[4] Projected figures for these 2 years.
[5] Although enrollments in these programs are expected to grow rapidly, there is no adequate basis for a projection.

NOTE.—Data in this table do not include enrollments in programs under the Manpower Development and Training Act.

Because increasing proportions of young people are entering baccalaureate programs or at least deferring occupational specialization until they have completed high school, it is especially noteworthy that the number of secondary students in vocational programs have represented, during this 20-year period, a fairly constant proportion—approximating 20 percent—of all public school enrollments in grades 9 through 12. In part, this may reflect a broadening in the definition of vocational education, but it also reflects a growing awareness that an "academic" or "general" curriculum which terminates at the high school level no longer provides, for many students, a very good preparation for entry into the labor market. There is good evidence that the States are increasingly alert to the expanding needs for occupational training and that they are moving rapidly to broaden the range of opportunities for occupational training and to bring these opportunities within reach of more of those who can benefit from them.

Since most vocational programs are carried out in conjunction with more comprehensive education programs (and use, at least in part, joint facilities) it is not now possible to provide any complete accounting of vocational facilities *per se*. Most of these must be included under elementary and secondary schools or under higher education. In part, however, facilities for a small but growing seg-

ment of the vocational education enterprise can be fairly clearly distinguished. These are the facilities for a group of institutions which have come to be known as area vocational schools and which represent one of the most significant efforts to expand vocational training opportunities. It should be noted that an important focus of these schools is on the victims of a changing technology, including those whose jobs have disappeared and those whose skills must be updated and expanded for them to function effectively in jobs which have been redefined. Thus, there is only partial overlap between these schools and the existing educational establishment, and it is appropriate to treat them separately. Accordingly, information presented in this chapter pertains exclusively to area vocational school facilities.

2. DESCRIPTION OF FACILITIES

(a) *General Characteristics of Area Vocational Schools*

The core of meaning in the phrase "area vocational education school" is best indicated by the language in the Vocational Education Act of 1963 which defines such schools to include:

> (A) A specialized high school used exclusively or principally for the provision of vocational education to persons who are available for full-time study in preparation for entering the labor market, or
>
> (B) The department of a high school exclusively or principally used for providing vocational education in no less than five different occupational fields to persons who are available for full-time study in preparation for entering the labor market, or
>
> (C) A technical or vocational school used exclusively or principally for the provision of vocational education to persons who have completed or left high school and who are available for full-time study in preparation for entering the labor market, or
>
> (D) The department or division of a junior college or community college or university which provides vocational education in no less than five different occupational fields, under the supervision of the State board, leading to immediate employment but not leading to a baccalaureate degree,

if it is availabe to all residents of the State or an area of the State designated and approved by the State board, and if, in the case of a school, department, or division described in (C) or (D), it admits as regular students both persons who have completed high school and persons who have left high school.

(b) *Standard of Performance*

The necessity for developing vocational school facilities on an area basis reflects the fact that shops, laboratories and other special spaces adequate for training in many occupational fields cannot be economically provided for very small numbers of students. This point is illustrated by the following estimates of minimum facilities for various activities:

	Square feet
Vocational agricultural shop	2, 400
Electronics laboratory	3, 200
Auto mechanics facility	6, 000

When such a school can be designed to serve a sufficiently large population, however, the physical area (about 100 square feet per student) and the cost per student of adequate facilities appear comparable to those for secondary schools in general. Similarly, there is no reason to anticipate differences between these two types of schools in the useful life of the average physical structure, which may be estimated at 30 to 40 years or more, depending on structural characteristics and quality of maintenance. Because vocational schools are

more dependent on specialized equipment, however, it must be anticipated that they will have a somewhat higher overall rate of obsolescence. This point deserves emphasis, because much vocational education involves training in quite specific skills and the student who receives his training on out-of-date equipment will enter the job market with a very serious handicap.

(c) *Existing Capital Plant in the United States*

As of 1965, based on reports from the States, 613 institutions, either completed or under construction, had been designated area vocational educational schools. The distribution of these schools by State is shown in table 2. The distribution by population size of city is not known.

Of these 613 schools, 144 represented new construction and 64 had been remodeled since 1963,[2] but information as to the age of the remaining schools has not been reported.

TABLE 2.—*Distribution of area vocational schools by State, 1965*

Alabama	15	New Hampshire	3
Alaska	1	New Jersey	17
Arizona	8	New Mexico	2
Arkansas	8	New York	8
California	78	North Carolina	24
Colorado	4	North Dakota	1
Connecticut	25	Ohio	16
Delaware	3	Oklahoma	2
District of Columbia	6	Oregon	11
Florida	5	Pennsylvania	17
Georgia	20	Rhode Island	7
Hawaii	5	South Carolina	5
Idaho	5	South Dakota	1
Illinois	---	Tennessee	17
Indiana	2	Texas	33
Iowa	---	Utah	5
Kansas	10	Vermont	11
Kentucky	14	Virginia	34
Louisiana	32	Washington	24
Maine	5	West Virginia	8
Maryland	6	Wisconsin	19
Massachusetts	3	Wyoming	1
Michigan	19	Canal Zone	---
Minnesota	19	Guam	---
Mississippi	18	Puerto Rico	15
Missouri	14	Virgin Islands	---
Montana	2		
Nebraska	4	Total	613
Nevada	1		

All of these area schools are publicly owned and are administered either by State or by local boards of education. Based on information furnished by the States, their estimated total value in 1965 was $250 million.

B. Costs and User Charges

There are substantial variations, both among regions and within the same region, in the cost of constructing and equipping vocational school facilities. Nationwide, in 1964–65, construction costs ranged

[2] Among the 208 newly constructed or remodeled schools were: 27 specialized high schools, 62 departments of comprehensive high schools, 76 technical or vocational schools, and 43 departments in institutions of higher education. A similar breakdown by type for the remaining area schools is not available.

from $11 to $27 per gross square foot, with an average of approximately $20 per foot, or about $1,850 per full-time student. These costs include site development, architects' fees, construction, and fixed equipment, but exclude land and movable equipment. In much of this construction, trends follow recent trends in industry toward the adoption of modular patterns and the elimination of interior bearing walls, to allow maximum flexibility for adaptation to changing technological requirements.

Reliable data on costs of operation and maintenance of vocational education facilities are not available.

Area vocational schools, as public institutions with a broad educational mission, do not, in general, charge users for their services. Some adult courses are conducted on a fee basis, but such fees cover, at most, a very small proportion of the cost of maintenance and operation. With very minor exceptions, current expenses of these schools, like those of other public schools, are met from tax revenues.[3]

C. Trends of Capital Outlays

Until passage of the Vocational Education Act of 1963, all funds for construction of vocational school facilities were obtained from local or State sources. However, historical information regarding capital outlays is not available.

In fiscal year 1965, Federal matching funds for construction of area vocational schools became available for the first time; and in that year, a total of nearly $86 million (approximately one-half Federal) was expended or allocated for those 208 area school construction projects which have been discussed in an earlier section.

D. Needs and Prospective Capital Outlays: 1966–75

(a) *Capital Requirements*

Preceding sections of this chapter have presented—as far as possible, based on State reports—a separate accounting of facilities for area vocational schools, because these schools exemplify an emerging concept of special interest. It has been made clear, however, that these facilities cannot be clearly separated from facilities covered in chapters on public elementary and secondary schools and on institutions for higher education. In part, this is because many facilities are shared by different types of educational programs, in part because present accounting procedures do not make the necessary distinctions.

Arrangements are now underway to collect more comprehensive statistical information about vocational programs. At present, however, it is not possible to project future needs for area vocational schools, as such, nor to distinguish between vocational needs and needs projected in other chapters of this report. Specific problems are the following:

(1) The extent to which the increase in vocational students will be accommodated in area schools is unknown. This will depend largely on State policies with respect to the designation of such schools and may vary greatly among States.

(2) The precise distribution of area school students between secondary and postsecondary schools or colleges is unknown and the future

[3] Federal, State, and local expenditures for vocational education, excluding programs funded under the Manpower Development and Training Act, are shown in app. A. Area vocational schools, of course, constitute only a small part of the total activities covered by these funds.

distribution cannot be predicted on the basis of information now available.

(3) There is no adequate basis for predicting the facilities which will be required for adult programs, over and above those programs which will be accommodated by the extra-shift operation of facilities already included in projections of needs for full-time students covered in other chapters.

Capital outlay requirements for all vocational-technical education facilities during the decade 1966–75 have been estimated at approximately 2,860,000 student work stations. This is based on the prediction of a very sharp increase in vocational student enrollments from about 5.4 million in 1965 to about 14 million in 1975. It is assumed that the schools will operate three shifts—two during the day and one in the evening. Hence, each station will serve three students. The predicted growth will reflect both an increase in the proportion of regular secondary and postsecondary students in vocational programs, and also a great expansion of adult programs, serving both those who are unemployed or underemployed and those who will need new skills because of changes in the job market.

At current estimated facility costs of about $1,850 per work station, the capital outlay required to meet those projected needs would be approximately $5.3 billion. However, the recent trend in cost of vocational facilities shows an increase of at least 3 percent per year. If this trend continues, the average cost during the decade will be in the neighborhood of $2,200 per work station. At this level, required capital outlay will approximate $6.3 billion.

(b) *Distribution of Needs by Population Size of Community*

There is no adequate basis for estimating this distribution.

(c) *Spending Agencies for Capital Outlays*

It is anticipated that all projected outlays will be expended by local public bodies.

APPENDIX A.—*Expenditures of Federal, State, and local funds for vocational education, by year, 1945–65* [1]

[In thousands of dollars]

Year	Total [2]	Federal	State	Local
1945	65,642	20,005	15,348	30,289
1946	72,807	20,628	18,538	33,641
1947	83,252	21,087	22,180	39,985
1948	103,339	26,200	25,834	51,305
1949	115,131	26,409	30,439	58,283
1950	128,717	26,623	40,534	61,561
1951	137,354	26,685	44,208	66,462
1952	146,466	25,863	47,818	72,784
1953	145,951	25,366	52,218	68,367
1954	151,289	25,419	54,550	71,320
1955	164,761	30,351	57,591	76,819
1956	175,886	33,180	61,821	80,884
1957	190,726	37,063	67,524	86,139
1958	209,748	38,733	72,305	98,710
1959	228,315	41,399	79,534	107,381
1960	238,812	45,313	82,466	111,033
1961	254,073	48,010	89,155	116,909
1962	283,948	51,438	104,264	128,246
1963	308,900	54,582	112,685	141,633
1964	332,785	55,027	124,975	152,784
1965 [3]	588,655	146,300	175,767	266,589

[1] Does not include funds from Manpower Development and Training Act.
[2] Detail may not add to total because of rounding.
[3] Estimate based on reports received to date.

CHAPTER 19

Academic Facilities for Higher Education*

A. NATURE AND COMPOSITION

1. DESCRIPTION OF FACILITIES

(a) *General Characteristics and Services Rendered*

Institutions of higher education exist in every State in the Union and in all the larger and more populous outlying areas. More than one-third of the entire number of approximately 2,200 institutions are under the control of State governments or of cities, counties, or other subdivisions of States. Twelve are controlled by the Federal Government. The remaining 64 percent are controlled by religious sects, organizations within one professional group or another, or self-perpetuating groups of public-spirited persons.

These institutions present the widest range imaginable in type of instruction offered. Junior colleges typically provide only the first two years of training at the post-secondary level, usually including both courses creditable toward a baccalaureate degree and courses comprising terminal vocational programs. Universities commonly offer, in addition to a full undergraduate course in liberal arts, graduate work leading to the doctorate, as well as courses preparing for entrance into at least two or three of the learned professions. Between these two extremes fall the hundreds of institutions which reflect a very broad spectrum of general and special educational needs and purposes.

TABLE 1.—*The American higher education establishment, 1963* [1]

	Public institutions		Private institutions		All institutions	
	Number of institutions	Enrollment [2]	Number of institutions	Enrollment [2]	Number of institutions	Enrollment [2]
		Thousands		*Thousands*		*Thousands*
Universities	88	1,188	58	558	146	1,746
Liberal arts colleges	101	459	684	768	785	1,227
Teachers colleges	159	396	27	13	186	409
Technological schools [3]	26	55	31	75	57	130
Schools of theology and religion [3]			201	46	201	46
Schools of art [3]	2	1	44	18	46	19
Other professional schools [3]	8	10	71	58	79	68
Junior colleges	360	548	217	74	577	622
Total	744	2,657	1,333	1,610	2,077	4,267

[1] By fall 1965, the number of institutions had increased to 2,207, of which 1,417 were privately controlled.
[2] Enrollments are *resident* degree-credit enrollment and hence do not correspond precisely to data presented elsewhere in this chapter.
[3] These categories include only the independent professional schools. Many students in professional programs are of course included in university enrollments.

Source: Resident and Extension Enrollment in Institutions of Higher Education, Fall 1963 (OE 54000-63)

*This chapter has been prepared by Dr. E. Eugene Higgins, of the National Center for Educational Statistics, and Dr. Kent Halstead, of the Bureau of Higher Education, U.S. Office of Education, Department of Health, Education, and Welfare, with minor editing by committee staff.

TABLE 2.—*Institutions and proportionate enrollments, by size of student body*

Size of student body [1]	Number of institutions			Percent of all institutions	Enrollments as percent of all enrollments
	Public	Private	Total		
Less than 200	55	287	342	16.5	0.8
200 to 499	122	318	440	21.2	3.6
500 to 999	129	347	476	22.9	8.0
1,000 to 2,499	156	271	427	20.5	15.7
2,500 to 4,999	137	44	181	8.7	15.1
5,000 to 9,999	79	45	124	6.0	20.6
10,000 to 19,999	44	17	61	2.9	19.4
20,000 or more	22	4	26	1.3	16.7
Total	744	1,333	2,077	100.0	100.0

[1] Based on resident degree-credit enrollment.

Source: Resident and Extension Enrollment in Institutions of Higher Education, Fall 1963 (OE 54000-63).

Tables 1 and 2 present summary information, including enrollment data, by type and size of institution. As table 2 shows, institutions with enrollments of under 1,000 constitute about 60 percent of all institutions but account for less than 15 percent of the students. In contrast, those colleges and universities with enrollments of 5,000 or more comprise less than 10 percent of the institutions but account for almost 60 percent of the students.

(b) *Enrollment Growth in Higher Education*

The recent rapid growth in higher education enrollment is shown in table 3, which summarizes data from 1946 to the present. In the years immediately following World War II, public and private institutions represented approximately equal segments of the total student population. During the postwar period returning veterans, supported by the GI bill, caused an enrollment surge in both types of institutions which was followed by a brief decline in the early fifties. Subsequently, enrollments recovered rapidly from the low point reached during the Korean conflict; and in recent years there has been continuous and accelerating growth, with the increase being largest in the public sector. As a result, degree-credit enrollment in 1965 represents a 168-percent increase over 1946 and is more than double the enrollment in 1955. Of more than 5½ million students now enrolled, about 65 percent are now in publicly controlled institutions, compared with 50 percent in 1947. Junior college enrollments, especially in public institutions, have increased even more rapidly than those in 4-year colleges and universities. In total, these have more than quadrupled since 1946; and although the pattern of development in higher education varies considerably from State to State and cannot be predicted with full confidence, there is good reason to anticipate a continuing trend toward increased emphasis on 2-year institutions.

TABLE 3.—*Degree-credit opening fall enrollment in higher education institutions, by level and control: Aggregate United States, 1946–65*

Year	All institutions	4-year institutions			Junior colleges		
		Total	Public	Private	Total	Public	Private
1946	2,078,095	1,889,956	(1)	(1)	188,139	(1)	(1)
1947	2,338,226	2,116,181	989,372	1,126,809	222,045	163,005	59,040
1948	2,408,249	2,197,067	1,036,266	1,160,801	211,182	154,175	57,007
1949	2,456,841	2,227,630	1,047,681	1,179,949	229,211	170,899	58,312
1950	2,296,592	2,079,020	986,413	1,092,607	217,572	168,043	49,529
1951	2,116,440	1,916,353	895,661	1,020,692	200,087	156,329	43,758
1952	2,148,284	1,908,772	921,902	986,870	239,512	191,798	47,714
1953	2,250,701	1,990,434	992,923	997,511	260,267	210,635	49,632
1954	2,499,750	2,183,766	1,131,533	1,052,233	315,984	263,693	52,291
1955	2,678,623	2,369,647	1,232,619	1,137,028	308,976	265,891	43,085
1956	2,946,985	2,598,702	1,383,112	1,215,590	348,283	298,559	49,724
1957	3,068,417	2,698,454	1,463,489	1,234,965	369,963	316,791	53,172
1958	3,258,556	2,872,045	1,580,561	1,291,484	386,511	331,671	54,840
1959	3,402,297	2,990,802	1,645,946	1,344,856	411,495	356,922	54,573
1960	3,610,007	3,156,390	1,742,137	1,414,253	453,617	393,553	60,064
1961	3,891,230	3,370,227	1,893,423	1,476,804	521,003	458,296	62,707
1962	4,206,672	3,614,344	2,075,917	1,538,427	592,328	520,987	71,341
1963	[2] 4,528,516	3,900,710	2,319,521	1,581,189	627,806	553,302	74,504
1964	[3] 4,987,867	4,274,591	2,583,805	1,690,786	713,276	621,978	91,298
1965	[4] 5,570,271	4,725,027	2,914,660	1,810,367	845,244	739,918	105,326

[1] Not available.
[2] Excludes 271,816 students in undergraduate programs not chiefly creditable toward a bachelor's degree.
[3] Excludes 332,427 students in undergraduate programs not chiefly creditable toward a bachelor's degree.
[4] Excludes 397,140 students in undergraduate programs not chiefly creditable toward a bachelor's degree.

NOTE.—Prior to 1953, includes *only* resident degree-credit students; in 1953 and subsequent years includes resident *and* extension degree-credit students.

(c) *Academic Facilities Covered by this Report*

The foregoing review of enrollment trends provides an important context for the remainder of this chapter—an analysis based primarily on the most recent comprehensive information on higher education facilities provided by an inventory conducted by the Office of Education as of December 31, 1957.[1] Institutions participating in the inventory represented about 96 percent of all students enrolled, and the results thus provided a wealth of detailed information relating to virtually the entire establishment in existence at that time. In the ensuing years, however, construction required to meet the needs of a more than 80-percent increase in the number of students has made this inventory substantially out of date as a census report, although its norms of experience or practice are still useful. A new inventory will be made as of September 30, 1965, and will be updated annually; but since only crude updating of the 1957 data is possible now, the 1957 inventory necessarily provides the basis for most of the information to be presented here.

Academic facilities will be defined to include all those which have been classified under three major categories, designated "instructional," "research," and "general." They thus exclude the "auxiliary" and "residential" facilities which are covered in another chapter. Tables 4, 5, and 6 show the composition of these categories. Percentages in these tables are based on assignable area [2]; that is, on the total area which could be explicitly allocated by function. Elsewhere in this chapter, facilities are generally reported in terms of gross square feet, because the latter is more appropriate for cost estimates and for a

[1] Higgins, E. Eugene, *and* Mary B. Fuller. *College and University Facilities Survey, Part 3: Inventory of College and University Physical Facilities, December 31, 1957.* U.S. Department of Health, Education, and Welfare, Office of Education (OE-51007). Washington: U.S. Government Printing Office, 1965. 573 pages.
[2] Such areas were reported in net square feet, defined as the area of a space measured from the inside walls at floor level, ignoring minor architectural projections or setbacks.

number of other purposes. When facilities are to be separated by function, however, gross area data are inappropriate because they are obtained from outside building measurements and are thus available only for buildings which usually serve several functions.

TABLE 4.—*Percentage distribution of total assignable area [1] for instructional facilities, by function and control—Aggregate United States*

Function	Public	Private
Instructional facilities category	100.00	100.00
Educational laboratory schools	4.85	.98
General or academic classrooms	25.07	30.02
Home management laboratory houses	.38	.25
Instructional laboratories and shops	31.77	24.59
Library	13.68	17.78
Museum	.88	1.01
Other instructional	1.48	1.06
Physical education [2]	18.08	20.25
*Teaching hospital	3.81	4.06

[1] Exclusive of areas for which function was not reported; exclusive of detail areas of buildings for which total assignable area only was reported; exclusive of buildings shared with institutions of less than college grade.
[2] Includes fieldhouses, gymnasiums, swimming pools, and enclosed areas of stadiums *when* reported as serving the physical education programs; includes spectator seating area in fieldhouses and gymnasiums.

TABLE 5.—*Percentage distribution of total assignable area [1] for research facilities, by function and control—Aggregate United States*

Function	Public	Private
Research facilities category	100.00	100.00
Agriculture	33.20	.99
Astronomy	.21	.41
Biology	6.54	5.62
Chemistry	6.47	5.50
*Dentistry	.31	.45
Engineering	11.55	8.67
Mathematics and statistics	.33	1.34
*Medicine	10.18	36.98
Not identified	23.68	25.80
Other physical sciences	2.06	4.72
Physics	3.88	7.37
Social sciences	1.59	2.15

[1] See footnote 1 for table 4.

TABLE 6.—*Percentage distribution of total assignable area [1] for general facilities, by function and control—Aggregate United States*

Function	Public	Private
General facilities category	100.00	100.00
Armories	1.34	.39
Auditoriums	8.16	9.53
Chapels	.35	7.67
Extension service and experiment stations	.87	[3]
Faculty clubs and facilities	.36	.62
Faculty offices	24.32	20.11
Garages	2.61	1.32
General storage	7.28	4.44
Maintenance shops, stores, and services	11.04	9.24
Multipurpose	8.10	8.60
*Nonteaching hospitals	.69	1.47
Other general	11.08	9.81
Power and heating plants	4.61	4.86
Staff offices	18.22	18.59
Theaters	.97	3.34

[1] See footnote 1 for table 4.
[3] Less than 0.05 percent.

The totals of assignable areas (net square feet) represented in tables 4, 5, and 6 are as follows:

	Control of institution		
	Public	Private	Total
Instructional	97, 394, 000	68, 216, 100	165, 610, 100
Research	12, 484, 800	6, 271, 800	18, 756, 600
General	53, 854, 500	38, 537, 400	92, 391, 900
Total	163, 733, 300	113, 025, 300	276, 758, 600

Attention should be called to the fact that a small part of the facilities included above and elsewhere in this report overlap with those covered in other chapters of this study. These are the hospital facilities appearing in tables 4 and 6, and the medical and dental research facilities appearing in table 5 (identified by asterisks). It has not proven feasible to eliminate these facilities from subsequent detailed tabulations, but the total overlap can be closely estimated, to provide a basis for adjusting national totals. The estimates follow:

	Percent
Public institutions	3. 30
Private institutions	5. 11
All institutions	4. 04

(d) *Standards for Academic Facilities*

Data already presented give some indication of the tremendous range in types of facilities used in higher education. There are, in fact, such large variations among regions and among institutions of different types and sizes that only the most general statements can be made about requirements for educational adequacy based upon the norms of experience or practice. Some further indications of this variation are provided by tables 7, 8, and 9. Table 7 shows, for different types of institutions, the assignable area per student in each of the three major facilities categories, and in total. The other two tables present data on "student capacity" for selected types of facilities. Explicitly, they express the number of seats or student stations as percentages of total enrollment and thus provide some evidence on utilization of these facilities. Such data, however, must be interpreted with great caution, and only in the context of detailed information about scheduling problems, multiuse possibilities, and other factors pertaining to the specific institution under consideration. Table 10 indicates that there are substantial "economies of scale" for educational institutions which enroll large numbers of students, but the increasing criticism of some of our large universities for their impersonality and "factory like" atmosphere suggests that some of these economies may be purchased at a higher cost than has sometimes been realized.

The average area of academic facilities per student (full time and part time) at all institutions of higher education in 1957 was approximately 135 gross square feet, and this average has probably subsequently declined, as the institutions have struggled to meet the unprecedented demand of the last few years. Although it is evident that in the final analysis, needs for facilities must be determined for each institution individually, a number of States have adopted, for planning purposes, a standard of 150 square feet per student; and

this figure has recently been used by the Office of Education as a basis for estimates of aggregate demand.

TABLE 7.—*Area per student in major facilities categories at institutions of different types (based on data from 1957 facilities inventory)*

	Public institutions assignable area [1] per student (in square feet)				Private institutions assignable area [1] per student (in square feet)			
	Instructional [2]	Research [2]	General [2]	Total	Instructional [2]	Research [2]	General [2]	Total
Universities	60.7	13.8	41.2	115.7	43.1	9.1	28.2	80.4
Liberal arts colleges	49.2	1.4	23.5	74.1	66.7	1.2	35.2	103.1
Teachers colleges	65.6	.6	27.3	91.5	47.1	1.2	22.7	71.0
Technological schools	98.7	4.1	42.2	145.0	52.1	7.2	25.0	84.3
Theological and religious schools					75.3	1.8	65.8	142.9
Other independent professional schools	143.1	25.3	96.6	265.0	73.3	12.9	30.5	116.6
Junior colleges and technical institutes	34.2	.2	9.9	44.3	70.5	.4	35.1	106.0
All institutions [3]	56.4	7.2	31.2	94.8	56.7	5.2	32.0	93.9
Percent of all academic facilities	59.5	7.6	32.9	100.0	60.4	5.5	34.1	100.0

[1] Assignable area, rather than gross area, was used for this breakdown, because gross area is computed from outside measurements of buildings, and many buildings serve multiple functions. On the average, area assignable to specific functions contributes about 70 percent of gross area, but this proportion is subject to substantial variation.

[2] See text (p. 377) for definition of these categories.

[3] Figures for "all institutions" represent weighted averages, to which certain types of institutions contribute negligible amounts. Although the "mix" of institutions has probably changed since 1957, the data in table 1 provide a general indication of the mix on which these averages were based.

TABLE 8.—*Percentage of fall 1957 enrollment that could have been accommodated at one time [1] by selected instructional facilities, by type of institution—Aggregate United States*

Type of institution	Academic classrooms		Instructional laboratories		Libraries	
	Public	Private	Public	Private	Public	Private
All types	83.3	93.8	35.8	30.0	13.4	16.0
University	94.4	75.5	39.7	24.5	15.1	12.3
Liberal arts college	71.2	109.7	31.7	34.2	12.7	19.6
Teachers college	87.0	74.2	33.0	22.4	15.6	16.1
Independent technological school	89.3	72.6	48.1	36.4	9.5	6.8
Theological and religious school		119.9		10.4		25.7
Other independent professional school	131.9	80.8	67.0	36.6	13.8	11.7
Junior college	59.5	122.9	28.2	33.1	9.0	22.1
Technical institute	67.2	73.1	73.5	50.5	6.5	5.0

[1] Exclusive of educational laboratory or demonstration schools.

TABLE 9.—*Percentage of fall 1957 enrollment that could have been accommodated at one time [1] by selected instructional facilities, by enrollment group—Aggregate United States*

Enrollment group	Academic classrooms		Instructional laboratories		Libraries	
	Public	Private	Public	Private	Public	Private
All groups	83.3	93.8	35.8	30.0	13.4	16.0
Below 500	148.4	135.9	61.6	40.4	25.7	28.5
500 to 999	102.8	122.4	49.7	40.2	16.5	22.8
1,000 to 2,499	91.6	100.9	39.0	33.6	14.9	16.4
2,500 to 4,999	83.5	82.6	40.4	24.7	13.4	11.0
5,000 to 9,999	74.1	73.1	32.3	22.3	10.9	11.0
10,000 and more	76.8	62.8	29.5	22.0	13.2	9.8

[1] Exclusive of educational laboratory or demonstration schools.

2. EXISTING CAPITAL PLANT FOR HIGHER EDUCATION

(a) *Distribution*

Colleges and universities in the aggregate United States reported 387,011,100 square feet of gross area in their instructional, research, and general facilities categories of buildings at the end of 1957. Institutions were requested not to report those buildings that were located on remote institutional properties that were not used for instructional purposes, or which were used by relatively small portions of the student body for only a short period of time each year, such as experiment stations, observatories, field camps, farms, ranches, and investment properties; hospitals not owned by the institution even though some limited research and/or instruction may be carried on in them; and public schools, not owned by the institution, which are used for practice teaching.

Gross area is defined as the sum of the areas at each floor level included within the principal outside faces of exterior walls, neglecting architectural setbacks or projections. All stories or spaces which have floor surfaces with clear standing headroom (6 feet, 6 inch minimum) and which are being used or can be adapted for use are included. Gross area, therefore, consists of assignable areas (areas having functions as adopted for the study) plus unassignable areas (restrooms, corridors, stairs, wall and partition thicknesses, and the like).

The gross areas for instructional, research, and general facilities categories are presented in table 10 by region, State, and type of control for the aggregate United States. It should be noted that as of the date of the survey Alaska and Hawaii were considered outlying areas. Also, it should be pointed out that the Canal Zone, Guam, and three of the U.S. service schools did not participate in the study.

A comparison of data in table 10 with information relating to assignable area presented in table 7 reveals significant differences in the relative proportions of facilities included in the major categories. These differences result from the fact that gross areas were categorized on the basis of primary function of each building, as reported by each institution. It turns out that gross area data substantially exaggerate the proportion of space devoted to research and greatly understate the proportion given to general uses. In table 10 and in subsequent tables, therefore, attention should be directed mainly to the total columns, as evidence of the distribution of all academic facilities, regardless of specific function.

Information on the distribution of facilities by population size of cities is not available.

(b) *Age and Condition of Academic Facilities*

Table 11 summarizes regional data which show the period of initial occupancy of facilities existing in 1957. It should be noted that in the period immediately following World War II, occupancy was not necessarily a reliable indicator of the actual age of buildings. This is because many of the buildings first occupied by educational institutions during the years 1946 through 1948 were actually war surplus buildings converted to temporary educational use. In general, however, it may be assumed that age and period of occupancy coincide.

TABLE 10.—*Gross areas of instructional, research, and general facilities categories of buildings,[1] by region, State, category, and control—Aggregate United States*

[Area in hundreds of square feet]

Region and State	Public				Private			
	Total	Instructional	Research	General	Total	Instructional	Research	General
Aggregate United States	2,338,088	1,680,922	414,049	243,117	1,532,023	1,155,913	209,983	166,127
Northeast	269,114	205,179	41,696	22,239	635,069	443,059	128,639	63,371
Connecticut	15,044	11,034	2,244	1,766	46,938	35,911	4,785	6,242
Maine	16,102	14,472	927	703	8,069	6,718	633	718
Massachusetts	24,309	16,664	5,814	1,831	147,590	95,977	35,876	15,737
New Hampshire	8,143	6,346	527	1,270	9,744	7,853	871	1,020
New Jersey	22,956	17,289	3,606	2,061	33,441	20,370	8,216	4,855
New York	123,308	90,865	23,818	8,625	202,408	141,560	42,523	18,325
Pennsylvania	47,273	39,321	2,150	5,802	167,140	120,090	33,933	13,117
Rhode Island	5,935	4,140	1,614	181	13,677	9,976	1,802	1,899
Vermont	6,044	5,048	996	----------	6,062	4,604	----------	1,458
North Central	777,685	519,271	174,804	83,610	400,462	323,379	39,612	37,471
Illinois	97,745	54,765	31,210	11,770	113,947	86,676	18,543	8,728
Indiana	71,479	44,147	19,986	7,346	42,940	38,283	241	4,416
Iowa	51,018	33,240	14,420	3,358	27,199	23,578	----------	3,621
Kansas	56,757	43,761	7,592	5,404	14,479	13,591	----------	888
Michigan	147,679	92,627	39,732	15,320	25,432	22,631	1,555	1,246
Minnesota	80,670	49,261	18,359	13,050	21,428	18,674	----------	2,754
Missouri	39,265	32,978	3,810	2,477	52,443	36,078	12,181	4,184
Nebraska	36,371	30,401	2,835	3,135	11,401	10,295	465	641
North Dakota	21,218	15,086	4,098	2,034	745	654	----------	91
Ohio	99,948	71,429	16,222	12,297	61,916	50,636	3,355	7,925
South Dakota	16,927	10,574	3,231	3,122	4,664	3,911	541	212
Wisconsin	58,608	41,002	13,309	4,297	23,868	18,372	2,731	2,765

South	751,900	551,071	116,283	84,546	357,707	278,002	31,942	47,763
Alabama	42,537	33,862	1,419	7,256	15,356	12,820	313	2,223
Arkansas	32,487	22,805	6,588	3,094	7,317	6,692	76	549
Delaware	6,501	6,071	30	400	90	90		
Florida	35,945	25,826	5,346	4,773	19,347	14,696	302	4,349
Georgia	49,230	37,389	7,682	4,159	29,213	20,202	3,622	5,389
Kentucky	36,667	25,806	5,003	5,858	13,749	12,725		1,024
Louisiana	51,771	38,730	7,835	5,206	19,258	17,024	565	1,669
Maryland	34,746	18,734	12,471	3,541	23,910	16,204	4,456	3,250
Mississippi	32,952	26,332	2,224	4,396	6,156	5,487	83	586
North Carolina	66,735	45,553	13,622	7,560	44,607	30,265	9,940	4,402
Oklahoma	54,923	42,574	5,774	6,575	11,680	9,461		2,219
South Carolina	40,178	20,571	16,423	3,184	12,785	11,529	61	1,195
Tennessee	40,341	31,930	3,644	4,767	39,095	30,704	5,885	2,506
Texas	129,977	95,953	17,398	16,626	62,619	50,351	1,549	10,719
Virginia	53,006	42,164	7,721	3,121	23,462	19,972	40	3,450
West Virginia	29,030	24,291	3,092	1,647	5,465	4,978		487
District of Columbia	14,874	12,480	11	2,383	23,598	14,802	5,050	3,746
West	507,713	383,319	78,871	45,523	137,416	110,276	9,790	17,350
Arizona	20,730	12,145	6,240	2,345	1,086	819		267
California	237,823	171,588	44,963	21,272	82,495	63,843	9,098	9,554
Colorado	40,288	36,205	1,841	4,242	14,627	10,388	333	3,906
Idaho	17,980	15,454	740	1,786	1,773	1,650		123
Montana	16,960	15,018	1,116	826	1,376	1,318		58
Nevada	3,906	3,008	689	209				
NewMexico	22,158	15,855	3,091	3,212	918	553		365
Oregon	46,960	37,832	5,462	3,666	11,280	9,947	234	1,099
Utah	27,318	19,173	5,651	2,494	9,207	8,401	125	681
Washington	60,618	47,681	8,825	4,112	14,654	13,357		1,297
Wyoming	10,972	9,360	253	1,359				
U.S. service schools	10,815	5,989	751	4,075				
Outlying parts	20,861	16,093	1,644	3,124	1,369	1,197		172
Alaska	1,371	999	176	196				
Canal Zone								
Guam								
Hawaii	8,273	7,051	756	466	217	217		
Puerto Rico	11,217	8,043	712	2,462	1,152	980		172

[1] Exclusive of buildings shared with institutions of less than college grade.

Source: *College and university facilities survey*, table 11.

TABLE 11.—*Gross areas of instructional, research, and general facilities categories of buildings,*[1] *by region, category, period of initial occupancy, and control: Aggregate United States*

[Area in hundreds of square feet]

Region and facilities category	Public				Private			
	Through 1899	1900–1919	1920–39	1940–57	Through 1899	1900–1919	1920–39	1940–57
Aggregate United States	139,262	424,741	752,632	1,009,108	218,936	301,806	493,898	512,649
Instructional [2]	108,235	306,126	567,025	696,181	173,809	225,894	365,539	387,309
Research [3]	15,516	78,429	117,985	197,626	20,148	43,904	80,495	65,270
General [4]	15,511	40,186	67,622	115,301	24,979	32,008	47,864	60,070
Northeast	30,817	54,665	90,272	92,626	107,538	141,430	213,309	170,855
Instructional	25,179	40,832	72,732	65,933	80,487	91,614	152,372	116,940
Research	2,707	7,497	10,587	20,905	13,891	36,798	41,988	35,962
General	2,931	6,336	6,953	5,788	13,160	13,018	18,949	17,953
North central	63,326	209,748	228,781	272,752	62,124	84,860	129,163	123,365
Instructional	49,831	141,173	154,619	173,571	52,498	71,803	101,446	96,949
Research	7,880	50,367	51,370	65,187	2,445	3,681	18,994	14,492
General	5,615	18,208	22,792	33,994	7,181	9,376	8,723	11,924

South	25,785	92,718	270,749	359,248	29,425	57,673	109,825	158,937
Instructional	17,783	71,269	206,510	254,255	24,898	48,636	78,480	124,955
Research	2,849	11,057	37,711	63,565	935	2,528	17,694	10,619
General	5,153	10,392	26,528	41,428	3,592	6,509	13,651	23,363
West	18,525	66,681	154,789	264,083	19,632	17,843	41,388	58,553
Instructional	14,759	52,425	127,626	188,486	15,709	13,841	33,028	47,698
Research	2,080	9,508	17,468	46,423	2,877	897	1,819	4,197
General	1,686	4,748	9,695	29,174	1,046	3,105	6,541	6,658
U.S. service schools	809	72	115	9,819				
Instructional	683			5,306				
Research				751				
General	126	72	115	3,762				
Outlying parts		857	7,926	10,580	217		213	939
Instructional		427	5,538	8,630	217		213	767
Research			849	795				
General		430	1,539	1,155				172

[1] Exclusive of buildings shared with institutions of less than college grade.
[2] Exclusive of area of buildings for which year of initial occupancy was not reported (public, 3,355; private, 3,362).
[3] Exclusive of area of buildings for which year of initial occupancy was not reported (public, 4,493; private, 166).
[4] Exclusive of area of buildings for which year of initial occupancy was not reported (public, 4,497; private, 1,206).

In the 1957 inventory, institutions were asked to report the condition of buildings in one of three categories:

1. Satisfactory;
2. Needs major rehabilitation now;
3. Should be razed now, but need for space and lack of money for replacement force continued use.

Table 12, which summarizes results of this query, reveals that about one-sixth of all academic facilities either required major rehabilitation or should have been retired from use at the time of the inventory.

(c) *Control of Higher Education Facilities*

Except for the distinction between public and private institutions, which has been maintained throughout this chapter, reliable information on the proportions of facilities under different types of control is not available. Based on the most recent data, the distribution of institutions of higher education among the various control categories is as follows:[3]

	Number of institutions
State governments or agencies	424
Cities, counties, special districts, etc	354
Private nonprofit organizations	1,385
Proprietary organizations	32
Federal Government	12
Total	2,207

However, the additional data, such as enrollments, which would permit estimates of the distribution of facilities, have not been aggregated by these categories.

TABLE 12.—*Gross areas of instructional, research, and general facilities categories of buildings,[1] by region, condition, category, and control: Aggregate United States*

[Area in hundreds of square feet]

Region and condition	Public				Private			
	Total	Instructional	Research	General	Total	Instructional	Research	General
Aggregate United States	2,338,088	1,680,922	414,049	243,117	1,532,023	1,155,913	209,983	166,127
Condition 1	1,936,466	1,396,491	349,936	190,039	1,310,531	987,615	185,499	137,417
Condition 2	221,419	162,889	40,143	18,387	140,287	103,730	22,098	14,459
Condition 3	176,754	119,007	23,179	34,568	77,608	61,890	2,288	13,430
Not reported	3,449	2,535	791	123	3,597	2,678	98	821
Northeast	269,114	205,179	41,696	22,239	635,069	443,059	128,639	63,371
Condition 1	232,998	175,012	37,590	20,396	569,069	395,913	117,264	55,892
Condition 2	21,721	18,008	3,132	581	43,146	29,417	9,833	3,896
Condition 3	14,395	12,159	974	1,262	22,374	17,249	1,542	3,583
Not reported					480	480		
North Central	777,685	519,271	174,804	83,610	400,462	323,379	39,612	37,471
Condition 1	610,730	405,940	139,935	64,855	324,986	265,662	30,962	28,362
Condition 2	94,763	64,692	23,560	6,511	46,396	33,582	8,278	4,536
Condition 3	71,314	47,957	11,113	12,244	27,026	22,617	372	4,037
Not reported	878	682	196		2,054	1,518		536

See footnote at end of table.

[3] See *Education Directory, 1965–66; Part 3, Higher Education;* U.S. Office of Education, 1966. Institutions with less than 4-year programs constitute the great majority of those controlled by cities, counties, and special districts, and a substantial majority of those under proprietary control.

TABLE 12,—*Gross areas of instructional, research, and general facilities categories of buildings,*[1] *by region, condition, category, and control: Aggregate United States*—Con.

Region and condition	Public				Private			
	Total	Instructional	Research	General	Total	Instructional	Research	General
South	751,900	551,071	116,283	84,546	357,707	278,002	31,942	47,763
Condition 1	644,085	474,817	103,302	65,966	304,248	233,371	31,352	39,525
Condition 2	62,289	46,316	8,329	7,644	31,142	27,611	220	3,311
Condition 3	43,631	28,671	4,057	10,903	21,274	16,360	272	4,642
Not reported	1,895	1,267	595	33	1,043	660	98	285
West	507,713	383,319	78,871	45,523	137,416	110,276	9,790	17,350
Condition 1	422,111	323,007	66,992	32,112	111,076	91,689	5,921	13,466
Condition 2	39,836	31,632	4,844	3,360	19,386	12,903	3,767	2,716
Condition 3	45,090	28,094	7,035	9,961	6,934	5,664	102	1,168
Not reported	676	586		90	20	20		
U.S. service schools	10,815	5,989	751	4,075				
Condition 1	8,897	4,459	751	3,687				
Condition 2	1,703	1,513		190				
Condition 3	215	17		198				
Not reported								
Outlying parts	20,861	16,093	1,644	3,124	1,369	1,197		172
Condition 1	17,645	13,256	1,366	3,023	1,152	980		172
Condition 2	1,107	728	278	101	217	217		
Condition 3	2,109	2,109						
Not reported								

[1] Exclusive of buildings shared with institutions of less than college grade.

(d) *Estimated Value of Facilities*

The value of academic facilities existing in 1965 has been estimated roughly based on the following:

1. 1957 values, as reported by the institutions which participated in the inventory.

2. 1958–60. Institutional reports of capital outlay for new academic facilities. (One-half of the outlay for the fiscal year 1958–59 was added as the assumed cost of construction during the 6 months between the inventory and the first fiscal year covered by these reports.)[4]

3. 1961–65. Estimated outlays, based on reports to the Office of Education which indicate a general continuation of the steadily increasing effort put forth by the institutions during the preceding 5 years. Estimated increases were 12 percent annually through 1964 and 10 percent for 1965.

All values and costs were adjusted upward to take account of nonresponding institutions. Then, based on experience data, values were increased by 3.25 percent per year as an allowance for rising construction costs. They were decreased by 2 percent per year to allow for depreciation.

[4] See the following:
Bokelman, W. Robert and Leslie F. Robbins. *Progress in the Construction of Higher Education Facilities, 1951–59.* U.S. Department of Health, Education, and Welfare, Office of Education (OE-51002). Washington: U.S. Government Printing Office, 1962. pp. 1, 14.
———. *New Construction and Rehabilitation on College Campuses, 1959–60 and 1960–61.* U.S. Department of Health, Education, and Welfare, Office of Education (OE-51002-61). Washington: U.S. Government Printing Office, 1963. pp. 1, 9, 11, 19.

Results of these estimates and computations are summarized below:

[Thousands of dollars]

Period of construction	Institutional control		
	Public	Private	Total
Through 1957	3, 594, 920	3, 054, 570	6, 649, 490
Jan. 1 to June 30, 1958	125, 928	70, 237	196, 165
Fiscal years 1959–61	893, 735	503, 768	1, 397, 503
Fiscal years 1962–65	1, 894, 038	974, 430	2, 868, 468
Total	6, 508, 621	4, 603, 005	11, 111, 626

Precise information on additions to academic facilities resulting from the large outlays of the past few years is not available. Estimates place net additions during this period at about 230 million gross square feet, indicating that the aggregate facilities now in use exceed 600 million gross square feet.

B. Costs and User Charges

1. CONSTRUCTION COSTS AND OPERATING COSTS

(a) *Construction Costs*

Average costs in 1964–65 for several different types of academic facilities are shown below. These costs are per gross square foot, including land, buildings, fixed and movable equipment, and improvements such as utilities and landscaping. Figures in parentheses in the first column indicate the number of projects included in the average. The third column shows the cost range within which the majority (i.e., 65–70 percent) of the projects fell.

Facility function	Mean cost	1 standard deviation range
Library (124)	$25. 48	$19. 16–$31. 80
Library and classroom (47)	23. 44	17. 19– 29. 69
Library and sciences (11)	27. 00	20. 38– 33. 62
Classroom and science (25)	26. 87	17. 80– 35. 95
Science (150)	28. 24	19. 75– 36. 73
General classroom (37)	27. 14	20. 67– 33. 42
Weighted average	26. 57	

Based on the data above, the typical cost used currently for budgeting purposes is $27.50 per gross square foot.

(b) *Costs of Maintenance and Operations*

In academic year 1957–58 all institutions of higher education spent $408,938,467 for operating and maintenance of their physical plant. Included in this amount are salaries, wages, supplies, other expenses, and equipment for operation and maintenance of the institutional plant, excluding those appropriately chargeable to auxiliary enter-

prises and organized activities relating to educational departments. In 1957–58 the total gross area of academic facilities in the United States was approximately 387,011,100 gross square feet. Unit maintenance cost in 1958 was therefore approximately $1.06 per gross square foot per year. To update this cost to 1964–65, a 3.6 percent annual rate of increase is used which represents the rate of change in salaries for the skilled maintenance trades and unskilled plant workers. For 1964–65 the derived unit maintenance costs equal $1.36 per gross square foot per year.

2. USER CHARGES

In higher education, user charges are principally tuition and fees assessed against students for educational and general purposes. No given proportion of this student income is designated for educational services as opposed to maintenance and operation expenses. User charges expressed as a percentage of current educational expenditures covering both educational services and plant operation and maintenance are indicated below.

	1959–60	1961–62
Services:	*In millions*	*In millions*
General administration	$587	$736
Instruction and departmental research	$1,803	$2,216
Library	$136	$178
Subtotal	$2,526	$3,130
Maintenance and operation of the physical plant	$474	$566
Total	$3,000	$3,696
Student fees	$1,196	$1,547
Student fees as a percent of total	39.9	41.9

Since colleges and universities are continually expanding, their facility expenditure burden is best represented by the total of debt retirement and new construction expenditure. A very small component of student tuition and fee income is restricted for plant expansion and debt retirement, but, as shown below, this component meets only a trivial part of the total burden.

	1959–60	1961–62
	In millions	*In millions*
Reduction of capital indebtedness and interest	$176	$262
Construction	$1,197	$1,555
Total	$1,373	$1,817
Student fees (restricted for these purposes)	$15	$23
Restricted student fees as percent of total	1.1	1.3

The extent to which the cost of higher education facilities is met from general tax resources and general obligation borrowings of State and local government units is indicated in the next section. (See table 14, lines 2, 3, 5, and 6.)

C. Trends of Capital Outlays

The most reliable estimates of capital outlay for academic facilities now available cover only the period since the 1957 facilities inventory. These estimates, together with estimates of the area added to facilities each year, appear in table 13.

Of these annual capital outlays the distribution by spending agency has been estimated for 2 recent years, as follows:

[In percent]

	1963–64	1964–65
Public institutions	67.7	61.3
Private insitutions	32.3	38.7
Total	100.0	100.0

Information on sources of financing for capital outlay is summarized in table 14. The following notes provide references to items in the table which relate to specific items of information requested by the committee:

(*a*) Appropriations from tax resources—lines 1, 2, and 3.
(*g*) Gifts, bequests, donations, etc.—line 8.
(*c*) Federal Government grant assistance [1]—line 1.
(*d*) State grants-in-aid (all States)—line 2.
(e) Tax exempt municipal bond market—lines 4, 5, 6, and 7 (public institutions only).
(*f*) Capital flotations in other security markets—lines 4, 5, 6, and 7 (private insitutions only).
(*g*) Borrowing from Federal Government—line 4.

Table 13.—*Estimated capital outlay*

[In millions of dollars]

Year	Total	Breakdown of total		Breakdown of total	
		Public	Private	Federal	Non-Federal
1959–60	613	412	201	----------	613
1960–61	628	387	241	----------	628
1961–62	715	455	260	----------	715
1962–63	788	515	273	----------	788
1963–64	882	597	285	----------	882
1964–65	1,352	829	523	382	970
1965–66	1,701	1,000	701	634	1,067

TABLE 14.—*Estimated percentage distribution of funds by source for new academic construction and rehabilitation completed by higher education institutions*

	Public institutions			Private institutions		
	1960–61	1963–64	Estimate [1] 1964–65	1960–61	1963–64	Estimate [1] 1964–65
Appropriations and grant income from public sources	60.5	51.5	61.3	8.4	11.1	28.0
1. Federal Government	3.4	5.3	25.1	7.2	8.7	26.5
2. State government	54.3	43.9	34.4	1.2	1.1	.5
3. Local government	3.0	2.3	1.8		1.3	.8
Loans for plant funds from general obligation or revenue—bonds, mortgages, bank loans, notes, etc., issued by	30.1	37.3	29.9	14.6	12.0	24.9
4. Federal Government			.7			17.6
5. State government and state authority	12.9	16.3	12.8	1.9		
6. Local government	6.3	3.5	2.7			
7. Institutions of higher education	10.9	17.5	13.7	12.7	12.0	7.3
Other funds	9.2	11.2	8.8	77.0	76.9	47.1
8. Gifts and grants from private sources	6.6	4.3	3.4	54.0	60.5	37.0
9. Loans from other institutional funds	.6	2.2	1.7	5.7	9.1	5.6
10. Transfers from other institutional funds	1.2	3.2	2.5	12.4	4.6	2.8
11. All other sources	.8	1.5	1.2	4.9	2.7	1.7
Total	100.0	100.0	100.0	100.0	100.0	100.0
Estimated capital outlay (in millions)	$387	$597	$829	$241	$285	$523

[1] Estimated values are based on the assumption that the source mix percentages for all incomes other than Federal funds administered under titles I, II, and III, HEFA, will remain the same as the 1963–64 distribution.

D. NEEDS AND PROSPECTIVE CAPITAL OUTLAYS: 1966–75

(a) *Capital Requirements*

Facility needs for higher education in the decade 1966–75 have been estimated as follows:

	Million gross square feet
Backlog of unmet needs	133
Facilities required for new enrollment	561
Rehabilitation, estimated at 7.5 percent of requirements for new enrollment. Hence, equivalent to	42
Total requirement for decade	736

At estimated building and equipment costs of $27 per square foot for fiscal year 1965, the capital outlay requirements for the decade 1966–75 would be slightly under $20 billion. However, since recent experience indicates a rise in construction costs of at least 3.25 percent annually, it is prudent to assume that the average cost of facilities to be constructed during the decade will be at least $32 per square foot. At this cost, the required capital outlay will be approximately $23.5 billion.

The estimated requirement for rehabilitation included above is based on information showing that new construction and rehabilitation typically account for about 93 percent and 7 percent respectively of facility expenditures.

Other assumptions in this estimate are:

(1) That the allowance of 150 gross square feet per student will be adequate to meet future educational needs.

(2) That enrollments will increase during the decade by an average of slightly over 5 percent per year, leading to a total enrollment in fiscal year 1975 of approximately 8.7 million students.

As far as space is concerned, the per student allowance will probably be adequate. It should be noted, however, that the need to educate students for a world of increasingly complex technology, together with changes in educational technology itself, are expected to add very rapidly to the demands for costly equipment in higher education. This allowance, therefore, translated into dollar equivalents, is probably quite modest.

Capital outlay requirements will be very sensitive to changes in enrollments. Hence, the uncertainty of the enrollment estimates used here should be emphasized. Specifically, it should be noted that enrollment projections make no allowance for the effect of the Veterans' Readjustment Benefit Act of 1966, nor do they take fully into account the growing belief that the education of most students should be extended at least 2 years beyond high school graduation. The projection does imply an increasing ratio of college enrollments to "college-age" (18–24) population, as shown below:

	Percent		*Percent*
1960	22	1970	29
1965	25	1975	33

Whether the estimated increase will be sufficient to reflect rising demand for higher education is a matter of judgment. Even small changes in the ratio will have substantial effects, because the population in this age group is large. To be explicit, an increase in the 1975 ratio of only 2 percentage points (from 33 to 35 percent) would require an upward adjustment in the projected enrollment of more than half a million students. At construction costs estimated for 1975, such an increase would mean an added capital outlay requirement of approximately $3 billion.[5]

(b) *Distribution of Needs by Population Size of Community*

The proportions of projected facility needs ascribable to places of various population sizes cannot be reliably estimated at this time. In view of the increasing preponderance of large institutions in higher education, it can be assumed that the bulk of the required construction will occur in communities of substantial size.

(c) *Types of Institutions Responsible for Projected Outlay*

The proportions of prospective capital outlay to be expended by public and private institutions are estimated as follows: Public, 59 percent; private, 41 percent.

In the public sector, the proportion of funds to be expended by units other than State governments and State agencies cannot be reliably estimated. In the private sector, the overwhelming majority of the institutions are nonprofit.

[5] In fact, it appears likely that the effect of enrollment increases, beyond the levels currently projected, will be partially offset by gains in the efficiency of the educational process, and by increases in the average length of the "academic year," resulting from the current trend toward the adoption of quarter and trimester calendars in higher education.

Chapter 20

College Housing and Related Service Facilities*

A. Nature and Composition of Facilities

1. DESCRIPTION OF FACILITY

"If a graduate of the class of 1920 were to set out today on a tour of the housing at his old alma mater, he would be struck above all by its variety. The off-campus rooming house, the dormitory quadrangle, and fraternity row are still there—dressed in a different style, perhaps, but still recognizable. But the apartment village for married students is new. So is the center for graduate students. And so is the nearby subdivision where the faculty are building homes. Colleges are housing more people of more kinds, and they realize that a large and varied population demands extensive and varied facilities." [1]

In broad terms, college housing includes housing facilities occupied by individuals associated with an institution whether on or off campus, privately or institutionally owned. This discussion will deal only with that part of college housing which is owned and controlled by the institution, and limited to the housing requirements of the college student. Included are residence halls for single students, apartments for married students, houses for special groups and for graduate students. Since the college housing complex is the student's home away from home, other facilities which affect the physical and social well-being such as food service facilities, student centers, and infirmaries are also included.

The structures may be small, large in size, single story, or high-rise, incorporating a wide range of architectural design and floor plan varying with the need and characteristics of the institution, its location and circumstances.

Whatever the nature of the facility, its size or design, it needs first of all to serve the purposes and programs of the institution's educational program. Since institutions vary widely in their philosophies and objectives, it would be expected that the housing patterns would reflect such differences. While definitive statistics are not available on institutional housing policies, tabulations from American Council of Education and Office of Education publications for the school year 1962–63 are informative:

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* Prepared by J. Trevor Thomas, Community Facilities Administration, Department of Housing and Urban Development, with minor editing by Committee staff.

[1] Riker, Harrold C., *College Students Live Here*, Educational Facilities Laboratory, 1961.

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Percentage of full-time enrollments housed, fiscal year 1963

[In percent]

	Single student dwellings			Student families
	Men	Women	Total	
Public institutions:				
4-year	31.76	48.67	38.24	2.80
2-year	7.85	7.67	7.79	.19
Private institutions:				
4-year	42.97	63.09	50.58	1.31
2-year	54.16	76.44	65.00	.58
Total, public and private:				
4-year	36.20	54.30	43.10	2.21
2-year	15.49	25.55	19.27	.27
Total, all institutions	33.54	50.69	40.06	1.96

Sources: Cartter, Allan, "*American Colleges and Universities, American Council for Education,*" 1964; Gleazer, Edmund J., Jr., "*American Junior Colleges, American Council for Education,*" 1963; "*Opening Fall Enrollments in Education, 1962,*" U.S. Office of Education.

While institutions may vary widely in the amount and type of housing facilities provided, there seems to be near unanimity among them in the durability of the facilities constructed. Educational buildings are expected to last for 50 years. Many bond issues extend over such a period. The design and construction must incorporate enough durability to achieve useful service over this period with as little maintenance as possible.

2. EXISTING CAPITAL PLANT IN THE UNITED STATES

Current information is not available on the quantity of existing college housing in the United States. Publications of the Office of Education and the American Council on Education do contain information on which to base estimates of the inventory of dwellings for single and married students.

Estimated capacity, college dwelling units, school year 1962–63

	Single student dwellings						Married student dwellings	
	Public			Private				
	Men	Women	Total	Men	Women	Total	Public	Private
1962–63 [1]	310,000	299,400	610,300	283,600	268,200	551,800	43,100	13,300

[1] Tabulated from "*American Universities and Colleges—American Junior Colleges,*" American Council on Education, 1963 and 1964 and extrapolated to 100 percent of enrollment.

If it could be assumed that the percentage of students housed was the same in 1965 as in 1962 (see table p. 396), the inventory of housing in the fall of 1965 would be as follows:

	Single student dwellings				Married student dwellings	
	Public		Private			
	Men	Women	Men	Women	Public	Private
Fall of 1965	462,000	455,000	409,000	363,000	60,000	17,000

Similar information is not available for related service facilities such as dining halls, infirmaries, and student centers.

From the tabulations of housing reported in the American Council on Education publications, distribution of these facilities by regions is revealed as follows:

Geographical distribution of single and married student housing, school year 1962–63

Region	Single student dwellings						Married student dwellings	
	Public			Private				
	Men	Women	Total	Men	Women	Total	Public	Private
Northeast	21,875	26,170	48,045	67,854	55,367	123,221	359	2,644
Middle Atlantic	29,568	33,967	63,535	47,443	40,077	87,520	1,748	2,462
Southeast	68,298	53,841	122,139	40,147	41,844	81,991	8,156	2,380
Middle West	80,596	80,150	160,746	63,096	61,985	125,081	14,546	2,730
Southwest	70,116	61,338	131,454	28,880	30,840	59,720	10,168	2,279
Far West	32,976	32,501	65,477	23,380	25,014	48,394	7,729	2,096
Puerto Rico	393	376	769	851	850	1,701	----	65
Total	303,822	288,343	592,165	271,651	255,977	527,628	42,706	14,656

The above table is based on an incomplete report representing institutions enrolling 94 percent of total full-time private college enrollment and 98.7 percent of total public college enrollment.

While no study has been made on the distribution of college housing by community size, the records of the Department of Housing and Urban Development, cumulative to December 31, 1965, reveal such distribution for approved loans for the 16 years of the program. These loans represent housing spaces equal to more than one-third of the total number estimated in use in the fall of 1965.

Net approved loans by community size college housing program

Population	Cumulative through Dec. 31, 1965 [1]	
	Number	Percent
Program total	2,537	100.0
Under 500	29	1.1
500–999	33	1.3
1,000 to 2,499	146	5.8
2,500 to 4,999	183	7.2
5,000 to 9,999	307	12.1
10,000 to 24,999	458	18.1
25,000 to 49,999	322	12.7
50,000 to 99,999	260	10.2
100,000 to 249,999	307	12.1
250,000 to 499,999	179	7.1
500,000 to 999,999	193	7.6
1,000,000 and over	120	4.7

[1] 1st loan approved in August 1951.

Based on the methods and sources used in estimating the capacity of existing college housing facilities, the age distribution of such facilities is estimated as follows:

Percentage distribution of single student housing capacity by period of initial occupancy

Period of initial occupancy	Public	Private	Public and private
Through 1899	1.03	4.68	2.70
1900–1919	3.65	7.80	5.55
1920–39	11.57	11.74	11.65
1940–57	21.50	22.73	22.02
1958–61	28.81	24.62	26.88
1962–65	33.44	28.53	31.20
Total	100.00	100.00	100.00

Ownership of these facilities is estimated to be distributed as follows:

Percentage distribution of ownership of single student dwellings and married student apartments by public and private categories

Ownership	Single student dwellings	Married student dwellings
Public educational institutions	54.29	77.92
Private nonprofit organizations	45.71	22.08
Total	100.00	100.00

Information on the current value of existing college housing structures is not available. From the experience under the college housing program, the current estimated average cost of dwelling space for a single student is $4,650 and that for a married student is $12,500.

Assuming these values to represent current construction costs, replacement value of existing college housing residential facilities are estimated as follows:

Estimated replacement value of existing college housing residential facilities

[In millions of dollars]

Type of institution	Single student dwellings	Married student dwellings	Total
Public	5,960.5	750.0	6,710.5
Private	3,589.8	212.5	3,802.3
Total	9,550.3	962.5	10,512.8

B. Costs and User Charges

An analysis of 148 projects financed under the Federal college housing program placed under construction during fiscal year 1965 reflects the following information on unit costs of college housing facilities:

Structural costs per square foot, college housing program projects placed under construction, fiscal year 1965

Number of projects	148
High	$41.25
Median	$17.01
Low	$8.29
Third quartile	$19.70
First quartile	$14.78

Median costs for the same projects by regions were as follows:

Region	Number of projects	Median square foot structural costs
Northeast	17	$19.70
Middle Atlantic	19	18.36
Southeast	29	14.22
Middle West	31	16.24
Southwest	27	16.41
Far West	25	19.57
Total	148	

Historically, colleges have attempted to operate housing facilities on a break-even basis and only rarely have charges been so regulated as to produce an operating profit. It has been customary to segregate the income from housing facilities and to employ that income to pay for all of the services attendent to the occupancy and use of such facilities.

The revenue bond concept under which most college housing loans are made developed as a method of financing under which a facility would produce sufficient income to pay all operating costs plus a debt service requirement which would amortize the cost of the facility, plus interest, during the term of the loan. While this objective may have been attainable during the early years of the college housing loan program, it is difficult of attainment now with current student charges and construction costs.

The latest *Information for Applicants* published by the Department of Housing and Urban Development (August 1962) contains illustrations of M. & O. expense ranging from $70 to $140 per student per year. Assuming the current college housing 3-percent interest rate, a per student construction cost of $4,650, and a 48-year-loan term with 1.25 percent coverage, the annual debt service requirement is $230. The addition of the M. & O. expenses above produces required income ranging from $300 to $370 per student per year. Contrasted to this total are the dormitory rates actually charged during 1963–64 as

reflected in the Office of Education's "Basic student charges" for that year:

Percentile	School year room rates	
	Men	Women
90th	$299	$310
75th	271	274
50th	210	214
25th	171	175
10th	121	126

Thus, only at the 90th percentile of student charges and at the lower end of the range of required income, does the income approach an amount sufficient to cover M. & O. charges plus debt service. If a more realistic estimate of $200 per student per year for M. & O. charges is used, current student charges at the 90th percentile provide only 70-percent coverage of M. & O. and debt service requirements.

There are, of course, exceptions to the pattern, notably those institutions which by a combination of higher student charges, effective management and low-cost structures of comparatively short lifespan have reported a profit on student housing operations. Since these methods produce higher cost of college attendance and often abnormally high maintenance charges in later years, most colleges have been reluctant to adopt them.

Definitive data on the extent to which costs for college housing facilities are being met from general tax resources and general obligation borrowings of State and local government units would only be available after an extensive survey and analysis. However, published Office of Education surveys for 1951–59 and 1959–61 and unpublished data for 1961–64 showed institutions reporting fund sources as follows:

Sources of funds for new construction of residential facilities completed

PUBLIC INSTITUTIONS

	Appropriations	Tax levies	General obligated bonds	HHFA revenue bonds	Other revenue bonds	Gifts, grants	Other sources
1951–56 (average)	20.8	0.7	4.1	65.8		0.8	7.8
1956–57	12.6	1.3	4.0	21.1	48.4	.2	12.4
1957–58	4.4	.9	8.8	34.6	46.7	.1	4.5
1958–59	7.3	.5	9.1	57.1	16.2	.2	9.4
1959–60	18.9	.8	3.3	56.4	13.2	1.3	6.1
1960–61	15.4	.8	3.8	44.2	30.5		5.3
1961–62	10.5	.1	5.8	43.4	25.4	.5	14.3
1962–63	8.6	.8	4.8	55.6	24.4	.2	5.6
1963–64	3.7	.5	2.5	45.3	42.8	.3	5.2

PRIVATE INSTITUTIONS

1951–56	1.5	0	.3	32.9		38.3	27.0
1956–57	0	0	.3	35.4	2.4	27.3	34.5
1957–58	2.2	0	0	57.3	0	15.2	25.3
1958–59	2.4	0	1.8	64.3	0	13.1	18.4
1959–60	1.1	0	.2	63.7	.5	12.4	22.1
1960–61	0	0	.9	51.9	.2	26.0	21.0
1961–62	0	0	5.6	57.6	.1	18.4	18.3
1962–63	0	0	0	75.7	.8	9.7	13.8
1963–64	0	0	.3	60.6	.4	14.6	24.1

C. Trend of Capital Outlays

The trend of annual capital outlays for college housing construction follows closely the trends in enrollments at colleges and universities:

	Enrollement		Facilities	
	Degree credit enrollment (in thousands)	Index, (1959–60=100)	Estimated value of facilities [1] (in thousands)	Index (1959–60=100)
1957–58	3,068	90	4,361,457	87
1958–59	3,258	96	4,624,318	92
1959–60	3,402	100	5,008,418	100
1960–61	3,610	106	5,344,949	107
1961–62	3,891	114	5,710,079	114
1962–63	4,206	124	6,204,130	124
1963–64	4,529	133	6,687,322	133

[1] Higher education facilities survey, pt. 3, with annual increments as reported by colleges in Office of Education new construction series.

While information is not available for construction completed in 1964–65 and 1965–66, the Office of Education's new construction series reported the following for the years 1951–52 through 1963–64:

Residential and auxiliary facilities completed

[In thousands of dollars]

Year completed	Residential facilities		Auxiliary facilities		Residential and auxiliary		
	Public	Private	Public	Private	Residential	Auxiliary	Total
1951–52	42,967	26,193	13,320	8,143	69,160	21,463	90,623
1952–53	56,624	18,331	15,464	3,466	74,955	18,930	93,885
1953–54	27,186	42,640	18,116	10,885	69,826	29,001	98,827
1954–55	42,123	54,984	17,551	12,507	97,107	30,058	127,165
1955–56	91,648	82,323	13,629	12,025	173,971	25,654	199,625
1956–57	169,708	69,105	17,932	6,143	138,813	24,075	162,888
1957–58	103,436	70,682	22,764	10,757	174,118	33,521	207,639
1958–59	143,767	73,474	25,896	19,724	217,241	45,620	262,861
1959–60	177,456	110,052	55,650	40,942	287,508	96,592	384,100
1960–61	139,730	118,681	49,194	28,926	258,411	78,120	336,531
1961–62	148,903	135,090	34,050	47,087	283,993	81,137	365,130
1962–63	216,875	174,047	43,891	59,238	390,922	103,129	494,051
1963–64	251,591	153,776	49,874	27,951	405,367	77,825	483,192
Total	1,512,014	1,129,378	377,331	287,794	2,641,392	665,125	3,306,517

D. Needs and Prospective Capital Outlay

The needs and capital outlay for college housing are assumed to have direct relationship to the increases in full-time students in colleges and universities. It has been further assumed that the requirements will vary as changing mixes occur in enrollments (i.e., public versus private; 4–year versus 2–year; men versus women; etc.). Cost factors used are those gained from the experience of the college housing program in recent years. The capital outlays listed are those required to meet the housing needs of the estimated increase in full-time student enrollments in the fall of each of the years listed. Data on enrollment projections may be found in exhibit I.

Prospective capital outlay, college housing, 1966–75

[Dollar amounts in millions]

	Public institutions	Private institutions	Total
1966	$672.2	$532.6	$1,204.8
1967	713.6	668.7	1,382.3
1968	535.9	341.8	877.7
1969	376.3	213.5	589.8
1970	523.5	403.7	927.2
1971	474.6	417.5	892.1
1972	742.1	553.6	1,295.7
1973	610.6	397.4	1,008.0
1974	714.9	510.9	1,225.8
1975	716.6	503.4	1,220.0
Total	6,080.3	4,543.1	10,623.4
Percent	57.23	42.77	100.00

Using the experience of the college housing program, the proportion of the estimated need ascribed to varying community size is estimated as follows:

Population;	*Percent*
More than 50,000	41.7
2,500 to 49,999	50.1
Less than 2,500	9.2
	100.0

Reporting institutions in the Office of Education's college and university facilities survey, part 2, planning for college and university physical plant expansion 1956–70, reported expected sources of revenue as follows:

Percentage distribution of proposed sources of funds for residential and auxiliary facilities planned by higher education institutions 1956–70

Sources of funds	Public		Private	
	Auxiliary	Residential	Auxiliary	Residential
Appropriations:				
State	25.08	15.97	----------	----------
Local	.17	.06	----------	.08
Federal	13.16	4.39	1.30	.61
Taxes:				
State	.38	.82	----------	----------
Local	.88	.02	----------	----------
State earmarked	.51	.66	----------	----------
Local earmarked	.12	.04	----------	----------
Bonds:				
State	3.20	2.53	----------	----------
Local	.44	.01	----------	----------
Institutional	2.06	.38	.90	.13
Revenue	40.16	69.65	29.97	54.53
Other sources:				
Gifts and grants	6.03	1.51	53.99	31.89
Outside borrowing	.88	.25	1.91	2.62
Endowment investment	.36	.06	1.45	2.32
Investment of college funds	2.84	2.00	4.15	2.78
Other	----------	.01	----------	.07
Uncertain	3.73	1.63	6.33	4.95

Source: College and University Facilities Survey, pt. 2, U.S. Office of Education, 1960.

Applying these estimates to the prospective capital outlay indicates the following:

Estimated sources of financing, college housing, 1965–75

[In millions of dollars]

	Public	Private	Total
Appropriations:			
State	$1,029.9		$1,029.9
Local	4.4	$3.2	7.6
Federal	323.6	31.2	354.8
Taxes:			
State	86.2		86.2
Local	9.8		9.8
Bonds:			
State	158.2		158.2
Local	3.3		3.3
Institutional	33.9	9.8	43.7
Revenue	4,044.2	2,353.3	6,397.5
Other sources:			
Gifts and grants	121.6	1,561.3	1,682.9
Borrowing from financial institutions	19.3	115.4	134.7
Endowment investment	5.6	101.0	106.6
Investment of other college funds	127.1	133.2	260.3
Other	.5	2.8	3.3
Uncertain	112.7	231.9	344.6
Total	$6,080.3	$4,543.1	$10,623.4

EXHIBIT 1

ASSUMPTIONS

Full-time, Degree-credit Enrollment (Aggregate United States)

1. It is assumed that enrollments are related to live births occurring during the period 18 through 21 years before the time of enrollment. No separate assumptions are made about graduate school enrollments because the historical data available lumps them with undergraduate enrollments (see p. 4).

2. It is assumed that the historic trend for an increasing proportion of the live births to be enrolled each year will continue, and that the proportion for men will continue to be different from that for woman.

3. It is assumed that both the total and increased enrollments at U.S. service schools and at private theological and religious schools will continue to be too small to affect estimates significantly. The historical data available did not permit the enrollments at these institutions to be subtracted from the national totals.

4. It is assumed that assumptions 1 and 2 will continue to be true of total enrollments at private institutions, as well as for total national enrollments (see pp. 5, 6, and 7).

   a. It is further assumed that the historic trend for an increasing proportion of total private enrollments to occur at 2-year institutions will continue, and that the proportion for men will continue to be different from that for women.

   b. It is assumed that the remaining private enrollment will occur at 4-year institutions.

5. It is assumed that the remaining total national enrollment will occur at public institutions.

   a. It is further assumed that the historic trend for an increasing proportion of total public enrollments to occur at 2-year institutions will continue until stabilizing in the fall of 1972, and that the proportion for men will continue to be different from that for women.

b. It is assumed that the remaining private enrollment will occur at 4-year institutions.

Design Capacity of Housing Required

The following assumptions are based upon subjective evaluations of information reported by four separate studies of college housing during the spring of 1956 and the fall of 1957, 1960, and 1962. The studies differ in scope, participation and bases. Valid objective comparisons cannot be made among them.

6. It is assumed that private 4-year institutions, excluding theological and religious schools, should provide additional dormitory spaces for 90 percent of the increase in men and women enrolled full time, and have student family units for 2 percent of their total full-time male enrollment.

7. It is assumed that private 2-year institutions should provide additional dormitory spaces for 35 percent of the increase in men and 100 percent of the women enrolled full time, and have student family units for 1.4 percent of their total full-time male enrollment.

8. It is assumed that public 4-year institutions should provide additional dormitory spaces for 40 percent of the increase in men and 60 percent of the increase in women enrolled full time, and have student family units for 4.5 percent of their total full-time male enrollment.

9. It is assumed that public 2-year institutions should have dormitory spaces for 8.6 percent and student family units for 0.3 percent of their total full-time male enrollment, and dormitory spaces for 8.3 percent of their total full-time female enrollment.

Comparison of full-time, degree-credit enrollments, with live births during the 4-year period 18 to 21 years earlier (aggregate United States)

[In thousands of students]

Enrollment in fall of—	Men			Women		
	Full-time enrollment	Live births 18 to 21 years earlier	Percent of births enrolled	Full-time enrollment	Live births 18 to 21 years earlier	Percent of births enrolled
1962 [1]	1,822	6,026	30.2	1,100	5,708	19.3
1963 [1]	1,914	6,106	31.3	1,176	5,783	20.3
1964 [1]	2,121	6,323	33.5	1,320	5,988	22.0
1965 [1]	2,434	6,690	36.4	1,503	6,335	23.7
1966 [2]	2,657	7,047	37.7	1,669	6,676	25.0
1967 [2]	2,914	7,452	39.1	1,857	7,062	26.3
1968 [2]	3,055	7,561	40.4	1,973	7,173	27.5
1969 [2]	3,153	7,561	41.7	2,068	7,179	28.8
1970 [2]	3,319	7,700	43.1	2,202	7,316	30.1
1971 [2]	3,491	7,862	44.4	2,346	7,470	31.4
1972 [2]	3,697	8,089	45.7	2,515	7,690	32.7
1973 [2]	3,855	8,203	47.0	2,652	7,801	34.0
1974 [2]	4,038	8,360	48.3	2,806	7,949	35.3
1975 [2]	4,219	8,506	49.6	2,962	8,093	36.6

[1] Actual.
[2] Estimated.

Sources: Live births: Bureau of Census; actual enrollments: Office of Education; estimated enrollments: Community Facilities Administration.

Full-time fall enrollments in private institutions (actual through fiscal year 1966; projected fiscal years 1967–76)

Fiscal year	4-year private			2-year private			Total private		
	Men	Women	Total	Men	Women	Total	Men	Women	Total
1963	674,712	394,435	1,069,147	28,838	31,014	59,852	703,550	425,449	1,128,999
1964	686,272	410,153	1,096,425	30,034	29,828	59,862	716,306	439,981	1,156,287
1965	736,040	443,383	1,179,423	38,455	35,753	74,208	774,495	479,136	1,253,631
1966	806,445	488,842	1,295,287	46,794	40,552	87,346	853,239	529,394	1,382,633
1967	862,000	529,000	1,391,000	54,000	45,000	99,000	916,000	574,000	1,490,000
1968	929,000	579,000	1,508,000	62,000	50,000	112,000	991,000	629,000	1,620,000
1969	959,000	607,000	1,566,000	69,000	53,000	122,000	1,028,000	660,000	1,688,000
1970	976,000	620,000	1,596,000	75,000	55,000	130,000	1,051,000	675,000	1,726,000
1971	1,011,000	650,000	1,661,000	82,000	60,000	142,000	1,093,000	710,000	1,803,000
1972	1,043,000	683,000	1,726,000	89,000	64,000	153,000	1,132,000	747,000	1,879,000
1973	1,090,000	724,000	1,814,000	99,000	68,000	167,000	1,189,000	792,000	1,981,000
1974	1,123,000	754,000	1,877,000	107,000	73,000	180,000	1,230,000	827,000	2,057,000
1975	1,163,000	789,000	1,952,000	116,000	77,000	193,000	1,279,000	866,000	2,145,000
1976	1,201,000	824,000	2,025,000	126,000	82,000	208,000	1,327,000	906,000	2,223,000

Full-time fall enrollments in public institutions (actual through fiscal year 1966; projected fiscal years 1967–76)

Fiscal year	4-year public			2-year public			Total public		
	Men	Women	Total	Men	Women	Total	Men	Women	Total
1963	949,042	584,561	1,533,603	168,921	90,029	258,950	1,117,963	674,590	1,792,553
1964	1,022,082	642,214	1,664,296	175,589	93,442	269,031	1,197,671	735,656	1,933,327
1965	1,134,630	729,708	1,864,338	212,194	111,651	323,845	1,346,824	841,359	2,188,183
1966	1,305,488	838,807	2,144,295	275,235	135,092	410,327	1,580,723	973,899	2,554,622
1967	1,414,000	936,000	2,350,000	327,000	159,000	486,000	1,741,000	1,095,000	2,836,000
1968	1,521,000	1,043,000	2,564,000	402,000	185,000	587,000	1,923,000	1,228,000	3,151,000
1969	1,611,000	1,116,000	2,727,000	416,000	197,000	613,000	2,027,000	1,313,000	3,340,000
1970	1,650,000	1,176,000	2,826,000	452,000	217,000	669,000	2,102,000	1,393,000	3,495,000
1971	1,714,000	1,250,000	2,964,000	512,000	242,000	754,000	2,226,000	1,492,000	3,718,000
1972	1,746,000	1,230,000	3,076,000	613,000	269,000	882,000	2,359,000	1,599,000	3,958,000
1973	1,856,000	1,430,000	3,286,000	652,000	293,000	945,000	2,508,000	1,723,000	4,231,000
1974	1,942,000	1,515,000	3,457,000	683,000	310,000	993,000	2,625,000	1,825,000	4,450,000
1975	2,042,000	1,610,000	3,652,000	717,000	330,000	1,047,000	2,759,000	1,940,000	4,699,000
1976	2,140,000	1,706,000	3,846,000	752,000	350,000	1,102,000	2,892,000	2,056,000	4,948,000

Total full-time fall enrollments—Public and private institutions (actual through fiscal year 1966; projected fiscal year 1967–76)

Fiscal year	Total public-private 4-year			Total public-private 2-year			Total public-private		
	Men	Women	Total	Men	Women	Total	Men	Women	Total
1963	1,623,754	978,996	2,602,750	197,759	121,043	318,802	1,821,513	1,100,039	2,921,522
1964	1,708,354	1,052,367	2,760,721	205,623	123,270	328,893	1,913,977	1,175,637	3,089,614
1965	1,870,670	1,173,091	3,043,761	250,649	147,404	398,053	2,121,319	1,320,495	3,441,814
1966	2,111,933	1,327,649	3,439,582	322,029	175,644	497,673	2,433,962	1,503,293	3,937,255
1967	2,276,000	1,465,000	3,741,000	381,000	204,000	585,000	2,657,000	1,669,000	4,326,000
1968	2,450,000	1,622,000	4,072,000	464,000	235,000	699,000	2,914,000	1,857,000	4,771,000
1969	2,570,000	1,723,000	4,293,000	485,000	250,000	735,000	3,055,000	1,973,000	5,028,000
1970	2,626,000	1,796,000	4,422,000	527,000	272,000	799,000	3,153,000	2,068,000	5,221,000
1971	2,725,000	1,900,000	4,625,000	594,000	302,000	896,000	3,319,000	2,202,000	5,521,000
1972	2,789,000	2,013,000	4,802,000	702,000	333,000	1,035,000	3,491,000	2,346,000	5,837,000
1973	2,946,000	2,154,000	5,100,000	751,000	361,000	1,112,000	3,697,000	2,515,000	6,212,000
1974	3,065,000	2,269,000	5,334,000	790,000	383,000	1,173,000	3,855,000	2,652,000	6,507,000
1975	3,205,000	2,399,000	5,604,000	833,000	407,000	1,240,000	4,038,000	2,806,000	6,844,000
1976	3,341,000	2,530,000	5,871,000	878,000	432,000	1,310,000	4,219,000	2,962,000	7,181,000

Reported capacity of residence halls for single persons, fiscal year 1963

	Public		Private		Public and private		
	Men	Women	Men	Women	Men	Women	Total
4-year institutions	289,297	280,827	254,906	231,838	544,203	512,665	1,056,868
2-year institutions	14,525	7,516	16,735	24,139	31,260	31,655	62,915
Total	303,822	288,343	271,641	256,077	575,463	544,320	1,119,783

Reported capacity of dwellings for married students, fiscal year 1963

	Public	Private	Total
4-year institutions	42,159	12,485	54,644
2-year institutions	547	423	970
Total	42,706	12,908	55,614

Percentage of full-time enrollments housed, fiscal year 1963

	Single student dwellings			Student families
	Men	Women	Total	
Public institutions:				
4-Year	31.76	48.67	38.24	2.80
2-Year	7.85	7.67	7.79	.19
Private institutions:				
4-Year	42.97	63.09	50.58	1.31
2-Year	54.16	76.44	65.00	.58
Total, public and private:				
4-Year	36.20	54.30	43.10	2.21
2-Year	15.49	25.55	19.27	.27
Total, all institutions	33.54	50.69	40.06	1.96

Source: Cartter, Allan, *American Colleges and Universities, American Council on Education*, 1964; Gleazer, Edmund J., Jr., *American Junior Colleges*, American Council on Education, 1963; *Opening Fall Enrollments in Education, 1962*, U.S. Office of Education.

CHAPTER 21

Educational Television *

A. NATURE AND COMPOSITION OF PUBLIC WORK OR FACILITY

1. DESCRIPTION OF FACILITIES

(*a*) Educational television broadcast (ETV) stations operate on television channels which have been reserved for noncommercial educational use. A total of 632 channels have been reserved for this purpose by the Federal Communications Commission. The same general physical characteristics apply to both commercial TV and ETV stations. Each station requires a transmitter, antenna, and related equipment in order to transmit a signal. Space to house the transmitter is also required. Program producing ETV stations require a wide variety of production equipment including TV cameras and videotape recorders. In addition, program producing ETV stations require studio and office space. Repeater ETV stations, which receive all of their programs from other sources, usually only require space to house their transmitters.

(*b*) The majority of the existing ETV stations are physically located in urban areas. Because of their transmitting power, however, ETV stations provide a broadcast service to nonurban, agricultural, and sparsely populated areas in addition to the urban areas where they are physically located. On the average, ETV stations devote almost 50 percent of their broadcast hours to instructional television programs most of which are intended for classroom reception in elementary and secondary schools. Many credit and noncredit higher education ETV courses are also provided. The remaining broadcast hours are generally devoted to cultural and entertainment programs and programs of a community service nature such as job training and basic health information.

(*c*) The average ETV station is on the air between 9 and 10 hours a day and operates 5 days a week.

(*d*) Pursuant to Federal Communications Commission Rules and Regulations, noncommercial educational broadcast stations are licensed only to nonprofit educational organizations upon a showing that the proposed stations will be used primarily to serve the educational needs of the community; for the advancement of educational programs; and to furnish a nonprofit and noncommercial television broadcast service. Educational purposes as applied to educational television broadcasting means the transmission of educational, community service, and cultural programs.

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*Prepared by John W. Bystrom, assistant to the Assistant Secretary for Education, and John J. Hurley, deputy assistant to the Assistant Secretary for Education, Department of Health, Education, and Welfare, with minor editing by committee staff.

The nature of the surrounding terrain, antenna height, and transmitting power each have an effect on the total area covered by an ETV station broadcast signal. The maximum effective radiated power for ETV stations operating on VHF channels 2 through 6 is 100 kilowatts and for ETV stations operating on VHF channels 7 through 13 is 316 kilowatts. The maximum effective radiated power for ETV stations operating on UHF channels 14 through 83 is 5 megawatts. The coverage areas of ETV stations average from between 15 to 70 miles.

Based on the average operating schedule, it is estimated that most of an ETV station's broadcast equipment fully depreciates over a 10-year period.

2. EXISTING CAPITAL PLANT IN THE UNITED STATES

(*a*) As of June 30, 1965, there were a total of 103 ETV stations in operation in the United States and Puerto Rico.

(*b*) These facilities were distributed as follows:

Alabama	5	Nebraska	1
Alaska	0	Nevada	0
Arizona	2	New Hampshire	1
Arkansas	0	New Jersey	1
California	7	New Mexico	1
Colorado	1	New York	3
Connecticut	1	North Carolina	1
Delaware	1	North Dakota	1
District of Columbia	1	Ohio	8
Florida	7	Oklahoma	3
Georgia	5	Oregon	2
Hawaii	0	Pennsylvania	5
Idaho	0	Puerto Rico	2
Illinois	3	Rhode Island	0
Indiana	0	South Carolina	2
Iowa	1	South Dakota	1
Kansas	0	Tennessee	2
Kentucky	1	Texas	5
Louisiana	1	Utah	5
Maine	4	Vermont	0
Maryland	0	Virginia	2
Massachusetts	1	Washington	5
Michigan	3	West Virginia	0
Minnesota	3	Wisconsin	3
Mississippi	0	Wyoming	0
Missouri	2		
Montana	0	Total	103

(*c*) The 103 ETV stations in operation as of June 30, 1965, were physically located in cities of the following population size:

500,000 or more	22	10,000–49,999	23
100,000–499,999	41	2,500–9,999	6
50,000–99,999	10	Under 2,500	1

ETV stations provide a broadcast service to a much wider area than the cities wherein they are physically located. For example, ETV station KCSM–TV is located in San Mateo, Calif., which has a population of 69,870. However, the station provides a broadcast service to an area which has a total population of 2,385,866. ETV station WNDT is located in Newark, N.J., which has a population of 405,220. The station currently serves a population of 11,400,000

and will soon serve a population of 16,300,000 as a result of a recent expansion grant under the Educational Television Facilities Act.

(*d*) ETV stations were first authorized by the Federal Communications Commission in 1952. From 1953 through 1960 a total of 51 stations were activated. An additional 52 stations were activated from 1961 through June 30, 1965.

(*e*) Of the 114 ETV stations in operation as of December 31, 1965, 50, or 44 percent were owned by State agencies, including State supported colleges and universities; 39, or 34 percent were owned by nonprofit community associations; and 25, or 22 percent were owned by city and county authorities. No stations were owned by profit-making organizations or by the Federal Government.

(*f*) The estimated value of 114 ETV stations in operation as of December 31, 1965, was $61.5 million.

B. Costs and User Charges

1. CONSTRUCTION COSTS AND OPERATING COSTS

(*a*) ETV station construction costs are divided between (1) costs for housing station operations (studios, offices, transmitter buildings, etc.) and (2) broadcast equipment.

The wide range of basic requirements and methods utilized to provide housing for the operation of ETV stations makes it difficult to subject these costs to a standard unit of measurement. For example, many stations operate as repeater stations receiving all of their programs from other sources and thus require no more than a small transmitter building. Many stations are provided operating space within the existing plants of the universities and school systems to which they are licensed.

Grants under the Educational Television Facilities Act (Public Law 87–447) are available for the acquisition of eligible transmission apparatus. As of December 31, 1965, 28 new ETV stations had been activated with Federal grant assistance. Of these, 9 were repeater stations requiring minimal land and building costs. An additional 9 stations were licensed to school districts or institutions of higher higher education. A high percentage of nonproject costs for these stations were not identifiable since they were absorbed within existing land-building plants. The remaining 10 stations were licensed to nonprofit community associations. Nonproject costs for these 10 stations break down as follows:

Three of the ten stations had land or land development costs totaling $39,700, or an average of $13,233 for each of the three stations.

Nine of the ten stations had building costs totaling $1,244,804, or an average of $138,311 for each of the nine stations.

Eight of the ten stations had nonproject broadcast and general purpose equipment costs totaling $155,000 or an average of $19,375 for each of the eight stations.

Eight of the ten stations had office equipment costs totaling $140,954 or an average of $17,619 for each of the eight stations.

The average new station activation grant during 1965 under the Educational Television Facilities Act for eligible broadcast equipment

alone was $235,000. Since these grants were made on a 50 percent matching basis the total investment in equipment for such stations would be approximately $470,000.

A recent study of ETV stations financing indicates that the average station investment in overall broadcast property is $540,000.

(*b*) ETV station operating expenses vary widely. A repeater station, for example, operates for very much less than a program producing station. Personnel salaries, the largest single expense item, account for approximately 44 percent of the operating expense of all stations. The NDEA study of ETV station financing indicates that 17 percent operate with less than $100,000 a year and 39 percent operate with less than $200,000 a year. Only five stations required more than $1 million a year to operate.

(*c*) The estimated first-year operating costs for the 10 ETV stations licensed to nonprofit community associations and analyzed above, averaged $201,145. Estimated total salary costs for these stations averaged $114,440 (57 percent of total estimated operating costs). Of this amount, total administration salary costs averaged $32,348 (16 percent of total estimated operating costs), total programing salary costs averaged $45,210 (23 percent of total estimated operating costs), and total engineering salary costs averaged $36,882 (18 percent of total estimated operating costs).

2. USER CHARGES

Under the Rules of the Federal Communications Commission, ETV stations cannot charge for broadcast time in the same manner as commercial TV stations. However, ETV stations are compensated for certain types of services including the production of instructional programs for local schools and institutions of higher education. Services account for approximately 21 percent of the income of all ETV stations. In no instance does compensation for services exceed the sum of prorated operating and capital costs.

Of the 114 ETV stations in operation as of December 31, 1965, 50 were owned by State instrumentalities and 25 by local government agencies. Of these 75 stations, 45 had received matching equipment grants under the Educational Television Facilities Act totaling $6.8 million. All other facilities and construction costs for the 75 stations were met out of general tax resources and general obligation borrowings of State and local government units.

C. Trend of Capital Outlays

1. ETV stations were first authorized in 1952. The rate of new station activations was initially slow. For example, one station was activated in 1953, nine were activated in 1954, and seven in 1955. This rate has increased to the point where 16 new stations were activated in 1964 and 15 in 1965.

2. Capital financing for the estimated investment of $61.5 million in 114 ETV stations was from sources listed below.

(*a*) Approximately $22.2 million was appropriated by the States for the 50 ETV stations owned by State agencies.

(*b*) Approximately $16.6 million was derived from gifts, bequests, donations, and fund raising drives for the 39 ETV stations owned by nonprofit community associations.

(*c*) Approximately $10.6 million was derived from general obligation borrowings of city and county authorities for the 25 ETV stations owned by such authorities.

(*d*) Matching grants under the Educational Television Facilities Act provided $12.1 million.

D. Needs and Prospective Capital Outlays

In terms of the Great Society, capital requirements for ETV stations in the decade 1966–75 total $354 million.

(a) *Great Society Requirements*

National interest.—It is a national necessity that the capability exist for providing needed knowledge quickly and universally directly to schools and to homes.

Equity.—An ETV signal should be available to every citizen and not limited to those in the centers of wealth and population.

Effectiveness.—As a result of research and demonstrations over the last decade, it is known that television can be used to teach effectively a wide variety of subjects and to expand educational opportunity. Operation experience to date has shown the great potential of statewide interconnection of television facilities and other network arrangements in providing otherwise unavailable high quality materials at reasonable cost to numbers of people who may be widely scattered.

Increased need.—In every sector of the public service there are comparable problems which can be assisted by the use of noncommercial educational television. These include the limited number of trained professionals, greatly increased knowledge, greatly increased need and demand for services by an expanding population, greater differentiation of functions within the service involving an increase in professional specialties, expanded role for subprofessional and semiskilled categories, and increased stress on public self-reliance assisted by the distribution of public information. There is an increasing use by private industrial management of noncommercial television for training.

Attack on poverty.—The new directions of public policy can be greatly implemented by an effective noncommercial television service. These include emphasis on employment training, increased attention to the needs of certain special groups within the society such as the aging, new efforts to improve the environment in which we live, and greater emphasis on the development of new cultural opportunities.

The Federal Communications Commission has reserved a total of 632 ETV channels in order to make possible a minimum service of one ETV signal in every part of the United States and 2 ETV signals in 40 major population centers. More than 500 additional ETV stations would be required to attain this goal. A number of the presently unused reserved channels are located in very sparsely populated areas. It is possible that State and local authorities would

determine that activation of such channels would be economically inefficient. For this reason, a total of 400 new ETV stations has been used as a basis for this 10-year projection.

(b) The 10-year projection is based on construction of 40 new stastions per year with an average total capital investment of $540,000 for each new station. Of this amount, $470,000 is attributed to the cost of broadcast equipment alone for each station. The increasing sophistication of TV equipment, including color equipment, will undoubtedly increase basic costs over the next 10 years. This is offset, however, by the fact that it is estimated that approximately 50 percent of the new ETV stations activated during this period will be repeater stations requiring a considerably lower equipment investment than program producing stations. The following table sets forth total capital outlay requirements for 40 new ETV stations per year. It also reflects broadcast equipment replacement costs based on a 10-year depreciation schedule.

[In millions of dollars]

	Capital outlay—40 new ETV stations per year	Capital outlay—equipment replacement costs	Total capital outlay, 1966-75
1966	21.6	5.4	27.0
1967	21.6	7.2	28.8
1968	21.6	9.1	30.7
1969	21.6	11.0	32.6
1970	21.6	12.8	34.4
1971	21.6	14.8	36.4
1972	21.6	16.6	38.2
1973	21.6	18.5	40.1
1974	21.6	20.4	42.0
1975	21.6	22.3	43.9
Total	216.0	138.0	354.0

NOTE.—All estimatcs are based on 1965 dollar values.

(c) ETV stations provide a broadcast service to a much wider area than the cities wherein they are physically located. Of the 400 new ETV stations used as a basis for the 10-year projection, it is estimated that 200 would be program producing—transmitting stations, physically located near major population and education centers in the States. The remaining 200 ETV stations would be repeater stations retransmitting materials provided by program producing stations to more sparsely populated areas.

(d) It is estimated that capital outlays for 400 additional ETV stations and yearly broadcast equipment replacement costs would be expended as follows:

(1) State governments or State agencies, 50 percent.

(2) Cities, counties, towns, special districts, public authorities or other local public bodies, 33⅓ percent.

(3) Private, nonprofit organizations and cooperatives, 16⅔ percent.

(4) Proprietary or profitmaking organizations, none.

(5) Federal Government, none.

CHAPTER 22

Hospital Facilities*

A. NATURE AND COMPOSITION

1. DESCRIPTION OF THE FACILITIES

(a) and (b) *Physical Description and Services*

This chapter will be mainly concerned with general short-term hospitals. Information on tuberculosis hospitals is included wherever possible and appropriate.[1]

The origin of hospitals in the United States dates back to colonial days. At first, any efforts to care for the sick were incidental to shelter for the poor and unfortunate through almshouses. Philadelphia General Hospital, considered by some to be the oldest hospital in the United States, traces its history back to "Old Blockley" Hospital which was originally established as a public almshouse in 1732. The first incorporated hospital in America, known as The Pennsylvania Hospital, was established in Philadelphia in 1751 solely for the care of the physically and mentally ill without regard to economic status, race or creed. Other early hospitals grew out of a need to provide a place for clinical practice for medical schools, in New York, Massachusetts, and Connecticut. These early hospitals were chiefly of voluntary sponsorship, other than church or public.

For the next century, hospital construction progressed slowly. When the first census of hospitals was made by the U.S. Bureau of Education in 1873, only 178 hospitals were listed. During this period of slow growth, ideas were changing with regard to the place of the hospital in society. It ceased to be considered principally as an eatablishment for the care of the indigent sick and gradually developed as a place for the treatment of people of all classes of society. Ideas were evolving, also, with regard to the requirements for adequate care of the sick, as well as the concept of preventive medicine.

In the early years of the 20th century, rising levels of income stimulated local efforts to construct facilities needed to meet broadening demands for hospital care. Private fortunes created during the era of industrial expansion contributed greatly to the building of hospitals. In 1909, a hospital census listed 4,359 hospitals. The growth of hospitals accelerated steadily through the prosperous decade following World War I. The distribution was uneven, however, with overbuilding in some communities and a complete lack of facilities in others.

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*Prepared by Division of Hospital and Medical Facilities, Public Health Service, Department of Health, Education, and Welfare, with minor editing by committee staff.

[1] For mental hospitals please refer to the chapter on Community Mental Health Centers. Chronic disease hospitals are included in the chapter "Long-term Care Facilities."

With the coming of the depression in 1929, new hospital construction practically ceased. More than 700 hospitals were unable to find sufficient operating funds and were forced to close. During World War II hospital construction remained at minimum. Following the war, growing demands and increasing shortages focused national attention on the need for hospital facilities as a major aspect of postwar planning. In October 1944, a Commission on Hospital Care was organized under the sponsorship of the Public Health Service and the American Hospital Association, to study hospital needs. The direct outgrowth was the enactment of the Hospital Survey and Construction Act (Hill-Burton) in August 1946 as title VI of the Public Health Service Act. The purposes of the program thus established were twofold:

1. To assist States in inventorying existing facilities as a basis for determining their need for additional facilities and for developing comprehensive plans for construction of needed facilities, and

2. To provide the necessary incentive, through Federal financial assistance to the States, for constructing long-needed public and other nonprofit hospitals, public health centers, and related hospital facilities—particularly in rural areas.

The availability of modern hospital facilities has helped to attract physicians, including specialists, to relatively isolated areas; and the ratio of physicians to population in these areas as a whole has held fairly constant in recent years. Today the general hospital is recognized as the focal point of community health, the training ground for health personnel, and a center for medical research. Nevertheless, in some areas and particularly in metropolitan centers, the hospital plant is outmoded, poorly located, and sorely in need of renovation or replacement.

Physical characteristics of general hospitals are not readily subject to generalization. Little comparison can be made between the one-story 20-bed hospital on the outskirts of a small town and a 500-bed multistoried and multistructured teaching hospital in the State's largest city. Of necessity the small rural hospital is not able to have the variety of medical skills, costly equipment and specialized facilities of the large urban hospital.

Today's general hospitals range widely in size and services provided, depending upon location, number of persons to be served, and the availability of other health facilities. The average size of a general hospital is about 125 beds, of which 85 are medical-surgical, 25 obstetrical, and 15 pediatric. Basic services and departments usually include blood bank, central supply, clinical laboratory, electrocardiograph, medical record department, outpatient and emergency departments, pharmacy, X-ray diagnosis, operating rooms, delivery rooms, postoperative recovery room, medical library, premature nursery, and a physical therapy department.

As hospitals increase in size, the variety and types of services provided increase correspondingly. For example, the 400-bed facility may consist of a number of wings, units, or separate buildings and may provide, in addition to the services listed above, the following services or departments: cancer clinic, dental department, medical social service department, X-ray therapy, school of nursing, radioactive isotope facility, electroencephalograph, and a psychiatric unit.

Tuberculosis hospitals were often located far from urban centers before the introduction of modern drug therapy in the 1940's. This was in accordance with the then-prevalent theory that an abundance of fresh air and the avoidance of the stresses of urban living were necessary in the treatment of the disease. Since then, potent chemotherapeutics have enabled an increasing proportion of patients to receive the major part of their treatment through outpatient care after an initial period of hospitalization. This practice, together with the reduction in the rate of new active cases, has served to drastically reduce the demand for tuberculosis facilities. Many such hospitals, particularly the smaller State or local government tuberculosis facilities, have either closed or converted in whole or in part to other health uses.

(c) *Quantitative Standards of Performance*

Hill-Burton State agencies are currently in the process of submitting plans in which, for the first time, all States will determine community needs for hospital facilities on the basis of utilization rate, desirable occupancy, and population served. Uniform criteria for counting existing beds and for determining the need for facility modernization are also being newly applied. Total beds in existence at the present time are equivalent to 3.97 beds per 1,000 population. The State plans received thus far show a national need for 4.11 general hospital beds per 1,000 population (including 3.97 already in existence). However, among many of the States, the gaps between available beds and beds needed per 1,000 population are considerably wider than indicated by the averages for the Nation as a whole.

An additional task facing the country's general hospitals is to replace or renovate approximately 260,000 beds now obsolete due to fire or safety hazards or functional deficiencies. Final estimates of need for modernization and new capacity will be available later in the year when all State plans have been approved and summarized.

The decreased utilization of tuberculosis facilities is clearly illustrated by preliminary findings from State Hill-Burton plans for fiscal year 1966. A national estimate from plans received to date indicates a total need for 0.23 tuberculosis beds per 1,000 population compared with a total of 0.27 such beds per 1,000 population in existence at this time.

Minimum standards for evaluating the structural safety and efficiency of existing hospitals were recently established by the Public Health Service. These standards refer to:

A. Structural resistance to fire.

B. Safety of electrical and mechanical equipment, exits, fire alarm system, interior finishes, shafts, smoke barriers, etc.

C. Patient areas, including room size, corridor width, nurses' stations, windows, and access to corridors.

D. Service departments, including surgical suite, radiological department central supply, and dietary area.

The standards may be raised or expanded in scope at the State's discretion.

Other PHS standards provide that in the nursing department each patient room should have no more than four beds, not be located on any floor which is below ground level, and have a minimum of

80 square feet per bed in two- and four-bed rooms and 100 square feet in single bed rooms. Other requirements or recommendations relate to service facilities in each nursing unit, such as nurses' station, utility room, pantry, storage, and treatment room; also to nursery, surgical, obstetrics, emergency, outpatient, contagious disease, pediatric, and psychiatric departments or units.

(d) *Qualitative Standards of Performance*

Certification of hospitals by the Joint Commission on Accreditation of Hospitals is one measure of qualitative performance. Since beginning the field survey of hospitals in January 1953, the Commission has surveyed all hospitals applying for accreditation and periodically resurveyed those fully or provisionally approved.

In 1964, the non-Federal hospitals registered with the American Hospital Association included 5,712 short-term general and special hospitals.[2] Of these 5,712 hospitals, 3,415 were accredited.[3] The average size of these 3,415 accredited hospitals is 183 beds while all 5,712 registered short-term hospitals average 126 beds.

TABLE 1.—*Accredited and total registered non-Federal short-term general hospitals and beds, 1964*

Control	Hospitals		Beds	
	Total	Accredited	Total	Accredited
Voluntary nonprofit	3,402	2,493	498,677	460,215
Proprietary	870	255	46,022	24,068
State and local government	1,440	667	176,111	139,670
Total	5,712	3,415	720,810	623,953

Of the 187 tuberculosis hospitals registered in 1964 with the American Hospital Association, 108 were accredited.[4] As is the case with general hospitals, the accredited tuberculosis hospitals are significantly larger in average size than the nonaccredited hospitals. Average bed size of accredited tuberculosis hospitals was 271 while the other registered hospitals averaged 131 beds.

TABLE 2.—*Accredited and total registered tuberculosis hospitals and beds, 1964*

Control	Hospitals		Beds	
	Total	Accredited	Total	Accredited
Voluntary nonprofit	14	10	2,060	1,742
Proprietary	3		205	
State and local government	170	98	37,324	27,524
Total	187	108	39,589	29,266

[2] Short-term hospitals are those having an average stay of less than 30 days. The term "special hospitals" as used here includes maternity, EENT (eye, ear, nose, and throat), children's, orthopedic, and alcoholic; excludes psychiatric and tuberculosis facilities.
[3] *Hospitals*, Journal of the American Hospital Association, guide issue, Aug. 1, 1965, p. 484.
[4] *Hospitals*, Journal of the American Hospital Association guide issue, Aug. 1, 1965, p. 484.

Federal Government recognition of the importance of accreditation by the Joint Commission is evidenced by the effort made to operate and maintain federally-owned facilities at a level which will meet the accreditation standards. The recently enacted medicare legislation, it is important to note, prescribed that general hospitals currently accredited by the Joint Commission will be deemed to meet all conditions of participation in the program provided that they also furnish adequate evidence of an effective utilization review plan. In the case of tuberculosis and psychiatric hospitals, there are additional staffing and medical records requirements considered necessary for the provision of intensive care.

Almost all States have established licensure requirements for the full operation of general hospitals. As of the beginning of 1964, however, one State had no licensure law or regulations for general hospitals and another State licensed only hospitals operated for profit. Some States, in 1964, did not license some publicly owned hospitals—State, State and county, or county and municipal. Several others license only the maternity departments and only approve or certify hospitals as eligible to receive payments for public aid recipients. In all except five States the licensing agency is the health department. Licensure requirements vary widely from one State to another. A few States have licensure laws which have not been revised for 20 or 30 or more years and do not cover new functions assumed by hospitals in that time or changes in functions existing at the time the law was last updated.

A further indication of qualitative standards of performance is the extent to which existing hospital beds need modernization. As mentioned previously under "quantitative standards," Hill-Burton State agencies are now in the process of submitting plans which show the total number of beds needed and the count of existing beds. These State plans also show the number of beds which conform and do not conform to the minimum Public Health Service physical plant evaluation standards plus any standards added or increased by the State itself. A preliminary estimate, based on the plans received up to this time, is that about 260,000 general hospital beds are in need of modernization, that is, do not conform to the minimum standards. In terms of population this means that of the estimated 3.97 existing beds per 1,000 population, an estimated 2.58 beds per 1,000 population conform to the State and Public Health Service standards and 1.39 need modernization.

Tuberculosis beds are also being measured against these State and Public Health Service plant evaluation standards. Again using the State plans received thus far, the tentative estimate of tuberculosis beds which conform to the plant evaluation standards is equivalent to 0.18 beds per 1,000 population, or two-thirds of the 0.27 total existing tuberculosis beds per 1,000 population.

2. EXISTING CAPITAL PLANT

(a) and (b) *Number of Facilities and Distribution by State*

At the beginning of 1965, Hill-Burton State plans showed a total of 6,915 general hospitals. This number includes facilities that have been approved and/or scheduled for construction by Hill-Burton

State agencies. State distribution of both general and tuberculosis facilities is given in table 3. Among the States, Texas has the largest number of general hospitals—601, and Delaware the fewest—11. Tuberculosis facilities consisted of 234 hospitals and 103 units in hospitals of other categories.

TABLE 3.—*Non-Federal general and tuberculosis facilities, by State, Jan. 1, 1965*[1]

State	General hospitals	Tuberculosis facilities	
		Hospitals	Units[2]
Grand total, United States and territories	6,915	234	103
Total, United States	6,782	228	101
Alabama	158	8	------
Alaska	26	----------	3
Arizona	73	2	9
Arkansas	113	2	------
California	561	11	26
Colorado	83	3	5
Connecticut	36	3	1
Delaware	11	1	------
District of Columbia	14	1	3
Florida	184	3	2
Georgia	190	1	------
Hawaii	24	4	------
Idaho	52	1	------
Illinois	266	23	3
Indiana	116	7	1
Iowa	147	2	1
Kansas	156	3	1
Kentucky	138	8	------
Louisiana	166	2	4
Maine	62	2	------
Maryland	46	4	1
Massachusetts	135	5	------
Michigan	272	10	5
Minnesota	182	4	1
Mississippi	135	1	------
Missouri	166	3	1
Montana	65	1	------
Nebraska	119	1	------
Nevada	20	2	------
New Hampshire	30	1	------
New Jersey	107	6	6
New Mexico	55	4	------
New York	381	10	13
North Carolina	152	4	------
North Dakota	62	1	------
Ohio	217	18	3
Oklahoma	180	3	1
Oregon	86	1	------
Pennsylvania	267	7	------
Rhode Island	17	1	------
South Carolina	75	4	------
South Dakota	69	----------	------
Tennessee	182	7	1
Texas	601	16	6
Utah	43	1	------
Vermont	26	1	------
Virginia	111	3	1
Washington	122	2	1
West Virginia	84	3	------
Wisconsin	171	16	2
Wyoming	28	1	------
Guam	1	----------	1
Puerto Rico	129	6	------
Virgin Islands	3	----------	1

[1] As reported in Hill-Burton State plans.
[2] Units of 10 or more tuberculosis beds in general, mental, or chronic disease hospitals.

(c) *Distribution of Facilities by Size of Community*

The distribution by size of community of general and tuberculosis hospital facilities inventoried in Hill-Burton State plans can only be estimated. Available sources show that almost three-fourths of non-Federal general hospitals are located in communities of less than 50,000 population. In terms of beds, however, less than half are in these communities due to the fact that the average size of hospitals increases considerably in the larger urban areas (see table 4).

Tuberculosis hospitals do not vary in size directly with community population. Nearly half of all tuberculosis beds are located in communities with fewer than 10,000 persons, the result of a once-prevalent theory that an abundance of fresh air and complete isolation from the stresses and strains of urban living were necessary in the treatment of the disease.

TABLE 4.—*Estimate of non-Federal general and tuberculosis hospitals and beds by size of community*

Size of community	General		Tuberculosis	
	Hospitals	Beds	Hospitals	Beds
Total	6,915	766,793	234	55,287
500,000 and over	726	171,762	17	8,956
100,000 to 499,999	747	154,125	46	8,791
50,000 to 99,999	477	89,715	27	4,147
10,000 to 49,999	1,611	191,698	55	11,500
2,500 to 9,999	1,846	98,916	29	5,252
Under 2,500	1,508	60,577	60	16,641

Source: *Hill-Burton State Plan Data*, Jan. 1, 1965; and *Master Register of Hospitals*, 1963.

(d) *Age of Facilities*

Data are not available as to the age distribution of hospitals. Many facilities have renovated or replaced at least part of their physical space since their original construction. Information for each hospital as to the construction history of each building or unit would be required in order to be meaningful.

(e) *Ownership*

The estimated distribution of general and tuberculosis hospitals by type of ownership is given in table 5. Private nonprofit general hospitals make up over half of all non-Federal general hospitals in Hill-Burton State plans. In tuberculosis facilities the predominate ownership is by local government with State hospitals next and in third position the private nonprofit tuberculosis hospitals. As can be seen in table 5, however, the relative positions of the ownership groups in both general and tuberculosis hospitals are altered when number of beds is the criterion instead of number of hospitals, due of course to differences in the average size of hospitals.

TABLE 5.—*Estimate of general and tuberculosis hospitals and beds by ownership*

Ownership	General		Tuberculosis	
	Hospitals	Beds	Hospitals	Beds
Total	7,343	878,644	243	57,576
Federal	428	111,851	9	2,289
Total non-Federal	6,915	766,793	234	55,287
State	318	42,940	75	26,593
Local government	1,514	164,861	126	24,548
Private nonprofit	3,541	497,649	28	3,704
Proprietary	1,542	61,343	5	442

Source: *Hill-Burton State Plan Data*, Jan. 1, 1965; and *Master Register of Hospitals*, 1963

(f) *Current Value*

Total assets and plant assets of all hospitals registered by the American Hospital Assocation are reported in the annual "guide issue" of *Hospitals*, the association's journal. Plant assets include all funds invested in, or available for additions to land, buildings, and equipment, less any plant fund liabilities. Plant assets plus all other assets such as general fund balance, temporary fund balance, and endowment fund principal make up total assets. Both kinds of assets are shown in table 6.

In 1964, the latest year available, total assets for all 6,402 registered general and special hospitals [5] amounted to $17.9 billion (excludes all psychiatric and tuberculosis hospitals). Of this amount, $13.8 billion was plant assets, composed of $8.5 billion for voluntary nonprofit hospitals, $3.2 billion representing State and local government facilities, $1.9 billion for federally owned general and special hospitals and $0.3 billion in proprietary hospitals. (See table 6.)

Total assets of tuberculosis hospitals amounted to $471 million and plant assets were $437 million. State and local government tuberculosis plant assets are 89 percent of this total, or $387 million. The remainder consisted of Federal—$29 million, voluntary nonprofit—$18 million and proprietary tuberculosis hospitals—$3 million.

In reference to the assets information in table 6 and to all other data from the "guide issue" of *Hospitals*, it should be noted that there is some underrepresentation of proprietary hospitals therein. While the hospitals not represented are probably smaller and involve only a relatively minor volume of patient care, their absence does have some slight effect.

B. Costs and User Charges

1. CONSTRUCTION COSTS AND OPERATING COSTS

(a) *Construction Costs*

There are three main types of construction pertaining to hospitals: new buildings, additions to existing buildings, and remodeling. In many construction projects, two or all three of these types are involved. Construction cost per square foot or per bed is available on a national basis only for a sample of new general hospital buildings aided through the Hill-Burton program. The 1964 survey in table 7 should be interpreted with caution, due to the small size of the sample used in comparison with the voluem of construction nationally.

TABLE 6.—*Assets of general and tuberculosis hospitals, 1964*

[Assets in thousands]

Ownership	General and other special [1]			Tuberculosis		
	Number of hospitals	Total assets	Plant assets	Number of hospitals	Total assets	Plant assets
Total	6,402	$17,890,126	$13,822,318	194	$470,537	$436,829
Federal	390	1,859,045	1,850,988	7	29,005	29,005
Total non-Federal	6,012	16,031,081	11,971,330	187	441,532	407,824
Private nonprofit	3,564	11,837,003	8,474,544	14	26,161	18,195
Proprietary	889	428,847	336,684	3	3,312	2,956
State and local government	1,559	3,765,231	3,160,102	170	412,059	386,673
Total short-term	5,712	14,888,421	11,111,449			
Private nonprofit	3,402	11,422,566	8,216,608			
Proprietary	870	413,429	324,785			
State and local government	1,440	3,052,426	2,570,056			
Total long-term	300	1,142,660	859,881			
Voluntary nonprofit	162	414,437	257,936			
Proprietary	19	15,418	11,899			
State and local government	119	712,805	590,046			

[1] Excludes psychiatric hospitals.

Source: *Hospitals*, Aug. 1, 1965, p. 451.

[5] Includes all general and special hospitals—short term (defined in footnote 2, p. 414) and long term (having an average stay of 30 days or more).

TABLE 7.—*Construction costs of new general hospital buildings in the Hill-Burton program, 1964 survey*

Project size in beds	Number of projects	Square feet per bed	Building and fixed equipment costs		Total project costs	
			Per square foot	Per bed	Per square foot	Per bed
25 or less	5	724	$25.09	$15,267	$26.04	$22,213
26 to 50	19	707	27.00	19,086	30.82	21,783
51 to 100	16	708	27.93	19,780	33.31	23,592
101 to 200	10	723	27.33	19,716	33.33	24,047
201 to 300	6	926	27.93	25,869	33.21	30,761
301 or more	3	925	25.95	23,988	30.72	28,404
Total	59	804	27.19	21,871	32.38	26,041

Source: U.S. Department of Health, Education, and Welfare, Public Health Service, *Representative Construction Costs of Hill-Burton Hospitals and Related Health Facilities*, January-April 1965, and unpublished material.

There is such a wide variation in hospital projects involving additions that costs per square foot or per bed have little meaning. There is usually some and often extensive remodeling in conjunction with the addition and there also may be considerable equipment expense in any particular project. Therefore, national data are not meaningful for addition or remodeling type projects.

(b) *Operating Costs*

The 5,712 non-Federal short-term general and special hospitals registered with the American Hospital Association had a total expense of $8.3 billion in 1964. Payroll expense was $5.2 billion or 62 percent of total expense. Expense by size of hospital, as shown in table 8, reflects greater payroll expense per bed and per patient-day in the larger hospitals as well as the inclusion for large hospitals of the expense for such services and departments as emergency room, cafeteria, outpatient clinics, occupational therapy, and so forth. Another expense, that for food, has been estimated for all registered hospitals in the United States in 1964 at $1 billion.[6]

TABLE 8.—*Total expense of registered non-Federal short-term general and other special hospitals, by size, 1964* [1]

Size in beds	Number of hospitals	Beds	Total expense		
			Amount (in thousands)	Per bed	Per patient day
25 or less	583	10,171	$71,430	$7,023	$34.67
25 to 49	1,480	52,572	431,363	8,205	35.53
50 to 99	1,449	100,694	936,165	9,297	37.22
100 to 199	1,095	151,422	1,640,957	10,837	39.50
200 to 299	542	130,759	1,645,119	12,581	43.24
300 to 399	286	97,018	1,255,030	12,936	43.47
400 to 499	122	53,755	714,571	13,293	44.15
500 or more	155	124,419	1,654,588	13,299	44.97
Total	5,712	720,810	8,349,223	11,583	41.58

[1] Excludes short-term psychiatric hospitals.

Source: *Hospitals*, "Guide Issue," Aug. 1, 1965, pp. 450-451.

[6] *Hospitals*, Dec. 1, 1965, p. 64.

The hospital plant operation department is the administrative unit responsible for plant maintenance. Dollar costs per patient-day for the plant operation department by geographical region and size, estimated for 1963, are shown in table 9. For this year, the New England region had the highest estimated plant operation expenses per patient-day, $2.67. The South Atlantic region had the lowest expenses of $1.97 per patient-day.

Several factors can be mentioned among those responsible for the rising cost of hospital plant operation. The increasing necessity to modernize facilities is one of the most influential factors. Installation of air conditioning, electronic units, and waste disposal systems would be some major examples. Maintenance of electrical and mechanical systems represents an estimated expense of over 40 percent of all hospital maintenance costs. In many of the older hospitals, demands on the electrical and water systems far exceed allowances made during the planning for their initial construction.

2. USER CHARGES

Patient revenue in 1964 for voluntary nonprofit short-term general and other special hospitals amounted to $5.7 billion, or $40.40 per patient-day.[7] Total revenue for the same hospitals was $6.2 billion, or $43.28 per patient-day. This exceeded by only 2 percent their total expense of $6 billion, or $42.47 per patient-day. The $5.7 billion in patient revenue represents 95 percent of total expense and 93 percent of total revenue.

Obviously then, patient revenue in general hospitals is not sufficient to cover annual maintenance and operation expenses, which generally make some allowance for depreciation. However, it has been estimated that about 20 percent of hospitals do not calculate depreciation and 70 percent do not fund it.

TABLE 9.—*Plant operation department estimated cost per patient day, 1963, by region and size of hospital*

Size in beds	New England	Middle Atlantic	South Atlantic	East North Central	West North Central	South Central	Mountain States	Pacific Coast
All	$2.67	$2.28	$1.97	$2.45	$2.06	$2.11	$2.11	$2.66
1 to 100	2.56	2.35	1.83	2.50	1.90	2.19	2.02	2.70
101 to 225	2.46	2.16	2.09	2.39	1.94	1.96	2.17	2.34
226 and over	2.99	2.34	2.00	2.45	2.35	2.18	2.15	2.94

Source: *Hospital Management*, June 1965, p. 41.

Practices used by third party payers for handling depreciation differ in various sections of the country. Third-party payers in the East generally allow only historical costs to be depreciated. In the Far West, current replacement cost is generally allowed by the Blue Cross plans and other third-party purchasers of care. It is still generally true, however, that patient revenue does not provide capital requirements above and beyond historical cost depreciation,

[7] *Hospitals*, "Guide Issue," Aug. 1, 1965, p. 451.

and in some cases capital requirements are not taken into account at all in cost reimbursement formulas. A recent poll of all American and Canadian Blue Cross plans showed that 12 percent (7 out of 59 replying) did not consider depreciation in their reimbursement cost schedules.[8] An additional factor is the almost unanimous complaint by hospitals that public authorities do not adequately reimburse even operational expenses for public charge patients.

Average annual depreciation costs on a straight line method depend on the expected number of years of useful life. A facility having an expected life of 50 years would depreciate 2 percent yearly.

Depending on the age of the facility or equipment, average annual straight line depreciation costs for existing general hospitals would probably fall within the following limits:

Buildings, 2 to 5 percent.
Fixed equipment, 3 to 6 percent.
Movable equipment, 6 to 10 percent.

Illinois requires that depreciation be based upon historical costs and does not permit "interest cost" to be included as a cost. Among 199 hospitals reporting to the Illinois State Health Department, depreciation averaged 5.8 percent in 1964, varying from 5 percent for the 300-bed-and-over hospitals to 6.3 percent for hospitals from 100 to 199 beds in size.[9] On a per-patient-day cost basis, depreciation added an average of $2.47 to the daily cost, which came to $42.61 for all 199 hospitals. The range by size of hospitals was from $1.90 to $2.78 per patient-day.

Capital cost expenditures by State and local governments for general hospitals alone are not available. Based upon 1964 construction data for all health facilities, State and local governments are now meeting about 18 percent of the capital costs of all such facilities. This is considerably lower than the 40- to 45-percent range of the early and mid-1950's. Since that time the national volume of health facility construction has almost tripled while construction by State and local governments increased by approximately 10 percent. Public non-Federal outlays are obviously relatively stable and assume a lesser proportion of hospital construction when the volume is high, as is the case now and seemingly will be for the near future.

C. Trend of Capital Outlays

1. ANNUAL CAPITAL OUTLAY

During the 20 years 1946–65 a total of $18.2 billion of hospital and other health facility construction was put in place. This amount includes the value of construction for general hospitals, other types of hospitals, nursing homes, diagnostic and treatment centers and other related facilities. No breakdown is available for each category of facility. Publicly owned construction accounted for $7.4 billion of this and privately owned projects came to $10.8 billion. (See table 10.)

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[8] Barbatelli, Ettore. *Hospital Plant and Equipment Records*. American Appraisal Co., New York, N.Y. (Reprint courtesy of Foundation for Economic and Business Studies, Indiana University.) 24 pages.
[9] Unpublished material.

TABLE 10.—*Hospital construction: Value put in place, 1946–65*

[In millions of dollars]

Calendar year	Hospital construction by ownership in current dollars [1]				Construction cost index (1957–59=100) [3]	Total hospital construction in 1957–59 dollars
	Total	Public		Private		
		Total [2]	State and local			
1946	170	85	64	85	54.0	315
1947	187	77	47	110	63.5	294
1948	339	213	115	126	71.6	473
1949	660	458	289	202	72.5	910
1950	843	499	353	344	75.8	1,112
1951	946	527	395	419	81.7	1,158
1952	889	495	382	394	84.4	1,053
1953	686	369	303	317	87.1	788
1954	670	333	298	337	87.8	763
1955	651	300	278	351	90.4	720
1956	628	300	263	328	94.8	662
1957	879	354	309	525	97.7	900
1958	990	390	355	600	99.4	996
1959	998	428	370	570	102.9	970
1960	1,006	401	345	605	105.0	958
1961	1,140	369	314	771	106.3	1,072
1962	1,382	397	342	985	108.8	1,270
1963	1,433	403	337	1,030	111.3	1,288
1964	1,741	440	367	1,301	114.6	1,519
1965	1,928	494	400	1,432	118.5	1,630
Total	18,166	7,332	5,926	10,832		

[1] Construction of health related facilities, such as nursing homes, is included.
[2] Does not include Defense Department construction.
[3] Boeckh composite cost index for apartments, hotels, and office buildings.

Source: U.S. Department of Commerce, Bureau of the Census, *Value of New Construction Put in Place, 1946–65, Revised* and Construction Reports C 30–65 S *Value of New Construction Put in Place 1962–65.*

In 1946 hospital construction had just begun to respond to the peacetime health needs of the Nation. An early postwar peak was reached in 1951, by which time the "construction put in place" volume of $946 million had increased 456 percent since 1946. The next 5 years was a period of declining volume culminating in a postwar low of $628 million in 1956. All sources of funds showed volume decreases but the sharpest drops from 1951 were in federally owned projects (mainly veterans hospitals) and in Hill-Burton grant-in-aid funds (table 11). Since 1956 a strong upward trend of hospital construction put in place has been evident. Construction without Federal aid has led the field by almost tripling in volume. An important factor in the rise has been a threefold increase since 1960 in the construction of nursing home beds, particularly those under proprietary ownership. Currently we are riding a wave of unprecedented construction activity in almost every type of health facility. Public interest and concern with health care has never been greater and vigorous strides to meet these expectations are being made by private initiative as well as by public authorities on national, State, and local levels.

2. CAPITAL OUTLAY BY OWNERSHIP

Hospital construction data from the Bureau of the Census are somewhat limited as to detail by ownership. The annual capital outlays for State and local governments are not published separately and are therefore shown together in table 10. The same situation pertains to nonprofit and proprietary hospital construction data; both

are combined as "private" in table 10. Federally owned construction is shown in table 11 along with a breakdown of hospital totals by federally aided or unaided, and amount of Hill-Burton grant funds.

TABLE 11.—*Hospital construction: Financing 1946–65* [1]

[In millions of dollars]

Calendar year	Total	Direct Federal [2]	Non-Federal			Hill-Burton Federal share
			Total	Without Federal aid	Hill-Burton sponsor share	
1946	170	21	149	149	----	----
1947	187	30	157	157	----	----
1948	339	98	238	232	6	3
1949	660	169	450	367	83	41
1950	843	146	611	469	142	86
1951	946	132	710	568	142	104
1952	889	113	689	554	135	87
1953	686	66	547	438	109	73
1954	670	35	584	502	82	51
1955	651	22	588	531	57	41
1956	628	37	545	469	76	46
1957	879	45	756	581	175	78
1958	990	35	842	569	273	113
1959	998	58	793	453	340	147
1960	1,006	56	793	473	320	157
1961	1,140	55	920	608	312	165
1962	1,382	55	1,155	811	344	172
1963	1,433	66	1,200	842	358	167
1964	1,741	73	1,495	1,105	390	173
1965	1,926	94	1,664	1,237	427	168

[1] Value of new construction put in place.
[2] Does not include Defense Department construction

Source: Special reports to the Public Health Service by the Bureau of the Census.

3. CAPITAL OUTLAY BY SOURCE OF FINANCING

The Social Security Administration for several years now has been publishing estimates on the volume and sources of financing for all health expenditures in the Nation. Expenditures for "medical facility" construction by source of funds for selected years 1950–64 are given in table 12. The distribution of Government funds, shown in table 12, is based on the ultimate source of funds and includes as Federal expenditures those amounts actually paid out by State and local governments and nonprofit sponsors under Federal grant-in-aid programs.

This source of funds series by Social Security Administration consists in general of a reworking of hospital construction value put in place and financing data (tables 10 and 11) plus Defense Department construction. Broad assumptions were made as to the sources of funds for construction of private facilities, other than those receiving Federal grants, due to the availability of only fragmentary data.

A number of States have now or in the past had grant-in-aid programs for construction of hospital and medical facilities. As of January 1964, 12 States had active programs—Alabama, Alaska, California, Georgia, Hawaii, Kentucky, Maryland, Mississippi, Missouri, Nevada, New York, and North Carolina. Prior to 1964 Vermont, Virginia, Illinois, Louisiana, South Carolina, Tennessee, and Utah had active programs at some time after World War II.

Information as to expenditures by year from these State grant-in-aid programs is not available. However, it is known that approxi-

mately $175 million was appropriated for State hospital grant programs from 1946 to 1963.

TABLE 12.—*Expenditures for medical facility construction by source of funds and ownership, selected years 1950–64*

[In millions]

Year and ownership	Total	Source of funds					
		Private			Public		
		Total	Philanthropy	Own or borrowed	Total	Federal [1]	State and local
1950—All	$840	$294	$176	$118	$547	$229	$317
Public	496				496	181	315
Private	344	294	176	118	50	48	2
1955—All	721	324	194	130	397	133	264
Public	370				370	110	260
Private	351	324	194	130	27	23	4
1960—All	1,074	510	255	255	564	281	283
Public	469				469	193	276
Private	605	510	255	255	95	88	7
1961—All	1,197	670	335	335	527	277	250
Public	426				426	184	242
Private	771	670	335	335	101	93	8
1962—All	1,314	757	379	378	557	286	271
Public	444				444	183	261
Private	870	757	379	378	113	103	10
1963—All	1,568	939	470	469	629	320	309
Public	508				508	208	300
Private	1,060	939	470	469	121	112	9
1964—All	2,003	1,288	644	644	715	360	355
Public	585				585	240	345
Private	1,418	1,288	644	644	130	120	10

[1] Includes Defense Department construction.

Source: Social Security Administration, Office of Research and Statistics.

There are three Federal agencies empowered to make loans for hospital construction—Public Health Service, Small Business Administration and Department of Housing and Urban Development (HUD).

The Public Health Service, through its Hill-Burton hospital and medical facility program of grants and loans has made only five loans for $3.9 million since they were authorized in 1958. The Small Business Administration, as of December 31, 1965, had approved 129 loans to hospitals for $20.8 million under its health facility loan program. Through September 30, 1965, the Department of HUD made 118 loans for $79 million under the college housing loan program, to finance dormitory facilities for student nurses or interns in public and nonprofit hospitals with approved training programs. In addition, the Department of HUD makes interest-free loans for the advance planning of public works, including public hospitals and other medical facilities. Through September 30, 1965, planning

advances approved for hospital and the medical facilities numbered 95 and amounted to $4.8 million.

D. Needs and Prospective Capital Outlays

1. CAPITAL REQUIREMENTS

The capital requirements for hospital facilities for the decade 1966–75 are:

	Millions
Backlog of unmet need as of June 30, 1965 [1]	$8,457.5
Total additional requirements through June 30, 1975 [1]	7,252.5
Total estimated need	15,710.0

[1] Includes modernization and additional bed needs.

(a) Estimates of capital needs have been limited to general hospitals. The volume of capital outlay for separate tuberculosis hospitals has sharply declined in recent years and the future outlook is for the development of such facilities as parts of broader health facility complexes and not as independent institutions.

Hill-Burton State plans for fiscal year 1966 provided the basic data—in terms of hospital beds—for developing estimates of current capital needs for general hospitals. From these plans, national totals were derived for (1) total existing beds, (2) total beds needed, (3) beds to be modernized, and (4) beds needed over and above the present supply. Dollar estimates were obtained by applying an average cost of $25,000 per bed to the national estimates of beds to be modernized and additional beds needed. Experience under the Hill-Burton program has indicated that, on a cost per bed basis, there are relatively minor differences between the costs of new construction and the costs of modernizing obsolete facilities.

Projections of the costs of modernization and needed additional general hospital beds were based on the following assumptions and factors: (1) population growth, (2) a 3-percent obsolescence rate per year, or an assumption of a 33-year hospital "life," (3) an annual increase in bed capacity at the average rate which has obtained over the past decade, (4) maintenance of the current estimated need for beds in terms of beds per 1,000 population, and (5) maintenance of the current volume of nonfederally aided construction, but with some shifting emphasis from new construction to modernization of facilities.

(b) The estimated capital needs (in millions) for general hospitals, 1966–75 are as follows:

	Total	Modernization	Additional capacity
Backlog as of June 30, 1965	$8,457.5	$6,795.0	$1,662.5
Annual increments:			
1966	642.5	355.0	287.5
1967	655.0	362.5	292.5
1968	670.0	372.5	297.5
1969	687.5	382.5	305.0
1970	710.0	392.5	317.5
1971	732.5	402.5	330.0
1972	755.0	412.5	342.5
1973	777.5	425.0	352.5
1974	800.0	435.0	365.0
1975	822.5	447.5	375.0
Backlog plus increments	15,710.0	10,782.5	4,927.5

(c) It is not feasible to estimate the proportions of these needs by size of community. The bulk of modernization and replacement work needed in the Nation's general hospitals, however, comes from urban areas, particularly the core cities of large metropolitan areas. The existing need for additional capacity is generally located in areas of low per capita income and in areas of rapid population growth. Entire States in the Far West, as well as suburbs of large cities in every section of the country, are experiencing sizable increases in population.

(d) The proportion of the estimated capital outlays to be expended by non-Federal entities, is 100 percent. There is no feasible method for breaking this down among the non-Federal entities.

CHAPTER 23

Clinics and Other Outpatient Facilities*

A. NATURE AND COMPOSITION

1. DESCRIPTION OF FACILITIES

Within a relatively short span of years, facilities for outpatient care have expanded substantially in number and volume of services provided. Diagnostic and therapeutic services are being provided in a variety of facilities, including hospital outpatient departments, diagnostic and treatment centers, public health centers, and rehabilitation facilities.

(a) *Physical Characteristics*

Outpatient facilities in the United States can be grouped into the following major categories:

Hospital outpatient departments including scheduled clinics and emergency care services.

Hospital adjunct services including laboratory; radiological services (diagnostic and therapeutic); pharmacy; poison center; and rehabilitative services (physical and occupational therapy).

Free standing specialized facilities operated by governmental and voluntary agencies and those operated by private practitioners, either individually or in group practice.

Hospital outpatient departments are defined by the U.S. Public Health Service as: "That section of the hospital with allotted physical facilities, regularly scheduled hours, and personnel in sufficient numbers assigned for established hours, to provide for care of patients who are not registered as inpatients while receiving physician, dentist, or allied services."[1]

Physical features commonly found in the outpatient department of a short-term, general, community hospital can be grouped into the following general areas for service to the public concerned:

Public facilities.—Parking areas; entrances from the street and the hospital lobby; separate lobby with reception, information, and appointment desks; seating for persons waiting for services; toilets; drinking fountains; and public telephones.

Administrative offices.—Office spaces for executive and secretarial personnel; admitting procedures; business office; cashier's desk; medical records file room; rooms for maintenance and housekeeping services; and storage of supplies.

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* Prepared by the Division of Hospital and Medical Facilities, Public Health Service, Department of Health, Education, and Welfare, with minor editing by Committee staff.

[1] U.S. Department of Health, Education, and Welfare, Public Health Service, Division of Hospital and Medical Facilities. *Facts and Trends on Hospital Outpatient Services.* PHS Publication No. 930-C-6, June 1964.

Clinic facilities.—Clinics are defined as "those various units (excluding adjunct services units) of the outpatient department, responsible for general and specialty management of designated diagnostic and treatment procedures." [2] Outpatient clinics will generally require and contain similar spaces and items of equipment common to most physicians' and dentists' offices, or examination and treatment rooms.

In addition to these basic and general facilities, certain clinics, such as the emergency services unit, will require specialized areas and equipment. The emergency services unit is "that unit (clinic) of the outpatient department where services are rendered to outpatients in the diagnosis or treatment of conditions determined clinically, or considered by the patient (or his representative), as requiring *immediate* physician, dentist, or allied services." [3]

Required by the very nature of its services, the emergency service unit ideally has a distinctive architectural design, with physical features augmented by specialized equipment. Typically, the emergency services unit is located within the total area of, and adjacent to the other clinics of the outpatient department, providing easy communication of patients and staff personnel between clinics and specialized facilities. In addition to the usual examination and treatment room(s), the major physical features peculiar to this unit include: separate entrances, protected from the weather, with wide, swinging doors for use of patients arriving on foot or by ambulance; a concrete walkway to entrances, without steps; platform for unloading ambulances; a waiting area for relatives and friends of patients: a room for use by police officers and press reporters; facilities for restraint of psychotic and alcoholic patients; a poison center; storage spaces for wheelchairs and stretchers: and room(s) with beds and other equipment for observation, treatment, and procedures prior to possible admittance of emergency patients to the inpatient section of the hospital. Commonly included in the equipment specifically provided for emergency care, are: wheelchairs and stretchers; aspiration, drainage, and suction equipment; equipment for administration of drugs, medication, and anesthetic agents; emergency dental equipment; portable X-ray equipment; a storage safe for narcotics and drugs; and a storage safe for patients' valuables.

Hospital adjunct services are "those special diagnostic and therapeutic facilities and services established in the hospital for assisting in the determination and confirmation of the physician's or dentist's diagnosis, and/or the provision of treatment ordered by and under supervision of a physician or dentist." [4] These services are commonly thought of as including radiological, laboratory, pharmacy, and rehabilitative activities. Additional and specialized adjunct services, such as blood banks, bone and tissue banks, prosthetic, electrocardiology, and inhalation therapy, may be also offered depending upon program needs and other factors. Each of the major adjunct services normally requires extensive specialized equipment and housing space.

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[2] *Ibid.*
[3] *Ibid.*
[4] *Ibid.*

Dramatic increases in utilization of hospital outpatient services and demands for extension of services offered for the community's residents have caused a growth of specialized outpatient facilities. These facilities are provided by Federal, State, and local governments, voluntary health agencies, and in some cases by private practitioners, either individually or in group practice. Illustrative of these specialized facilities are the following: [5]

Public Health Center.—A publicly owned facility including related facilities such as laboratories, clinics, and administrative offices utilized by a local health unit for the provision of public health services.

Auxiliary Public Health Facility.—State or local health department laboratory and/or clinics physically separated from the central administrative office.

Diagnostic or Treatment Center.—A facility providing community service for the diagnosis or diagnosis and treatment of ambulatory patients, usually operated in connection with a hospital, or in which patient care is under the professional supervision of persons licensed to practice medicine or surgery in the State, or, in the case of dental diagnosis or treatment, under the professional supervision of persons licensed to practice dentistry in the State. This includes outpatient departments and clinics.

Rehabilitation Facility.—A facility providing community service which is operated for the primary purpose of assisting in the rehabilitation of disabled persons through an integrated program under competent professional supervision, of (*a*) medical evaluation and services, and (*b*) psychological, social, or vocational evaluation and services. The major portion of the required evaluation and services must be furnished within the facility; and the facility must be operated either in connection with a hospital or as a facility in which all medical and related health services are prescribed by or are under the general direction of persons licensed to practice medicine or surgery in the State. Integrated services may be provided in a facility to care for many types of disabilities or a single type of disability.

(b) *Services Rendered*

Adequate, high-quality outpatient services, including emergency care facilities, are essential elements in the contribution of hospitals to the total health program for the community. In terms of diagnostic, preventive, and restorative health procedures, such services complement inpatient care as well as the nonhospital services of physicians and dentists. Outpatient services help the hospital to fulfill its role as the true focal point of community health, professional education, and service to humanity. The extent of services to be offered is determined by the community's pattern of medical practice, professional competencies, community needs, and the role of the hospital in meeting the needs or demands of the community.

Many hospitals and other medical care facilities find it necessary or desirable to limit the number and types of outpatient services to be provided. Inclusion, or exclusion, of types of services or of persons served materially affects the planning, design, organization, and overall programs of the hospital's outpatient department.

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[5] U.S. Department of Health, Education, and Welfare, Public Health Service, Division of Hospital and Medical Facilities. *Hill-Burton State Plan Data: A National Summary as of Jan. 1, 1965.* PHS Publication No. 930-F-2 (revised 1965).

Hospital adjunct services can be formally organized and located to serve either inpatients only, outpatients only, or both categories of patients. Whether these services will be established and operated for both inpatients and outpatients, or solely for the use of the outpatient department, depends upon patient loads and characteristics, managerial concepts and decisions, and other considerations.

Regardless of the decision for utilization, the hospital's adjunct services need to be located in proximity to the outpatient clinics with accommodations to facilitate the flow of patient traffic.

In addition to the various general and specialty clinic services offered by hospitals, specialized health and clinic services are offered by Federal and local governments, voluntary agencies, and private practitioners. These entities provide a wide range of preventive health services and specialized programs for chronic diseases, accident prevention, and direct patient care. The range of services offered (other than by the Federal Government) is usually determined by community demands and local availability of qualified professional practitioners. Representative of the more commonly offered specialized clinical services are those concerned with:

Alcoholism	Immunizations
Cerebral palsy	Multiple sclerosis
Crippled children	Podiatry
Dermatology	Psychological
Family health	Social services
Health education	Speech
Hearing	Venereal diseases
Chronic long-term disease	Well-child

(c) *Standards of Performance*

Some measure of the overall magnitude of the increased use of outpatient facilities is indicated by the fact that, in 1955, a total of 4,832 hospitals reported outpatient visits to the American Hospital Association, compared with 5,624 hospitals reporting such visits in 1964. During that decade, total reported outpatient visits increased from 73,497,500 to 125,123,200,[6] or from 445 visits per 1,000 population in 1955 to 654 per 1,000 in 1964. Although these increases reflect, to some extent, more complete reporting by hospitals registered with the American Hospital Association, the actual increase in visits is unquestionably substantial.

Included in total outpatient visits are those for emergency services, clinic services, and for diagnostic or treatment procedures upon referral from physicians. In 1964, of the 654 total outpatient visits per 1,000 persons, 139 per 1,000 were for emergency services, 239 per 1,000 were for clinic services, and 112 per 1,000 were for services upon physicians' referral. The remainder, or 164 visits per 1,000 persons, were not classified as to type of visit.

Public health centers have increased in number from 468 in 1948 to 1,194 as of January 1965. Auxiliary public health facilities also have grown substantially in number—from 722 to 1,050 in the 1948–65

[6] American Hospital Association. *Hospitals*, "Guide Issue," pt. II, Aug. 1, 1965.

period. Services in these facilities vary widely—from purely environmental health activities to extensive preventive services provided to individuals. No data are available on the volume of services provided.[7]

Only very limited information is available on the standards of performance, in terms of persons served, of all other types of clinics or outpatient facilities. A 1964 directory of rehabilitation facilities indicated a total of 288,000 persons served in the 372 centers reporting on patient service. These centers, however, represented only half of the total participating in the study and only about 20 percent of the number identifying themselves as rehabilitation facilities.[8]

The most current data available on private group practice clinics dates back to 1959. At that time, 1,623 medical groups were reported in various sections of the country. These multispecialty and single specialty groups were staffed by a total of 14,841 physicians; about four-fifths of these physicians were on a full-time basis. No data were reported on the number of patients served by the various groups.[9]

Data are not available on the numbers of persons served by free-standing diagnostic and treatment centers (those not physically connected with a hospital) or by other free-standing specialized facilities operated by governmental or voluntary agencies.

For new construction under the hospital and medical facilities (Hill-Burton) program, outpatient departments diagnostic or treatment centers, public health centers, and rehabilitation facilities must meet certain requirements established by regulation. For example, hospital outpatient departments must be located on the most easily accessible floor and must have convenient access to radiology, pharmacy, laboratory, and physical therapy units. Public health centers must provide administrative, clinical, laboratory, and service areas adequate to serve the program needs of the center and the population group involved. Similarly, rehabilitation facilities must provide adequate space and proper physical location for the various services programed.

(d) *Qualitative Standards of Performance*

All outpatient and clinic facilities operated in direct connection with a hospital are covered by standards established for hospitals in general. Included in requirements for accreditation of hospitals by the Joint Commission on Accreditation are specifications relating to outpatient services. The recently enacted Social Security Act Amendments which provide payment for hospital inpatient and outpatient services to persons 65 years of age and older, prescribe that hospitals accredited by the Joint Commission are eligible to participate in the medicare program, provided they also furnish adequate evidence of an effective utilization review plan.

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[7] U.S. Department of Health, Education, and Welfare, Public Health Service, Division of Hospital and Medical Facilities. *Hill-Burton State Plan Data: A National Summary as of Jan. 1, 1965.* PHS Publication No. 930-F-2 (revised 1965).

[8] Association of Rehabilitation Centers. *1964 Directory of Rehabilitation Facilities,* Evanston, Ill., May-June 1964.

[9] U.S. Department of Health, Education, and Welfare, Public Health Service, Division of Public Health Methods. *Medical Groups in the United States 1959.* PHS publication No. 1063, 1963.

Nearly all States have established licensure requirements for the operation of general hospitals. These requirements extend to the outpatient as well as inpatient service, including rehabilitation facilities, diagnostic and treatment centers, and other clinics.

No single accreditation or approval body has been organized for certification of rehabilitation centers. However, specific services within a center's program may be certified by an accrediting group. For example, the American Board of Examiners in Speech Pathology and Audiology, and the American Board for Certification in Orthotics and Prosthetics, Inc., have established standards and certify services in their respective areas.[10]

Information on quality control of group practice clinics is limited. A 1959 survey of such clinics indicated that "approximately two-thirds of the medical groups surveyed reported having some formal method or methods for maintaining quality of care. These methods varied from minimum standards for staff membership to professional supervision by a medical director * * * to periodic medical audits by an outside review board." Some groups will accept only board-certified specialists.[11] No national accrediting organization has as yet been established for such groups.

2. EXISTING CAPITAL PLANT IN THE UNITED STATES

(a) and (b) *Number of Facilities and Distribution by States*

Of the 6,665 hospitals of all types (including Federal) reporting to the American Hospital Association on facilities and services in 1964, a total of 2,950, or 44 percent, reported having an "organized" outpatient department. An "organized" department is defined by the Joint Commission on Accreditation of Hospitals as one organized into sections (clinics), the number of which depends on the degree of departmentalization of the medical staff, available facilities, and the needs of the community. Well over 2,500 additional hospitals which report the provision of outpatient services do not report the operation of "organized" departments. The maintenance of emergency departments was reported by 5,565 hospitals, or 83.5 percent of the total reporting to the American Hospital Association in 1964. No data are available on the distribution of hospital outpatient or emergency departments by State.

At the start of 1965, State agencies which administer the Hill-Burton program reported a total of 1,194 primary public health centers, 1,050 auxiliary public health facilities, 4,513 diagnostic or treatment centers, and 1,339 rehabilitation facilities. In 1959, the latest year for which data are available, a total of 1,623 medical groups were in operation throughout the country. The distribution of these various types of facilities by State is shown in table 1.

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[10] Association of Rehabilitation Centers, *op. cit.*

[11] U.S. Department of Health, Education, and Welfare, Public Health Service, Division of Public Health Methods. *Medical Groups in the United States, 1959.* PHS publication No. 1063, 1963.

TABLE 1.—*Public health centers, diagnostic or treatment centers, rehabilitation facilities, and medical groups, by State*

State	Public health centers (January 1965)			Diagnostic or treatment centers (January 1965)	Rehabilitation facilities (January 1965)	Medical groups (1959)
	Total	Primary centers	Auxiliary public health facilities			
United States and territories	2,244	1,194	1,050	4,513	1,339	----
United States	2,035	1,132	903	4,379	1,312	1,623
Alabama	74	54	20	156	7	19
Alaska	33	5	28	15	4	0
Arizona	15	10	5	59	9	6
Arkansas	25	16	9	1	22	26
California	109	60	49	160	35	139
Colorado	13	9	4	80	19	42
Connecticut	24	6	18	45	46	6
Delaware	3	2	1	15	13	1
District of Columbia	32	1	31	12	20	11
Florida	64	39	25	25	55	19
Georgia	143	36	107	74	21	24
Hawaii	13	11	2	25	5	11
Idaho	21	3	18	56	2	12
Illinois	9	9	----	197	41	52
Indiana	5	4	1	120	10	34
Iowa	1	1	----	171	17	63
Kansas	9	9	----	161	7	34
Kentucky	82	72	10	123	9	29
Louisiana	86	54	32	37	11	54
Maine	----	----	----	65	6	1
Maryland	161	22	139	80	46	12
Massachusetts	17	17	----	155	86	12
Michigan	28	28	----	27	14	37
Minnesota	6	4	2	472	144	152
Mississippi	142	36	106	40	26	35
Missouri	48	48	----	152	15	47
Montana	----	----	----	62	17	18
Nebraska	4	4	----	130	7	26
Nevada	2	2	----	17	8	5
New Hampshire	----	----	----	31	7	5
New Jersey	13	11	2	106	60	14
New Mexico	17	14	3	62	6	8
New York	61	36	25	17	31	69
North Carolina	97	93	4	163	10	33
North Dakota	5	5	----	81	16	28
Ohio	141	120	21	241	45	90
Oklahoma	36	25	11	13	4	25
Oregon	20	14	6	78	17	28
Pennsylvania	95	21	74	105	86	29
Rhode Island	----	----	----	17	9	1
South Carolina	126	42	84	13	14	25
South Dakota	2	1	1	42	1	18
Tennessee	92	65	27	29	36	17
Texas	37	29	8	32	57	134
Utah	7	7	----	43	8	15
Vermont	----	----	----	36	1	2
Virginia	63	60	3	95	11	48
Washington	37	11	26	118	14	30
West Virginia	10	10	----	129	81	18
Wisconsin	5	4	1	165	66	51
Wyoming	2	2	----	31	10	8
Guam	9	8	1	3	1	----
Puerto Rico	196	53	143	128	26	----
Virgin Islands	4	1	3	3	----	----

Source: U.S. Department of Health, Education, and Welfare, Public Health Service, Division of Hospital and Medical Facilities. "Hill-Burton State Plan Data—A National Summary as of Jan. 1, 1965," PHS Publication No. 930-F-2 (revised 1965). U.S. Department of Health, Education, and Welfare, Public Health Service, Division of Public Health Methods. "Medical Groups in the United States, 1959," PHS Publication No. 1063, July 1963.

(c) *Distribution by Size of Community*

Data on the distribution of outpatient facilities by size of community are available for only one category—medical practice groups. For these groups the information is limited and relates to the year 1959.

At that time, slightly more than half of 1,623 medical groups surveyed were located in metropolitan counties containing at least one city of 50,000 or more residents. Less than one-sixth were in counties adjacent to metropolitan counties. The remaining one-third were in counties considered for the study as "isolated". The group physicians, however, were more heavily concentrated in metropolitan counties than were the group clinics. Nearly two-thirds of the group physicians were in metropolitan counties, compared with about half of the group clinics.

(d) *Age of Facilities*

Specific information is not available on the age distribution of most types of outpatient facilities. Many of the outpatient *services* (as distinguished from *facilities*) date from the establishment of the first general hospitals in this country. The Philadelphia Dispensary, for example, opened its doors in 1786. The impetus to the development of present-day rehabilitation facilities came from efforts to rehabilitate disabled members of the Armed Forces during World War II.

The first public health center was established in Philadelphia in 1912. Since that time their development has been uneven, with stimulation to their growth given in fairly recent years through the Hill-Burton construction program. In 1948, only 468 public health centers were in existence. Since that time the number has increased slowly but steadily to a total of 1,194.

Limited data on medical practice clinics indicate that of 1,187 reporting year of establishment, 258 were organized prior to 1940; 51 during 1940–44; 263 during 1945–49; 251 during 1950–54 and 364 in 1955 or later.

(e) *Ownership*

As reported by the American Hospital Association, the following indicates the distribution by ownership of organized outpatient departments and emergency units in operation in 1964:

TABLE 2.—*Organized outpatient departments and emergency departments, by type of ownership, 1964*

Ownership	Organized outpatient departments		Emergency departments	
	Number	Percent	Number	Percent
Total reporting	2,950	100.0	5,565	100.0
State or local government	812	27.5	1,475	26.5
Voluntary nonprofit	1,425	48.3	3,086	55.4
Proprietary	304	10.3	649	11.7
Federal Government	409	13.9	355	6.4

Source: American Hospital Association. *Hospitals*, "Guide Issue," pt. II, Aug. 1, 1965.

Of 390 rehabilitation facilities reporting on ownership to the Association of Rehabilitation Centers, Inc., 84 or 21.5 percent were under governmental ownership, 301 or 77.2 percent were under voluntary nonprofit auspices, and 5 or 1.3 percent were proprietary. Further details are shown in table 3.

TABLE 3.—*Rehabilitation facilities, by type of ownership, 1963*

Ownership	Number of facilities reporting	Percent
Total	390	100.0
Governmental	84	21.5
Federal	5	1.3
State	51	13.1
City or county	27	6.9
District	1	.2
Voluntary nonprofit	301	77.2
Church or church related	31	7.9
Other	270	69.3
Proprietary	5	1.3
Corporation	3	.8
Partnership	1	.2
Individual	1	.3

Source: Association of Rehabilitation Centers, *1964 Directory of Rehabilitation Facilities*, May–June 1964.

Data by ownership are not available for other types of clinics or other outpatient facilities.

(f) *Current Value*

Information is not available on the current value of any of the categories of clinics and other outpatient facilities, nor are any data available by which even the most gross estimate can be made.

B. Costs and User Charges

1. CONSTRUCTION COSTS AND OPERATING COSTS

The following data are available regarding construction and operating costs.

(a) *Construction Costs*

The following information on construction costs is based on records available through the Hill-Burton program for projects constructed under that program. In all instances, the costs per square foot include the costs of fixed equipment. Average cost data are not available for movable equipment since the use of such equipment varies widely from facility to facility, depending upon the program of service.

TABLE 4.—*Construction costs per square foot*

Type of facility:	*Cost of construction and fixed equipment*
Diagnostic or treatment center:	
Directly attached to hospital	$32.00
Free-standing	25.00
Public health center	22.50
Rehabilitation facility	21.00

Source: Unpublished data from Division of Hospital and Medical Facilities, Public Health Service.

(b) *Operating Costs*

Estimates of operating costs of clinics and other outpatient facilities are available only for rehabilitation centers. For 296 rehabilitation facilities reporting to the Association of Rehabilitation Centers in 1963, income in that year totaled $96.8 million or an average of $327,000 per center. Total expense for the same year reached $101.7 million—an average of $344,000 per center. In terms of patients served, annual expense per patient averaged about $458.

2. USER CHARGES

(a) and (b)—A thorough search of all available literature has not provided any type of information on user charges for service in clinics or other outpatient facilities.

(c)—Data are not available on the extent to which costs of clinics and other outpatient facilities are met out of general tax resources and general obligation borrowings of State and local government units.

C. Trends of Capital Outlays

1. ANNUAL CAPITAL OUTLAY

Other than for the types of facilities receiving construction aid under the Hill-Burton program (public health centers, diagnostic or treatment centers, and rehabilitation facilities) data are not available on the dollar volume of construction for clinics and other outpatient facilities.

The original Hill-Burton Act (Public Law 79–725) provided Federal assistance to States and local communities for construction of public health centers. While separate funds are not designated for the construction of such centers, but are included in the overall authorization for hospital construction, the amount of $65.9 million out of a total of $2.4 billion has been used for public health center construction from 1948 to June 30, 1965.

As of June 1965, Hill-Burton funds had assisted in the construction of 1,045 public health centers with an additional 116 built in combination with general hospitals; 726 diagnostic or treatment centers; and 338 rehabilitation facilities. Table 5 shows the number of such projects approved each year and the Federal and State or local funds involved. A more detailed breakdown of the State or local contribution is not available.

2. SOURCES OF FINANCING CAPITAL OUTLAYS

Although each applicant for Hill-Burton aid must submit a financial statement including data on the applicant's financial resources, the information relating to public health centers, diagnostic or treatment centers, and rehabilitation facilities has not been summarized. The work involved prohibits undertaking such a summarization at this time. Even were the data readily available, they would represent a very small portion of the capital outlay picture for all clinics and other outpatient facilities.

TABLE 5.—*Public health centers, diagnostic or treatment centers, and rehabilitation facilities approved under the Hill-Burton program, 1948–65*

[Dollars in millions]

PUBLIC HEALTH CENTERS

Fiscal year	Number of projects	Project costs		
		Total	Federal share [1]	State and local share
Total	[2] 1,045	$192.8	$65.9	$127.0
1948–55	464	57.6	19.3	38.3
1956	73	13.9	5.1	8.8
1957	69	14.5	5.4	9.0
1958	64	16.6	6.2	10.4
1959	73	18.1	5.4	12.7
1960	74	15.9	4.8	11.1
1961	42	7.2	2.7	4.5
1962	43	7.2	2.9	4.3
1963	52	9.2	4.1	5.1
1964	48	12.2	5.3	6.9
1965	43	20.5	4.7	15.8

DIAGNOSTIC OR TREATMENT CENTERS

Total	726	$316.9	$110.5	$206.3
1955	1	.3	.1	.2
1956	79	38.5	11.1	27.3
1957	55	16.5	5.4	11.1
1958	65	25.2	9.3	15.9
1959	61	22.1	7.4	14.7
1960	86	18.5	6.8	11.7
1961	62	23.2	7.9	15.3
1962	67	27.2	10.3	16.9
1963	75	44.0	16.6	27.4
1964	87	45.8	16.4	29.4
1965	88	55.7	19.3	36.4

REHABILITATION FACILITIES

Total	338	$217.0	$73.6	$143.3
1955				
1956	43	35.0	9.0	25.9
1957	19	11.1	3.6	7.5
1958	20	10.7	3.6	7.1
1959	32	20.6	7.7	12.9
1960	41	20.0	7.2	12.8
1961	35	19.9	8.4	11.5
1962	43	29.0	10.5	18.5
1963	39	21.2	8.5	12.7
1964	32	23.6	7.2	16.5
1965	34	25.9	7.9	18.0

[1] According to statute, annual Hill-Burton appropriations have a 2-year availability.
[2] Excludes 116 public health centers built in combination with general hospitals and not reported as separate projects.

Source: Unpublished data from Division of Hospital and Medical Facilities, Public Health Service.

D. NEEDS AND PROSPECTIVE CAPITAL OUTLAYS

CAPITAL REQUIREMENTS

The capital requirements for clinics and other outpatient facilities (limited to rehabilitation facilities and diagnostic or treatment centers) for the decade 1966–75 are:

	Millions
Backlog of unmet need as of June 30, 1965	$1,584.0
Total additional requirements through June 30, 1975	1,652.1
Total estimated need	3,236.1

(a) Estimates of capital needs have been limited to rehabilitation facilities and diagnostic or treatment centers (frequently the organized outpatient departments of hospitals). No information is available on capital needs or outlays for other types of outpatient facilities, including private group clinics.

Hill-Burton State plans for fiscal year 1966 provided the basic data for developing current capital needs for rehabilitation facilities and diagnostic or treatment centers. From these plans, national totals were derived for (1) total existing facilities, (2) total facilities needed, (3) facilities to be modernized, and (4) facilities needed over and above the present supply. Dollar estimates were obtained by applying an average cost of $700,000 to the national estimates for rehabilitation facilities and $550,000 to the national estimates for diagnostic or treatment centers.

Projections of the costs of modernization and needed additional rehabilitation facilities and diagnostic or treatment centers were based on the following assumptions or factors: (1) Population growth, (2) a 3-percent obsolescence rate per year, or an assumption of a 33-year "life," (3) an annual increase in the number of facilities at the average rate which has obtained over the past 8 years, (4) maintenance of the current estimated need in terms of facilities per million population, and (5) maintenance of the estimated current volume of nonfederally aided construction.

(b) The estimated capital needs (in millions) for rehabilitation facilities and diagnostic or treatment centers, 1966–75, are as follows:

	Total	Modernization	Additional capacity
Backlog as of June 30, 1965	$1,584.0	$864.0	$720.0
Annual increments:			
1966	139.3	75.6	63.7
1967	143.3	79.0	64.3
1968	148.0	82.5	65.5
1969	153.7	86.5	67.2
1970	160.7	90.5	70.2
1971	167.1	94.5	72.6
1972	174.5	99.0	75.5
1973	181.4	103.6	77.8
1974	188.3	108.1	80.2
1975	195.8	113.2	82.6
Total, backlog plus increments	3,236.1	1,796.5	1,439.6

(c) It is not feasible to estimate the proportions of these needs by size of community.

(d) The proportion of the estimated capital outlays to be expended by non-Federal entities is 100 percent. There is no feasible method for breaking this down among the non-Federal entities.

CHAPTER 24

Long-Term Care Facilities*

A. NATURE AND COMPOSITION

The past three decades have seen the emergence of a new type of health facility—the nursing home. Prior to the 1930's, only a handful of so-called nursing homes were in existence. In succeeding years, however, their growth accelerated rapidly, brought about by a combination of medical, social, and economic changes in our society. The initial impetus was given by the enactment of the Social Security Act in 1935, which made public assistance funds available to the needy aged except inmates of public institutions. As a result, proprietary boarding and nursing homes began to flourish. In 1939, there were approximately 1,200 nursing, convalescent, and rest homes throughout the country having a bed capacity of about 25,000.

Meanwhile, medical advances were extending life expectancy to a record high, resulting in a rapidly growing older population. Acute, infectious diseases were giving way to degenerative, long-term diseases as leading causes of illness and death. Patterns of housing and living were changing, and increased employment opportunities for women were reducing the number available at home to care for older family members. At the same time, the general attitude concerning institutional care was changing considerably. Gradually, the nursing home was recognized as having an important role in the total medical care picture.

In 1954, the Congress amended the Hospital Survey and Construction (Hill-Burton) Act to emphasize the need for long-term care facilities. Funds were specifically authorized to assist in the construction of public and voluntary nonprofit skilled nursing homes, chronic disease hospitals.

At that time there were just over 265,000 long-term care beds available, including beds in chronic disease hospitals and skilled nursing homes.

With the advent of "medicare," national concern over nursing homes or "extended care facilities"—their availability, kinds and quality of service provided, and future prospects—has reached a new peak. Today, some 13,500 nursing homes with a capacity of 550,000 beds are licensed to operate in the 50 States, District of Columbia, and Puerto Rico.[1] In addition, there are approximately 70,000 beds for patients in chronic disease hospitals or in long-term units of general hospitals. Across the country, the number of long-term care beds

*Prepared by the Division of Hospital and Medical Facilities, Public Health Service, Department of Health, Education, and Welfare, with minor editing by committee staff.

[1] Unpublished data from Hill-Burton State plans submitted to the Division of Hospital and Medical Facilities, Public Health Service; and from the American Nursing Home Association.

(skilled nursing homes and chronic disease facilities) averages 34.6 for each 1,000 persons 65 years of age and older.

1. DESCRIPTION OF FACILITIES

Over the years, the term "nursing home" has been applied to a wide variety of nonhospital facilities bearing varying names and offering a wide range in service. Among these are nursing homes, nursing home units of hospitals, convalescent and rest homes, homes for the aged, boarding homes, and county homes. Services have ranged from a purely domiciliary type of care to full-time professional nursing service with physical and recreational therapy, psychiatric care and the services of other medical specialists.

Gradually, however, the definition of a nursing home has been tightened to generally exclude the purely domiciliary-type facility and to represent one which serves convalescing or other patients who are neither acutely ill nor in need of hospital care, but who do require skilled nursing care beyond personal services. The Hill-Burton Act construes a facility for long-term care (including chronic disease hospitals and skilled nursing homes) as one which provides "community service for inpatient care for convalescent or chronic disease patients who require skilled nursing care and related medical services." [2]

(a) *Physical Characteristics*

Until rather recently, a nursing home generally could be described as a large, multistoried house, usually in an older part of the community, which had been converted to a home for elderly persons who were either convalescing or chronically ill. Too frequently, bed space would be cramped, hallways narrow, elevators lacking, bathrooms few, and therapy aid nonexistent. Staff might be limited to the nursing home owner—frequently an elderly woman—and perhaps a nursing aid or housekeeper-attendant. Many would have licensed practical nurses as their highest nursing-skill level. Homes answering this description still exist today in hundreds of communities throughout the country.

A new image of the nursing home has been emerging in recent years, however. While they approximate a homelike atmosphere to the extent possible, they no longer serve merely as substitutes for family dwellings but are developing as genuine medical institutions. Some of the new facilities are built as wings on community hospitals or as separate units on hospital grounds. Most are free-standing and independently operated. As a general rule they are one story, of attractive, contemporary design, and planned to serve the special needs of the nursing home patient. The nursing units and other patient areas may resemble those of a community general hospital. Corridors are wide and bright and permit the passage of wheel chairs. Centrally located recreation rooms and dining rooms are provided. Patient rooms are large enough to allow for movement of patients using wheel chairs, walkers, canes, or crutches, with furnishings designed to accommodate the wheel chair patient. Privacy in

[2] U.S. Department of Health, Education, and Welfare, Public Health Service, Division of Hospital and Medical Facilities. *Public Health Service Regulations—Part 53—Pertaining to the Construction and Modernization of Hospital and Medical Facilities*, Dec. 29, 1964, p. 2.

multiple bedrooms is provided by screens or curtains. Nurses' call systems are installed in each room. Bath and toilet facilities are conveniently located, and in some facilities lavatories are provided for each bedroom to encourage self-care. Each nursing unit has a nursing station, and a separate consultation and treatment room is available for use by physicians. Physical therapy equipment—essential in the treatment of certain long-term conditions and disabilities—is frequently available. Construction of this new type of nursing home is going on at an increasing pace throughout the country.

In general, nursing homes have tended to be small, averaging about 35 beds in 1961 in all nongovernmental facilities.[3] (Governmental facilities—Federal, State, and local—are much larger, on the average, than homes under proprietary or private nonprofit auspices. A survey conducted during April–June 1963, showed that government homes having nursing care as the primary type of service had an average of 125 beds.)[4] Homes constructed during recent years are generally somewhat larger than older facilities. An inventory conducted in 1954 gave the average size of nongovernmental homes as 25 beds. A 1965 survey by the American Nursing Home Association indicated that nursing homes now have an average size of about 40 beds.[5]

(b) *Services Rendered*

To appraise the services provided in nursing home facilities, it is important to have some knowledge of the people they serve. A recent estimate indicates that there are approximately 500,000 persons in nursing homes at the present time. The very elderly predominate; a number of studies have indicated that the average age (median) is about 80 years. While cardiovascular diseases constitute the largest single cause of disability among nursing home patients, senility and fractures (especially of the hip) are among the other most frequent causes. Although various studies differ as to the relative number of nursing home patients who are ambulatory, bedfast, or confused, all agree that a substantial proportion (at least two out of five) can walk unassisted; from 10 to 20 percent are bedfast; and perhaps half are confused part or most of the time.

To prevent the mental and physical deterioration to which so many nursing home patients are prone requires continuing care and supervision. It would be expected that, above all, nursing care would constitute the primary service. In terms of personnel to provide nursing care, many homes still have licensed practical nurses as their highest nursing-skill level. A 1961 inventory conducted by the Public Health Service indicated that among nearly 10,000 non-Federal skilled nursing homes 39 percent had full-time licensed practical nurses only; 29 percent had full-time registered professional nurses; 18 percent had both full-time professional nurses and licensed practical nurses; but 13 percent had neither full-time registered professional nor licensed practical nurses. Many of the homes, however, do have the part-time services of registered professional nurses and

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[3] U.S. Department of Health, Education, and Welfare, Public Health Service, Division of Hospital and Medical Facilities. *Characteristics of Nursing Homes and Related Facilities: Report of a 1961 Nationwide Inventory.* PHS Publication No. 930–F–5, 1963, p. 14.

[4] U.S. Department of Health, Education, and Welfare. Public Health Service. National Center for Health Statistics, *Characteristics of Residents in Institutions for the Aged and Chronically Ill*, Series 12, No. 2, September 1965. U.S. Government Printing Office, Washington, D.C., table A, p. 3.

[5] American Nursing Home Association. News release, Washington, D.C., Dec. 29, 1965.

the great majority probably have around-the-clock coverage of patients at least by nursing aids.

Aside from nurses, however, the full-time employment of other professional personnel is the unusual rather than the usual practice. Only the newer and larger homes are likely to provide the services of physical, occupational, and speech therapists, recreational directors, and in relatively rare instances the full-time services of physicians. Indications are, however, that concern with active, restorative care is growing and that more and more homes are providing some type of physical and occupational therapy.

(c) *Standards of Performance*

Ideally, nursing homes should be planned according to community needs. Statistics and other requirements relating directly to the individual community are needed before planning can be started. Surveys of community needs and existing resources provide the basic data for determining the beds required and services to be offered. State Hill-Burton agencies are currently determining the need for long-term care facilities in communities throughout their States, taking into consideration present utilization, a desirable occupancy, and the population to be served. Preliminary indications are that from 45 to 50 long-term care beds are required for each 1,000 persons of 65 years of age and older. The ratios may vary widely from community to community, of course, depending on the existence of community health programs and the availability of other health resources. Currently there are about 35 beds per 1,000 aged persons, more than one-third of which require modernization or replacement because of fire and safety hazards or functional deficiencies in their patient or service areas.

Minimum standards for evaluating the structural safety and efficiency of existing nursing homes were recently established by the Public Health Service for use by Hill-Burton State agencies. These relate to—

A. Fire resistiveness of construction;

B. Safety with regard to such items as electrical and mechanical services, exit facilities, fire alarm system, interior finishes, vertical shafts, smoke barriers;

C. Patient areas, including room size, width of corridors, nurses' stations, windows, and access to corridors; and

D. Service departments, including ventilation, equipment, and sanitation in the dietary and laundry areas.

For new construction under the Hill-Burton program, nursing homes must meet certain requirements established by regulation. No nursing unit within a home, for example, may have more than 40 beds. Although four beds within a room are permitted, it is recommended that patient rooms contain no more than two beds. Multibed rooms must have a minimum of 80 square feet per bed, and single-bed rooms must have at least 100 square feet. Each patient's room must be provided with a lavatory. Other requirements or recommendations relate to service facilities in each nursing unit, such as nurses' station, utility room, treatment room, and pantry; dining areas, recreation areas, and solaria; and departments for physical, occupational and speech therapy, examination and treatment rooms, and administration areas.

(d) *Qualitative Standards of Performance*

All States and territories, except the Virgin Islands, have established licensure requirements for the operation of nursing homes. The licensure responsibility, however, is assigned to several types of agencies. In 46 States and territories the licensing agency is the health department, in four States the welfare department, and in the remaining States it is in other agencies. Licensure requirements are far from uniform and are often the minimum standards that will assure a patient's safety. Because of the shortage of nursing homes, provisional licensing is not unusual for homes unable to meet upgraded licensure standards. In some States, certain homes are exempt from licensing, such as those sponsored by church or fraternal organizations. In the 1961 inventory by the Public Health Service, about half the States reported one or more homes which were operating without being fully licensed. At that time, beds in these homes accounted for 5 percent (16,500) of the total number of skilled nursing home beds in the country.

The need for minimal standards which would assure quality care in nursing homes has been recognized by various organizations for many years. A number of accreditation programs have been initiated by State nursing home associations and various national groups. Just recently, however, an accreditation program has been instituted by the Joint Commission on Accreditation of Hospitals. The program is directed to "extended care facilities," defined in brief as institutions providing accommodations and nursing and related health care to two or more persons (not related to the owner or administrator) for 24 hours or more, but not primarily for care and treatment of the acutely ill.

The standards as established by the joint commission are based on the principle that the patient must be under a continuing planned program of care, focusing on the total needs of the patient and rendered in a physical and social environment that provides for the safety of the patient and the achievement and maintenance of an optimum level of restoration. Substantial compliance with all the standards is necessary for accreditation.[6]

The Social Security Administration has recently issued the conditions of participation (constituting qualitative standards to be met) for extended care facilities in the health insurance program for the aged. Included in the conditions of participation are standards relating to (1) compliance with State and local laws, (2) administrative management, (3) patient care policies, (4) physician services, (5) nursing services, (6) dietary services, (7) restorative services, (8) pharmaceutical services, (9) diagnostic services, (10) dental services, (11) social services, (12) patient services, (13) clinical records, (14) transfer agreement, (15) physical environment, (16) housekeeping services, (17) disaster plan, and (18) utilization review plan.

2. EXISTING CAPITAL PLANT IN THE UNITED STATES

(a) and (b) *Number of Facilities and Distribution by States*

As of January 1, 1965, Hill-Burton State agencies reported a total of about 13,900 long-term care facilities in the United States and territories. Included in the total were some 13,000 skilled nursing

[6] Joint Commission on Accreditation of Hospitals. *Standards for Accreditation of Extended Care Facilities.* Chicago, Ill. Attached as app. B.

homes and chronic disease hospital facilities and nearly 900 long-term care units attached to other hospitals. Altogether, nearly 625,000 beds were reported—about 550,000 in skilled nursing homes and 75,000 in chronic disease hospitals or hospital units. Table 1 shows the distribution of long-term care facilities and beds among the States.

TABLE 1.—*Long-term care facilities, by State, as of Jan. 1, 1965* [1]

State	Facilities		Total beds
	Chronic disease hospitals and nursing homes [2]	Other [3]	
United States and territories	12,997	881	623,472
United States	12,983	878	622,292
Alabama	106	3	4,868
Alaska	2	3	404
Arizona	53	8	2,818
Arkansas	155	3	8,004
California	1,024	104	59,795
Colorado	148	22	9,065
Connecticut	253	4	11,468
Delaware	12		984
District of Columbia	70	4	1,760
Florida	287	13	14,707
Georgia	168	6	8,145
Hawaii	21	6	1,962
Idaho	56	4	2,683
Illinois	744	32	39,400
Indiana	426	26	13,689
Iowa	466	34	15,612
Kansas	49	25	3,550
Kentucky	100	6	5,223
Louisiana	172	21	8,260
Maine	195	3	3,918
Maryland	202	2	9,140
Massachusetts	775	11	35,505
Michigan	522	30	24,030
Minnesota	362	52	21,063
Mississippi	58	3	2,197
Missouri	416	37	23,077
Montana	44	22	2,437
Nebraska	121	22	6,654
Nevada	9	15	740
New Hampshire	113	5	3,829
New Jersey	270	4	14,978
New Mexico	36	10	1,667
New York	824	57	51,121
North Carolina	65	16	3,711
North Dakota	36	8	2,219
Ohio	1,024	30	39,982
Oklahoma	476	15	17,137
Oregon	192	20	8,904
Pennsylvania	492	36	36,448
Rhode Island	120	1	3,577
South Carolina	82	15	3,282
South Dakota	82	1	3,731
Tennessee	178	14	8,100
Texas	685	8	34,189
Utah	57	2	2,368
Vermont	77	3	1,770
Virginia	174	15	8,041
Washington	364	21	19,222
West Virginia	55	14	2,901
Wisconsin	548	53	13,186
Wyoming	17	9	771
Guam			
Puerto Rico	14	3	1,180
Virgin Islands			

[1] Represents chronic disease and skilled nursing home beds.
[2] Chronic disease hospitals and skilled nursing homes.
[3] Represents units of 10 or more long-term care beds in general, mental, or turbeculosis hospitals.

Source: U.S. Department of Health, Education, and Welfare, Public Health Service, Division of Hospital and Medical Facilities. *Hill-Burton State Plan Data: A National Summary as of Jan. 1, 1965*, PHS Publication No. 930-F-2, March 1966.

(c) *Rural-Urban Distribution*

Although current data from all States are not available, the findings from the 1961 Public Health Service inventory indicated that States with half or more of their people living in rural areas have relatively fewer skilled nursing care beds available than States with the majority of their population in urban areas.

TABLE 2.—*Skilled nursing care beds per 1,000 persons aged 65 and over*

Percent rural population	Number of States [1]	Beds per 1,000 population
50 and over	18	11.7
40 to 49	11	23.9
30 to 39	14	23.3
Less than 30	9	22.4

[1] Excludes Guam and Puerto Rico.

Source: U.S. Department of Health, Education, and Welfare, Public Health Service, Division of Hospital and Medical Facilities. *Characteristics of Nursing Homes and Related Facilities: Report of a 1961 Nationwide Inventory.* PHS Publication No. 930-F-5, 1963, p. 12.

Interestingly, the skilled nursing care bed-population ratio was no greater for metropolitan areas than the overall average for predominantly urban States. A total of 227,723 skilled nursing care beds was reported for facilities located in the standard metropolitan statistical areas. These metropolitan areas have 23.1 beds per 1,000 persons aged 65 and over—about the same as the average statewide ratio in the 34 States with more than half of their population in urban areas.

In the recently conducted survey of the American Nursing Home Association, responses were received from 20 States and the District of Columbia on nursing home construction within the past 5 years, by size of community. Survey results showed the following:

TABLE 3.—*Nursing homes constructed during 1961–65, by size of community*

Size of community	Nursing homes	
	Homes	Percent
Total	2,965	100.0
500,000 or more	146	4.9
100,000 to 499,999	834	28.1
50,000 to 99,999	410	13.8
10,000 to 49,999	761	25.7
2,500 to 9,999	415	14.0
Under 2,500	399	13.5

Source: Unpublished data from the American Nursing Home Association.

(d) *Age of Facilities*

Unfortunately, data are not available on the age distribution of presently existing nursing homes. Many, it is known, are converted large former residences, undoubtedly built in the late 1800's or early 1900's. In a recent survey conducted by the American Nursing Home Association, the oldest home responding was built in 1879. A total of 1,629 homes representing 35 percent of the association's member-

ship responded to the survey questionnaire. Half of these homes reported that they had been built within the past 10 years.

(e) *Ownership*

All recent nursing home surveys have found that about 90 percent of the homes are under proprietary ownership. These homes provide nearly three-fourths of all skilled nursing home beds. Of the nonprofit homes, about an equal number are owned by public agencies, church groups, and fraternal and other voluntary organizations. Among these, the public institutions (excluding Federal) have the greatest number of beds, as shown in table 4.

TABLE 4.—*Ownership of skilled nursing homes*

Type of ownership	Homes		Beds	
	Number	Percent	Number	Percent
Total reported	9,582	100.0	330,981	100.0
Proprietary	8,297	86.6	236,845	71.6
Public	432	4.5	40,841	12.3
Church related	438	4.6	28,740	8.7
Other voluntary nonprofit	415	4.3	24,555	7.4

Source: 1961 PHS Nationwide Inventory, p. 14 (see table 2).

The ownership pattern found in the recent American Nursing Home Association survey closely resembled that shown by the 1961 PHS Inventory. Neither survey included facilities owned and operated by the Federal Government.

(f) *Current Value*

Data are not available on the current value of existing nursing homes. Unquestionably, any estimate would extend into the billions of dollars. An effort was made by the American Nursing Home Association to obtain such an estimate for those facilities constructed within the period 1961–65. Only partial responses were obtained. If these partial results could be assumed to represent the value of all facilities constructed during the 5-year period, a value figure approaching $1.5 billion is estimated.

B. Costs and User Charges

1. CONSTRUCTION COSTS AND OPERATING COSTS

(a) *Construction Costs*

Wide variations in methods of construction and contractual procedures present difficulties in arriving at unit cost figures for nursing homes. In some instances costs reported include purchase of site, movable equipment and furnishings, and architects' fees; in others, such costs are excluded. Some owners participate directly in construction work without full contractual procedures. Others utilize general contractual procedures, either negotiated or competitive. The quality of materials and workmanship, type and method of construc-

tion, and price ranges in labor and materials in various localities are additional influencing factors.

Under the Hill-Burton program, applicants must perform actual construction work by the lump sum (fixed price) contract method. Adequate methods must be employed to obtain competitive bidding prior to awarding the construction contract. Also, applicants must follow certain minimum requirements for construction and equipment to assure properly planned and well constructed facilities which can be efficiently maintained and operated to furnish adequate services.

Data on nursing home construction costs are compiled periodically by the Division of Hospital and Medical Facilities, Public Health Service, which administers the Hill-Burton program. Average unit cost figures for nursing home projects approved under the program point out the upward trend in building costs over the past several years. Data are available only on a square footage and per bed basis and are not available on a per-person-served basis.

TABLE 5.—*Nursing homes: New construction costs*

Year	Building and fixed equipment average cost	
	Per square foot	Per bed
1962	$18.17	$8,476
1963	18.92	9,421
1964	19.96	10,712
1965 (1st 4 months)	19.25	9,207

Source: U.S. Department of Health, Education, and Welfare, Public Health Service, Division of Hospital and Medical Facilities. Architectural, Engineering, and Equipment Branch. *"Representative Construction Costs of Hill-Burton Hospitals and Related Health Facilities,"* January–April 1965, p. 1. Processed.

A study of 40 nursing homes, conducted in 1961–62 by the Division of Hospital and Medical Facilities, Public Health Service, in cooperation with the American Nursing Home Association, provided limited information on construction costs. Of the 40 homes selected for study, 20 were proprietary in ownership and 20 were under nonprofit auspices and built with Hill-Burton assistance. Construction costs were difficult to analyze since precise information, particularly among non-Hill-Burton homes, was sometimes lacking and some owners participated in construction without full contractual procedures. Moreover, there were wide differences among the homes in overall area per bed. In the 20 homes built without Hill-Burton aid the total space ranged from a minimum of 147 square feet per bed to a maximum of about 300 square feet per bed. The trend value of unit cost per bed among these homes rose steadily over this range from $1,500 per bed to about $4,500 per bed. At the median area of 236 square feet, the unit cost per bed approximated $3,125. Areas in homes receiving Hill-Burton assistance ranged 300 to 740 square feet per bed. In this range, the unit cost per bed extended from $4,500 to about $14,000. For the median area of 400 square feet per bed, the unit cost was $6,500 per bed.

On a square footage basis, the median cost for the 20 homes without Hill-Burton aid was $12.90 per square foot and for those receiving such assistance, $15.27. When the total unit area was comparable, however, the unit costs per square foot among the homes surveyed showed a measure of agreement.

(b) *Operating Costs*

Operating cost data are available only from widely scattered surveys conducted usually by State or local groups. Such surveys indicat e a wide spread in operating costs per patient day. A variety of factors account for this spread, including size of the facility, staffing, comprehensiveness of care provided and economic status of the local community.

A sample survey of 133 homes was conducted in California late in 1963 by the California Association of Nursing Homes, Sanitariums, Rest Homes, & Homes for the Aged.[7] The total operating cost of the 133 homes averaged $10.81 per patient day. The range reported was wide, however, from $6.98 per day to $19.91. Wage costs averaged $6.08 per patient day—56.3 percent of the total costs. Food costs per day accounted for another $0.94, or 8.7 percent of all costs. Again, the ranges within the averages were wide.

In Illinois in 1964 a survey undertaken at the request of the Illinois Nursing Home Association, showed similar wide variations in operating costs among the 26 homes studied.[8] Total operating costs ranged from an average of $5.24 per patient day in counties with a low cost of living index to $12.34 per day in counties with a high cost of living index. As expected, salaries comprised the major portion of the cost—55 percent in low economic areas and 50 percent in the high economic areas. Food costs ranged from a low of $0.48 to a high of $1.15 per patient day and accounted, on the average, for just under 10 percent of the total per diem costs. Plant operation and maintenance costs reported by the 26 homes ranged from 6.3 percent of total operating costs in homes in the high economic areas to 9.3 percent in low economic areas. Housekeeping and laundry and linen costs combined generally accounted for 6 to 9 percent of total costs.

A nationwide survey conducted in 1965 by staff of the periodical *Professional Nursing Home* obtained operating cost data which indicated similar wide ranges in average daily operating costs.[9] Among proprietary homes of 100 beds or more, operating costs per day averaged $8.86 compared with $7.76 in homes with fewer than 50 beds. For nonprofit homes the average ranged from $8.03 per day in facilities with fewer than 50 to $7.24 per day in facilities with 50 to 99 beds. Nonprofit homes having 100 beds or more reported an average daily operating cost of $7.84. No data were reported on the breakdown of operating costs such as food, salaries, and maintenance.

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[7] California Association of Nursing Homes, Sanitariums, Rest Homes & Homes for the Aged, Inc. *Cost of Patient Care in California Nursing and Convalescent Homes.* Sacramento, Calif., June 1964, 50 pp.

[8] DeBruyn, Joseph P., Illinois Nursing Homes report on costs. *Nursing Home Administrator*, November-December 1965, pp. 52–57.

[9] Planning guide. *Professional Nursing Home*, December 1965, p. 23.

The fragmentary data available as to the wage and salary component of costs, there is no breakdown between custodial and other personnel.

2. USER CHARGES

Only limited information is available on current charges to patients for nursing-home care. No data are available on the extent to which such charges cover maintenance and operation and other expenses, such as debt service payments on indebtedness incurred to finance capital costs of the facilities. The recent survey of the membership of the American Nursing Home Association which brought responses from 1,629 homes—35 percent of the total membership—provides the most current data on charges. As of late 1965, patients in the reporting homes were distributed by monthly charge rate as follows:

TABLE 6.—*Distribution of patients by basic monthly charges for room, board, and routine nursing services*

Monthly rate	Patients	
	Number	Percent
Total	66,589	100
Less than $100	906	1
$100 to $149	7,325	11
$150 to $199	16,806	25
$200 to $249	17,170	26
$250 to $299	11,145	17
$300 to $349	7,585	11
$35 and over	5,652	9

Source: Unpublished data from the American Nursing Home Association.

The survey of institutions for the aged and chronically ill, conducted by the National Center for Health Statistics during April–June 1963, provided information on monthly charges for care of residents by proprietary and nonprofit nursing care homes.[10] The average most frequent charge for proprietary nursing care homes was $211 per month; for nonprofit nursing care homes, $176 per month. As pointed out in the survey report, "the difference between these estimated charges do not necessarily indicate either the amount of profit being made by homes under different types of ownership or the cost of providing care. Possibly the charges made by nonprofit homes—are lower than those made by proprietary homes because they have sources of income other than the individuals being served."

[10] U.S. Department of Health, Education, and Welfare, Public Health Service, National Center for Health Statistics. *Institutions for the Aged and Chronically Ill: United States April–June 1963*, Series 12, No. 1, July 1965, U.S. Government Printing Office, Washington, D.C., p. 15.

With regard to sources of patient funds the following summarizes the results of the ANHA survey:

TABLE 7.—*Distribution of patients by sources of funds for payment of nursing home care*

	Percent of patients
Total	100
Source of funds:	
Personal or family funds	37
Medical assistance for aged	27
Other public assistance	17
Social security	15
Veterans' Administration	2
Blue Cross	(1)
Commercial insurance	(1)
Other	2

[1] Less than 1 percent.

Source: Unpublished data from the American Nursing Home Association.

C. TREND OF CAPITAL OUTLAYS

A large gap exists in present-day information on capital outlays for nursing homes. Other than for facilities receiving Federal aid for construction, no data are available on the presumably large dollar volume of work which has been going on in this field.

Federal assistance in nursing home construction is provided principally through three agencies—the Public Health Service (Hill-Burton program), the Federal Housing Administration, and the Small Business Administration.

Hill-Burton program.—In August 1946, Congress passed the Hospital Survey and Construction Act, establishing what is generally known as the Hill-Burton program. Federal participation in approved projects may range from one-third to two-thirds of the total costs of constructing and equipping the project.

In 1954 the act was amended to authorize funds specifically for the construction of public and voluntary nonprofit nursing homes and chronic disease hospitals. In 1964 the chronic disease and nursing home categories were combined into a single category designated as "long-term care."

By June 30, 1965, Hill-Burton funds had provided a total of 50,308 long-term care beds (chronic disease and nursing homes) either in new facilities or as additions to existing facilities. The total cost of these projects amounted to nearly $679 million with the Federal contribution amounting to more than $225 million and the State and local share totaling $454 million. The following table shows the dollar volume of projects approved each year since 1955:

TABLE 8.—*Long-term care projects approved under the Hill-Burton program, 1955–65* [1]

[Dollars in millions]

Fiscal year	Number of projects	Beds provided	Project costs		
			Total	Federal share [2]	State and local share
TOTAL LONG-TERM CARE PROJECTS					
1955	8	284	$1.8	$0.8	$1.0
1956	101	5,302	67.5	21.0	46.5
1957	72	3,079	39.1	12.9	25.2
1958	69	3,677	45.7	13.6	32.2
1959	82	4,565	52.0	17.5	34.5
1960	73	4,062	51.8	15.2	36.6
1961	88	4,621	61.1	19.9	41.2
1962	135	6,930	95.3	34.3	61.0
1963	130	6,361	86.5	34.0	52.5
1964	106	6,334	111.3	33.3	78.1
1965	84	5,093	67.5	23.0	44.5
Total	948	50,308	678.7	225.4	453.3
NURSING HOMES					
1955	2	123	$0.5	$0.2	$0.3
1956	56	2,687	30.6	9.1	21.5
1957	40	1,698	18.6	6.0	12.6
1958	52	2,792	32.7	10.0	22.7
1959	62	3,604	38.4	12.9	25.5
1960	63	3,755	44.1	12.8	31.3
1961	68	3,414	36.7	14.3	22.3
1962	96	5,362	61.9	23.5	38.4
1963	87	4,434	54.8	21.5	33.3
1964	80	4,600	73.5	21.9	51.6
1965	61	3,806	45.7	15.5	30.1
Total	667	36,275	437.4	147.9	289.5
CHRONIC DISEASE					
1955	6	161	$1.3	$0.6	.0
1956	45	2,615	37.0	11.9	$25.0
1957	32	1,381	19.5	6.8	12.7
1958	17	885	13.0	3.6	9.5
1959	20	961	13.6	4.7	9.0
1960	10	307	7.7	2.4	5.3
1961	20	1,207	24.4	5.6	18.9
1962	39	1,568	33.4	10.7	22.7
1963	43	1,927	31.7	12.5	19.2
1964	26	1,734	37.9	11.4	26.5
1965	23	1,287	21.8	7.5	14.4
Total	281	14,033	241.3	77.6	163.8

[1] Unpublished Hill-Burton program data.
[2] According to statute annual Hill-Burton appropriations have a 2-year availability.

No breakdown of the sources of funds comprising the State and local share of project costs is available. Although a financial statement, required to be submitted by each applicant for Hill-Burton aid, provides data on the applicant's financial resources, this information has not been summarized. To prepare such a summary is a time-consuming project of such proportions that it has not been undertaken.

However, a study has been made of the extent to which construction funds for nursing homes were obtained through loans identifiable on the project application as mortgage loans. Of 114 voluntary nonprofit nursing home projects approved during the years 1963 through 1965, a total of 61, or 54 percent, indicated mortgage loans as one means of financing their share of the project construction costs. Thirty of these projects were for completely new homes; the others were for additions to existing homes or for nursing home units of hospitals. Not all of the project sponsors reported details of their mortgage arrangements. Of those reporting the majority (58 percent) obtained their loans through banks or trust companies, although some obtained the loans through mortgage brokers or savings and loan associations.

The loans ranged in amount from $22,000 to $1,250,000 and averaged $457,000 over the 3-year period. Not all of the sponsors reported the interest rate paid or the maturity period of the loan. For those reporting, the loans were obtained for an average of 16 years with some, 23 percent, having loans of less than 10 years and a few, 10 percent, having loans with a maturity of 25 years. Interest rates averaged (unweighted) 5.61 percent, although one sponsor reported that a loan had been obtained at a rate as low as 4 percent.

Federal Housing Administration.—Mortgage insurance for the construction or remodeling of proprietary or private nonprofit nursing homes is made available through the Federal Housing Administration, an agency of the Department of Housing and Urban Development. Purchase of land and cost of site improvement and of certain nonresidential facilities such as recreational and social facilities, plus built-in fixtures and equipment, may be included in the mortgage. Homes obtaining this mortgage insurance must have a capacity of at least 20 beds and must present a certificate of need for the home from the State Hill-Burton agency. Through December 31, 1965, 364 nursing home projects for $213.4 million were insured by FHA to provide 33,159 beds.

Small Business Administration.—Under a program inaugurated in August 1956, the Small Business Administration makes commercial loans available to construct, expand, improve, or operate proprietary nursing homes whose dollar volume of receipts is not more than $1 million annually. The amount of the loan is limited by statute to $350,000 and may be either a direct loan or a participation loan jointly with SBA banks and other private lending institutions. A certificate of need for the facility must be obtained from the State Hill-Burton agency before the loan can be processed. As of December 31, 1965, a total of 506 applications had been approved by SBA for loans to sanatoria and convalescent rest homes. The cumulative amount of the loans totaled $36,763,000.

D. Needs and Prospective Capital Outlays

1. CAPITAL REQUIREMENTS

The capital requirements for long-term care facilities for the decade 1966–75 are:

	Millions
Backlog of unmet needs as of June 30, 1965	$3,186.3
Total additional requirements through June 30, 1975	3,044.0
Total estimated need	6,230.3

(*a*) Hill-Burton State plans for fiscal year 1966 provided the basic data—in terms of long-term care beds—for developing estimates of current capital needs for long-term care facilities. From these plans, national totals were derived for (1) total existing beds, (2) total beds needed, (3) beds to be modernized, and (4) beds needed over and above the present supply. Dollar estimates were obtained by applying an average cost of $10,000 per bed to the national estimates of beds to be modernized and additional beds needed. Experience under the Hill-Burton program has indicated that, on a cost-per-bed basis, there are relatively minor differences between the cost of new construction and the costs of modernizing obsolete facilities.

Projections of the costs of modernization and needed additional long-term care beds were based on the following assumptions and factors: (1) population growth, (2) a 3-percent obsolescence rate per year, or an assumption of a 33-year "life," (3) an annual increase in bed capacity at the average rate which has obtained over the past several years with a gradual lowering of the rate toward the end of the decade, (4) maintenance of the current estimated needs for beds in terms of beds per 1,000 population, and (5) maintenance of the estimated current volume of nonfederally aided construction for the early years of the decade with a gradual "leveling off," thereafter.

(*b*) The estimated capital needs (in millions) for long-term care facilities are as follows:

	Total	Modernization	Additional capacity
Backlog as of June 30, 1965	$3,186.3	$1,882.6	$1,303.7
Annual increments:			
1966	227.0	125.0	102.0
1967	242.0	138.0	104.0
1968	256.0	150.0	106.0
1969	273.0	165.0	108.0
1970	293.0	180.0	113.0
1971	312.0	195.0	117.0
1972	331.0	210.0	121.0
1973	351.0	225.0	126.0
1974	370.0	240.0	130.0
1975	389.0	255.0	134.0
Total, backlog plus increments	6,230.3	3,765.6	2,464.7

(*c*) It is not feasible to estimate the proportions of these needs by size of community.

(*d*) The proportion of the estimated capital outlays to be expended by non-Federal entities is 100 percent. There is no feasible method for breaking this down among the non-Federal entities.

Chapter 25

Community Mental Health Centers*

Background

Following a study of the findings and final report of the Joint Commission on Mental Illness and Health in early 1963, President Kennedy sent to the Congress his special message on mental illness and mental retardation. In that message the President asked for a bold new approach to replace the State mental hospital system with a system for providing comprehensive mental health services at the community level. This system would emphasize service which was short term and intensive rather than long term and custodial. It would also emphasize the prevention of mental illness through consultation and education, as well as the full rehabilitation of those who have been mentally ill. The community mental health center program is based on the belief that it will be possible to reduce substantially, within a decade or two, the number of patients who receive only custodial care in an institution—or who are not under treatment at all—when they could be helped by the application of one or more of the modern methods of dealing with emotional disturbances and the mental illnesses.

The community mental health centers program authorized in October 1963, under Public Law 88–164, title II (as amended in 1965 by Public Law 89–105), is designed to stimulate State, local, and private action to provide comprehensive mental health services in a community setting—close to the homes, families, and jobs of the mentally ill. These community centers will provide for the first time in the Nation's history the concentrated collaboration of services required for a concerted program of prevention, diagnosis, and treatment, of the mentally ill.

A. Nature and Composition of Centers

1. DESCRIPTION OF COMMUNITY MENTAL HEALTH CENTERS

(a) *General Physical Characteristics*

The community mental health center refers not to a physical facility but to the concept of a program of comprehensive mental health services available within, and easily accessible to, a local community. To make this definition more specific, three key terms "community," "comprehensive services," and "program" require elaboration.

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*Prepared by Dr. Martin A. Kramer, Chief, Community Mental Health Facilities Branch, National Institute of Mental Health, National Institutes of Health, Public Health Service, with minor editing by committee staff.

"Community" means all the people within that area, including the children and the aged, the rich and the poor, the residents and the transients, the healthy and the sick (whether the illness be mild or severe, acute or chronic).

"Comprehensive community mental health services" include inpatient, outpatient, partial hospitalization (at least day care), emergency, consultation and education, diagnostic, rehabilitation, precare and aftercare, training, and research and evaluation services.

All the services provided by a community mental health center must be tied together in a "program," and "program" is synonymous with "continuum of care." Such a program exists when patients, clinical information and professional staff can move easily and quickly from any one element of service to any other according to the needs of the patients. In effect, this establishes a "one-door" policy for mental health services, and the door must be open to any patient and to any qualified professional.

While the program demands a one-door policy, however, it does not require one roof. Indeed, it is possible for each of the services to be offered under separate auspices and in separate physical facilities.

(b) *Services Rendered and Performance Standards*

For the most part, the facility requirements for a community mental health center will vary widely along two dimensions: (*a*) the population served and its service utilization rate; and (*b*) the treatment program profile. The first dimension is self-evident. The second refers to the varying emphasis, from program to program, on each element of service. For example, one center might put a heavy emphasis on day care programs and attempt to move inpatients to the day care services whenever and as soon as possible. In this case there would be less need for inpatient beds and more for day care space. The relatively recent rapid developments in treatment techniques (for example, drug therapy) also affect the needs for physical facilities. For these reasons, the most commonly recurring theme in regard to architectural considerations for mental health centers is a stress on flexibility.

2. EXISTING CAPITAL PLANT IN THE UNITED STATES

(a) *Community Mental Health Centers*

As of this writing there are no existing community mental health centers consistent with the conceptual requirements outlined above. Thirty construction grant applications have been approved under the terms of the community mental health centers program (title II, Public Law 84–164, as amended by Public Law 89–105). Because of the construction lag time, however, the first "center" will open its doors early in the next year.

(b) *Other Mental Health Facilities*

Considering all mental health facilities, there is quite an extensive capital plant on which to build future community mental health centers. For example, there are approximately 1,050 general and specialty hospitals which admit psychiatric patients, and have about 25,000 beds for such patients. These, of course, are facilities and

do not bear a 1-to-1 correspondence to program resources. For example, one general hospital may admit patients for three services: inpatient, 24-hour emergency service, and day care. The double counting problem comes into focus here if we note that there are twice as many hospitals with psychiatric emergency service (2,108) as have psychiatric inpatient beds.

In addition, there are about 280 public mental hospitals with about 500,000 beds excluding those administered by the Veterans' Administration. Information as to the age of their facilities is not available. The potential future utility of these 280 hospitals in relation to community centers, however, is reflected in these facts:

*Only about one-third of the hospitals are located in relatively heavily populated areas.

*Less than one-third of the hospitals are accredited.

*Numerous hospitals in this group had their beginnings many years ago—53 of the hospitals were opened before the Civil War;

Another 102 of the hospitals were opened before the Spanish-American War.

Another 36 were opened before World War I.

By the end of the Second World War, the total reached nearly 240.

The facilities in many areas cannot be adapted to the concept of the community mental health center.

In addition to the public mental hospitals, there are 258 private mental hospitals with about 15,000 beds. Of these, about 95 are located within relatively heavily populated areas.

Apart from these hospital facilities there are also about 2,000 outpatient clinics. These are typically quite small in terms of facility and manpower resources though they do provide fairly extensive organizational resources.

B. Costs and User Charges

1. CONSTRUCTION COSTS AND OPERATING COSTS

(a) *Construction Costs*

The estimated cost of constructing one unit is $1,300,000. This estimate is based on the assumption that $18 per square foot would be the average construction cost in 1964–65 for the noninpatient facilities. The assumptions behind that assumption are that approximately—

Twenty-four percent of patients will utilize the inpatient service, which will require about 16 beds (Hill-Burton, $20,000 per bed, estimates were used);

Sixty percent of patients will utilize the outpatient services (some average "educational facility" costs were used);

Sixteen percent will utilize day-night care facilities (the costs of which were estimated to be approximately midway between the other two estimates).

Beyond these estimates, several other factors were considered: the average per square foot cost of research laboratories (which will appear in the average unit in varying degrees); the cost of emergency service facilities; the cost of rehabilitation facilities; the cost of parking lot construction; etc.

The difficulties involved in arriving at the average construction cost for a facility which houses at least 10 different functions in varying proportions to each other—and each requiring a different *kind* of construction—should be obvious. The average cost which finally evolved ($18 per square foot) was tested against the actual costs of several kinds of psychiatric facilities which were built in 1963 and 1964 in different parts of the country. This test demonstrated that the $18 estimate is reasonably accurate when equipment, furnishings, and architect fees are included.

(b) *Operating Costs*

It is estimated that the annual cost of operating one unit will be approximately $1,200,000 of which about 80 percent will be staffing costs.

The staffing pattern estimated for a one-half unit (an essential services center for a population of 100,000) would be as follows:

Type	Number	Cost
Total	72	$603, 000
Psychiatrists	6	135, 000
Psychologists	4	60, 000
Social workers	6	60, 000
Nurses	14	112, 000
Psychiatric aids	24	120, 000
Health educators	2	20, 000
Occupational therapists	2	16, 000
Supporting personnel (including EEG technicians, laboratory technicians, X-ray technicians, dieticians, practical nurses, and orderlies)	14	80, 000

Based on this pattern, it is estimated that the staff required for a full unit would probably number about 110, and the cost therefore would reach about $950,000. While these figures represent something of an ideal, the actual staffing patterns of the future are more likely to show fewer numbers of professionals; but with continually rising salaries and operational costs, the dollar figures shown above may remain fairly accurate.

2. USER CHARGES

In both the construction and operation of community mental health centers, there are of necessity many sources of support; the extent to which user changes will provide support, however, can not be estimated at present. While the major portion of the existing system of mental health care has rested on State support of the State mental hospital system, the new direction in mental health programs will require a large assumption of responsibility by local public and private agencies and by the Federal Government. At the same time, the States' financial responsibility will certainly continue, both because the States will have to maintain at least part of the State hospital system for an extended period of time, and because the States will be called upon to support the development of community programs.

Construction funds.—Because the bulk of the cost of mental health care was carried by the State hospital systems, many communities have been able to construct outpatient clinics, and a few have constructed inpatient facilities. The two types of achievement have been with and sometimes without Hill-Burton support. As the thrust

of the new program is toward centering all mental health services within communities, however, a much larger contribution toward the cost of operation will have to come from the communities.

For the relatively few construction grant applications approved thus far, construction support is to be borne by (*a*) Federal Government (average 50 percent), (*b*) State government (20 to 30 percent) and (*c*) local public and private funds (20 to 30 percent).

Sources of operating funds.—There are 25 States which provide State moneys to assist communities in assuming part (indeed up to 75 and 80 percent) of the costs of public mental health services (as through Community Mental Health Services Acts). Several other States are in the process of considering new legislation which would authorize similar support programs of their own. In large measure, of course, these represent new State expenditures—but it is anticipated that they also will begin to represent some redirection of State funds from the State hospital system to the new community care programs.

There is an encouraging movement among the Nation's health insurance carriers to liberalize the coverage of the treatment costs of mental illness. At the present time, substantial benefits are widely available for mental health services on an inpatient basis. The promising new developments lie in outpatient and partial hospitalization areas, though in these areas, too, two caveats must be added: Actual coverage of outpatient and partial hospitalization services at this time are extremely inadequate, and the high rising costs of health insurance may put such coverage out of the reach of too many people anyway. On the other hand, the 1964 contract agreement between the UAW and the automotive industries includes rather comprehensive mental health insurance coverage for the UAW members and their dependents (some 2.5 million people), the cost of which will be borne entirely by the employers. This agreement may set a precedent for rapid developments throughout the insurance industry. The major groups of the uninsured will then be the unorganized workers in the less industrialized and more service-oriented occupations.

While the per hour and per diem costs of treating mental illnesses have continued to rise (along with all medical costs), the new methods of short-term intensive treatment are making the per case costs gradually decrease. Hence, the percentage of costs which can be borne by patient fees—out of the patient's pocket or from third party payments—should continue to increase.

With the passage of Public Law 89–105 authorizing initial staffing grants for community mental health centers, a great many local programs will be able to get started. Once started, and once their value is demonstrated, the resources to keep them going are likely to be found.

C. Trend of Capital Outlays

As indicated above, there are at present no community mental health centers in operation, in terms of the comprehensive program envisaged. However, some of the existing mental health facilities as indicated below will be adaptable for use in the program.

Assumptions regarding use of existing resources. For many reasons, it is unlikely that more than one-half of the facility resources and administrative footholds presented by existing hospitals and clinics

will be used in community mental health center projects. The proportion is likely to be somewhat higher for existing general hospital and a selected few mental hospital inpatient units. For these purposes it is estimated that 600 such units will be used.

It can be further assumed that approximately 1,000 of the existing outpatient clinics will fit into community mental health center programs. As a community mental health center becomes more comprehensive—i.e., as it provides a greater range of services—more existing community resources will be potentially available. For example, existing rehabilitation facilities, recreation facilities, and residential facilities (for such as halfway houses) may be utilized in a comprehensive community mental health center. While it is not possible to either predict, or to attach a dollar value to, such potential developments, some allowance has been made for them by slightly inflating the probable value of the existing inpatient and clinic facilities. This inflation is reflected in the following figures on the dollar value for community mental health center purposes. It is estimated that each of the 600 inpatient facilities expected to be used in community mental health centers has a value of $325,000 in 1965.

It is further estimated that each of 1,000 clinic facilities to be used has a value of $100,000 in 1965.

D. Needs and Prospective Capital Outlays

Year-by-year estimates of capital requirements for community mental health centers, 1965–75, are presented below. The projections are based on the assumption that as the construction of comprehensive community mental health centers gets underway, existing inpatient and outpatient resources will be utilized to provide interim mental health services. These units will be eventually converted into comprehensive centers dispensing a broad range of mental health services: inpatient, outpatient, hospitalization, consultation-education, diagnostic, rehabilitation, etc. The program assumes the creation of a total of 2,200 comprehensive centers by 1975, serving a population of 220 million.

Projection of need for community mental health centers, 1966–75

Year	Amount [1] (millions)	Physical units	
		Changeover of existing facilities to centers	new construction
1966	$100	[2]	[2]
1967	130	[2]	[2]
1968	185	[2]	25
1969	209	91	60
1970	279	112	90
1971	301	131	115
1972	425	243	133
1973	422	260	140
1974	435	260	140
1975	448	260	140
Total	2,934	1,357	843
Total centers		2,200	

[1] Represents amounts obligated for construction each year, not completion dates of centers.
[2] Utilization of existing facilities while the construction program gets underway.

(*a*) *Factors taken into account in making projections.*—A physical unit for the purposes of this 10-year projection is a comprehensive community health center serving a population of 100,000. The average cost of constructing such a unit has been estimated at $1.3 million. It is assumed that most characteristics of any center (e.g., staff size and cost of construction) are linear with respect to population, so that a comprehensive center serving for example 200,000 people would be the equivalent, in terms of cost, of 2 units.

It is anticipated that the bulk of the early years' capital outlay will be applied to use of existing facilities. This is based on the assumption that it will take time for States to begin to shift capital expenditures from State hospitals to community centers and that in the interim it would be desirable to make at least the essential mental health services available to as many people as possible.

(*b*) Estimated capital needs on a per-year basis. (See above.)

(*c*) All of the community mental health centers envisaged will be located in cities with populations of 50,000 or more (each comprehensive mental health center is designed to serve a population of 100,000).

(*d*) The distribution of estimated capital expenditures for housing community mental health programs, 1966–75, is expected to be as follows:

	Percent
1. State governments or State agencies	50
2. Cities, counties, and local public authorities	
3. Private, nonprofit organizations	50
4. Proprietary or profitmaking organizations	

CHAPTER 26

Facilities for the Mentally Retarded*

Note: This chapter consists of two parts: I. Community Facilities for the Mentally Retarded and II. University-Affiliated Facilities for the Mentally Retarded.

I. COMMUNITY FACILITIES FOR THE MENTALLY RETARDED

INTRODUCTION

Mental retardation has been defined as impairment of ability to learn and to adapt to the demands of society.

The first step in developing programs for the mentally retarded in the United States was taken in 1848 by the opening of an institution in Massachusetts. Similar institutions were shortly established in New York, Pennsylvania, Ohio, Connecticut, and Kentucky. In 1876, a group founded what is today known as the American Association on Mental Deficiency.

Special education classes for the mentally retarded were established first in Providence, R.I., in 1896. These classes in public schools were, for the most part, for the mildly retarded. It was not until the 1920's that classes were introduced for the moderately retarded.

Parallel with developments in education for the retarded came new developments in the institutional field. Colonies were organized for the twofold purpose of moving part of the population in overcrowded institutions to cheaper quarters in rural areas and of utilizing the adult retarded for work on farms owned by the institutions and in domestic type jobs within the facility.

Public concern over the problem of mental retardation has increased sharply over the past 10 years. This concern was reflected by the appointment by President Kennedy in October 1961 of a panel of outstanding consultants with a mandate of preparing a national plant to combat mental retardation. The report of this panel, "National Action To Combat Mental Retardation," published in 1963, was instrumental in pushing the problems of this handicapping condition to the forefront of national interest and attention. From this interest has stemmed increased activity at all levels. The Mental Retardation Facilities and Community Mental Health Centers Construction Act, of 1963 (Public Law 84–164) authorizes grants for construction of research centers; grants for construction of community facilities for the care, treatment, and training of the mentally retarded; and assistance

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in the construction of clinical facilities providing specialized services for the retarded and the clinical training of physicians and specialized personnel needed in the program. A majority of States now have legislation making possible public schooling for the retarded and in some 40 States clinical programs for the retarded are available in public health departments. Increased interest and efforts of voluntary organizations should be added to these growing efforts of public agencies.

Most authorities agree that approximately 3 percent of the population, or about 5.8 million in 1965, would be classified as mentally retarded to some degree with about 126,000 additional being born each year.

A. Nature and Composition

1. DESCRIPTION OF THE FACILITIES

(a) *Physical Characteristics*

The term "facility for the mentally retarded" means a facility specially designed for the diagnosis, treatment, education, training, custodial care, or sheltered workshops for the mentally retarded. Such a facility may be under private ownership—voluntary nonprofit or proprietary—or under State or local governmental ownership.

It is difficult to describe the physical characteristics of buildings and equipment of facilities for the mentally retarded, since many of the programs are housed in buildings which have been converted from their former uses, as schools, churches, etc. Furthermore, the type, size, equipment, and other characteristics of new facilities will depend upon the scope and nature of the services provided, as well as the pattern of care on the State and local level.

Specially designed structures for the mentally retarded should create an environment appropriate to their particular needs. The functional requirements are often complex and may not always be compatible with the creation of an informal atmosphere of warmth and intimacy that is so desirable in these facilities. However, every effort should be made to eliminate any suggestion of an institutional character in the physical setting. In general, structures of one floor are preferable for ease of access and interior circulation and single-story buildings present a more intimate environment. Buildings as modest in size as function will permit; avoidance of rigid uniformity in planning; and skilled use of form, materials, and color will contribute to an informal atmosphere. This informality may be further enhanced by incorporating patios or landscaped areas in relation to the building. Architecturally, the buildings should recognize community standards and conform to applicable regulations, but the importance of an esthetic appearance cannot be overemphasized. Economical and efficient operation and maintenance of the facility is, of course, an important consideration in the total design.

Although programs for the metally retarded may be housed in many different kinds of buildings, there are four broad types of facilities: (1) Diagnosis and evaluation clinics—those providing diagnostic and evaluation services; (2) day facilities—those providing any or all elements of treatment, education, training, personal care, and sheltered workshop services for less than 24 hours per day; (3) residential facilities—those providing such services for a 24-hour period per day; and (4) group home facility—those providing group home or housing services for individuals being trained to live independently in the community and those who are employed within a community but need some type of minimal supervision.

(b) *Services Rendered*

The primary objective of all services for the mentally retarded should be to provide opportunities for each individual to attain his fullest potential. The types of services rendered, however, will be influenced by the number of individuals in various levels of retardation—mild, moderate, severe, and profound—and in age classifications such as children (preschool and school age) and adults. To meet the needs of the retarded as shown in chart I, taken from the report of the President's panel, and also to provide a continuum of care, widely varied services have been developed. Chart II shows both the variety and range of representative services needed by the retarded.

CHART I.—*Developmental characteristics of the mentally retarded*

Degrees of mental retardation	Preschool age, 0 to 5, Maturation and development	School age, 6 to 20, training and education	Adult, 21 and over, social and vocational adequacy
Profound	Gross retardation; minimal capacity for functioning in sensorimotor areas; needs nursing care.	Some motor development present; may respond to minimal or limited training in self-help.	Some motor and speech development; may achieve very limited self-care; needs nursing care.
Severe	Poor motor development; speech is minimal; generally unable to profit from training in self-help; little or no communication skills.	Can talk or learn to communicate; can be trained in elemental health habits; profits from systematic habit training.	May contribute partially to self-maintenance under complete supervision; can develop self-protection skills to a minimal useful level in controlled environment.
Moderate	Can talk or learn to communicate; poor social awareness; fair motor development; profits from training in self-help; can be managed with moderate supervision.	Can profit from training in social and occupational skills; unlikely to progress beyond 2d grade level in academic subjects; may learn to travel alone in familiar places.	May achieve self-maintenance in unskilled or semiskilled work under sheltered conditions; needs supervision and guidance when under mild social or economic stress.
Mild	Can develop social and communication skills, minimal retardation in sensorimotor areas; often not distinguished from normal until later age.	Can learn academic skills up to approximately 6th grade level by late teens. Can be guided toward social conformity.	Can usually achieve social and vocational skills adequate to minimum self-support but may need guidance and assistance when under unusual social or economic stress.

Source: U.S. Department of Health, Education, and Welfare. *Mental Retardation Activities of the U.S. Department of Health, Education, and Welfare*, Washington, D.C., U.S. Government Printing Office, July 1963, p. 2.

CHART II.—*Array of direct services for the retarded* [1]

Life stage	Components of special need						
	Physical and mental health	Shelter nurture protection	Intellectual development	Social development	Recreation	Work	Economic security
Infant	Specialized medical followup, special diets, drugs or surgery.	Residential nursery, child welfare services.	Sensory stimulation.				
Toddler	Home nursing, correction of physical defects, physical therapy.	Foster care, trained babysitter.	Nursery school	Home training, environmental enrichment.			
Child	Psychiatric care, dental care.	Homemaker service, day care.	Classes for slow learners, special classes—educable, special classes—trainable, religious education.		Playground programs.		
Youth	Psychotherapy	Short stay home, boarding school, halfway house.	Work-school programs, speech training, occupational training, vocational counseling.	Day camps, residential camps, youth groups, social clubs, personal adjustment training.	Scouting, swimming.		"Disabled child's" benefits, health insurance.
Young adult	Facilities for retarded in conflict.	Guardianship of person long-term residential care.		Marriage counseling.	Bowling	Selective job placement, sheltered employment, sheltered workshops.	Total disability assistance.
Adult		Group homes	Evening school	Social supervision			Guardianship of property, life annuity or trust.
Older adult	Medical attention to chronic conditions.	Boarding homes			Evening recreation		Old age assistance, OASI benefits.

[1] Not included are diagnostic and evaluation services, or services to the family; the array is set forth in an irregular pattern in order to represent the overlapping of areas of need and the interdigitation of services. Duration of services along the life span has not been indicated here.

Source: The President's Panel on Mental Retardation. *National Action to Combat Mental Retardation.* Washington, D.C., U.S. Government Printing Office, October 1962.

Among the more important services required in an overall program are the following:

Diagnosis and evaluation.—These services involve the diagnosis and evaluation of the individual; the appraisal of resources of the individual, his family, and the community; and the development of a plan to help the individual develop to the extent of his capabilities. An adequate and thorough diagnosis of all retarded persons is an essential service in any mental retardation program. Since all other services are largely dependent upon the quality of the diagnosis and evaluation services provided, these services are the keystone to the development of a complete array of services in any community.

Treatment.—These services include medical and appropriate related ancillary services and therapies to provide for the improvement of the individual: physically, psychologically, and socially. The importance of developing and maintaining adequate treatment services for the retarded is emphasized by the fact that a significant number of retardates have associated disabilities such as impaired hearing, difficulty in perceiving, impaired vision, poor muscular coordination, and physical deformities.

Education.—These services include curriculums of instruction geared to the needs of the mentally retarded at various levels of retardation and in different age groupings.

Training.—Included in these services are training in motor skills, self-help, and activities of daily living; vocational training; and socialization experience conducive to personality development.

Custodial care.—These services cover food, shelter, clothing, and medical care. Also included are special medical and nursing services directed at the prevention of regression in the retarded individual and stimulation of his maturation.

Sheltered workshops.—These services include vocational evaluation, training, and paid work experience.

(c) *Standards of Performance*

Uniform national statistics regarding mental retardation are very limited. In view of this, only gross estimates of the overall magnitude of the problem can be established. One such estimate may be derived through measures of intelligence. Experience has shown that most people with IQ's below 70 have difficulty in learning and in adapting to their environment. On this basis, it is estimated that about 30 per 1,000 population would score below this level. Based on the 1965 civilian resident population of 192 million, about 5.8 million persons would be affected. It should be borne in mind that large numbers of these people are classified in the mild category, and no special facilities or services are needed. In the best judgment of authorities in the field of mental retardation, the number of mentally retarded for which special facilities should be provided is not 30 per 1,000 population but closer to 10 per 1,000 population.

Some indication of the number being served in existing facilities for the mentally retarded may be obtained from information reported in 46 State plans. On the basis of this information, it appears that about 1.75 individuals per 1,000 civilian resident population are presently being served in existing facilities for the mentally retarded. Of the 46 States reported, the District of Columbia has the highest

ratio—4.53 per 1,000 population, and Florida has the lowest—0.29 per 1,000 population.

Construction projects under the Mental Retardation and Community Mental Health Centers Construction Act of 1963 must meet certain requirements established by regulation. Each facility, for example, is required to meet certain architectural standards to insure that the facility is fire safe, structurally sound, and so planned as to carry out effectively the proposed program.

(d) *Qualitative Standards of Performance*

At the present time there are no standards of performance for facilities for the mentally retarded that have been nationally adopted. No joint accreditation programs or procedures have been established such as those existing in the category of hospitals and related medical care facilities.

Some States have developed their own standards for the maintenance and operation of these facilities which may include provision for licensing.

Many of the institutions are owned and operated by the State and are under the supervision of State agencies specifically responsible for the care and treatment of the mentally retarded. Other facilities such as those for day care may be the responsibility of the public education authorities, while still others are operated by voluntary and religious organizations. Regardless of the sponsorship, some of the States exercise a significant degree of supervision over the quality and volume of care provided.

On the Federal level all Government agencies involved in this field are coordinating their efforts in providing guidance, recommendations, and financial assistance. These efforts are directed toward improved care through expanding programs in research and training, additional and more appropriately designed facilities, and greater concern for the individual retardate.

2. EXISTING CAPITAL PLANT IN THE UNITED STATES

(a) and (b) *Number of Facilities and Distribution by States*

Information is not yet available as to the total number of existing facilities for the mentally retarded in the United States. However, some indication of the number of facilities in which the mentally retarded are served may be obtained from the State plans relating to such facilities. Unfortunately, not all of the State plans have been received to date. On the basis of information presently available, it appears as though there are about 2,600 existing facilities in which the mentally retarded are served in the 46 States from which plans have been received.

Table 1 shows the distribution of the facilities serving the mentally retarded by State. As can be seen from table 1, California has the largest number of existing facilities in which the mentally retarded are served, with Pennsylvania and Massachusetts being next in order of magnitude of the 46 States reporting.

TABLE 1.—*Number of facilities in which the mentally retarded are served, based on data reported in 46 State plans*

Total	2,571	Montana	12
		Nebraska	(1)
Alabama	(1)	Nevada	4
Alaska	11	New Hampshire	8
Arizona	21	New Jersey	59
Arkansas	27	New Mexico	26
California	261	New York	83
Colorado	33	North Carolina	42
Connecticut	32	North Dakota	12
Delaware	(1)	Ohio	146
District of Columbia	15	Oklahoma	40
Florida	51	Oregon	37
Georgia	38	Pennsylvania	168
Hawaii	43	Rhode Island	8
Idaho	9	South Carolina	10
Illinois	95	South Dakota	8
Indiana	66	Tennessee	34
Iowa	68	Texas	87
Kansas	58	Utah	19
Kentucky	(1)	Vermont	(1)
Louisiana	58	Virginia	50
Maine	24	Washington	80
Maryland	54	West Virginia	20
Massachusetts	163	Wisconsin	100
Michigan	138	Wyoming	7
Minnesota	102	Puerto Rico	26
Mississippi	(1)	Virgin Islands	(1)
Missouri	118		

[1] Not available.

Source: Data compiled from State plans submitted under the requirements of title I, pt. C; of the Mental Retardation Facilities and Community Mental Health Centers Construction Act of 1963, Public Law 88-164.

(c) *Distribution of Facilities by Size of City*

There is considerable variation among States and territories in the distribution of facilities for the mentally retarded by size of city. In California, the largest proportion of such facilities are located in cities ranging in size from 10,000 to 49,999; whereas, in Pennsylvania, the largest number of facilities for the mentally retarded are situated in small towns (under 2,500). Table 2 presents the distribution of facilities by size of city based on information reported in the 46 State plans indicated in table 1. It should be noted that the distribution of facilities for the mentally retarded by size of city in which the facilities are located is not intended to represent the service area of the facility.

TABLE 2.—*Existing mental retardation facilities, by size of city*

Size of city	Number of facilities	Percent
Total reported	2,571	100.0
500,000 or more	240	9.3
100,000 to 499,999	421	16.4
50,000 to 99,999	290	11.3
10,000 to 49,999	797	31.0
2,500 to 9,999	428	16.6
Under 2,500	395	15.4

Source: Based on data compiled from State plans submitted under the requirements of title I, pt. C, of the Mental Retardation Facilities and Community Mental Health Centers Construction Act of 1963, Public Law 88-164.

(d) *Age of Facilities*

Data are not presently available concerning the age distribution of facilities for the mentally retarded. Since the first institution for the mentally retarded was opened in 1848 in Massachusetts, many of the existing facilities were probably built in the late 1800's or early 1900's.

(e) *Ownership*

Table 3 shows the distribution of existing facilities in which the mentally retarded are served by ownership. It will be noted that almost half of the facilities are owned by nonprofit organizations with proprietary organizations being next in order of ranking. This distribution is based on information reported in the State plans of the 46 States reporting.

TABLE 3.—*Existing mental retardation facilities, by type of ownership*

Type of ownership	Number of facilities	Percent
Total reported	2,571	100.0
State government	288	11.2
Cities, counties, towns	353	13.7
Nonprofit	1,202	46.8
Proprietary	460	17.9
Not identified as to ownership	268	10.4

Source: Based on data compiled from State plans submitted under the requirements of title I, Part c, o the Mental Retardation Facilities and Community Mental Health Centers Construction Act of 1963 Public Law 88-164.

(f) *Current Value*

Information is not available on the current value of existing facilities for the mentally retarded. Furthermore, it would be extremely difficult to arrive at a reasonable estimate in the near future, since many of the facilities are shared with other programs and it would be necessary to appraise each facility to determine the proportionate share of the current value of the facility. A review of the literature reveals that no surveys concerning this problem have been conducted on a national level.

B. Costs and User Charges

1. CONSTRUCTION COSTS AND OPERATING COSTS

(a) *Construction Costs*

A precise estimate of construction costs for facilities for the mentally retarded requires a detailed knowledge of the specific conditions which exist. The many variables that are involved quite obviously are reflected in the cost of a facility. The function of the building and the requirements of its operational program, the type and method of construction, quality of materials and workmanship, nature and extent of furnishings and equipment, as well as the price range for labor and materials in various geographical areas and under certain market conditions are some of the major factors that significantly influence any determination of construction costs. Recognition of the variables which may be involved suggests that a range of costs for construction in each category should be considered. In this connection, the follow-

ing estimates are made based on previous experience and records available. Data are not available on a per-person-served basis.

TABLE 4.—*Range of approximate costs*

Type of facility	Cost per square foot	
	Construction and fixed equipment	Movable equipment
Diagnosis and evaluation clinics	$20–$30	$5
Day facilities	16– 23	4
Residential facilities	18– 25	4

(b) *Maintenance and Operation Expenses*

Information is not available regarding expenditures for maintenance and operations for all facilities for the mentally retarded. Furthermore, much of the information which is available is fragmentary and inconclusive. Some indication of the trend of expenditures for maintenance and operations, however, may be seen from available data for public institutions for the mentally retarded for the period 1956 through 1965. On the basis of these data, it appears as though the aggregate amounts expended for maintenance and operations have been increasing significantly from 1956 to 1965. Table 5 presents the available information by year. Separate data on the wage and salary bill in general, or on the wage bill for custodial personnel in particular, are not available.

TABLE 5.—*Expenditures for maintenance of public institutions for the mentally retarded, United States, 1956–65*

[Thousands of dollars]

Year:	*Total expenditures for maintenance* [1]
1956	$168, 851
1957	190, 316
1958	214, 813
1959	234, 715
1960	266, 237
1961	288, 386
1962	324, 071
1963	353, 575
1964	391, 764
1965	439, 350

[1] Includes salaries and wages; purchased provisions; fuel, light, and water; and other maintenance.

Source: U.S. Department of Health, Education, and Welfare, Public Health Service, National Institute of Mental Health.

Costs per resident day have also risen for public institutions for the mentally retarded. Table 6 shows the cost per resident for 6 years.

TABLE 6.—*Maintenance expenditures per day per resident patient, public institutions for the mentally retarded*

Year:	
1956	$3. 19
1958	3. 86
1960	4. 51
1962	5. 07
1964	5. 89
1965	6. 36

Source: 1956–65, U.S. Department of Health, Education, and Welfare, Public Health Service, National Institute of Mental Health.

2. USER CHARGES

Data are not available on user charges for all facilities for the mentally retarded, and it is not known to what extent user charges are employed to pay for services, occupancy or use of these facilities. Undoubtedly, there is wide variation in user charges among different types of facilities and among States. Some indication of average charges in residential facilities, day facilities, and State institutions may be obtained from information presented in the "Directory for Exceptional Children," published by Porter Sargent, Boston, Mass., in 1965. Based on information reported for 203 privately operated residential facilities (voluntary nonprofit and proprietary), the average charge approximated $2,300 per year. For a reported 164-day facilities, also under private ownership, the annual charge averaged about $500. Charges for a total of 61 State-owned institutions, all identified as primarily residential facilities, averaged approximately $1,200 per year. It will be noted that the average charge in private residential facilities is about double the average charge in State institutions. No explanation is offered in the source document, but it appears that the charges in the State institutions are largely based on ability to pay. This, for the most part, would probably account for the difference. In view of these and other limitations, extreme caution should be exercised in interpretation and use of these data.

In terms of the total group of community facilities for the mentally retarded, it is not possible to state the extent (in percentage terms) to which the costs of the facilities and structures are met out of the general tax resources and general obligation borrowings of State and local governments.

C. Trend of Capital Outlays

Information is very limited pertaining to capital outlays for facilities for the mentally retarded. In fact, the only information presently available is the amount expended for additions, improvements and other capital expenditures of public institutions for the mentally retarded, and the amount expended for projects for the mentally retarded under the Hill-Burton program.

As can be seen from table 7, expenditures for additions, improvements, et cetera, ranged from $27 million in 1961 and 1962 to about $42 million in 1963. This, of course, is only a small part of the total capital outlays since it only includes public institutions for the mentally retarded, and it excludes the initial amount expended for construction of the existing facility.

TABLE 7.—*Additions, improvements, and other expenditures of public institutions for the mentally retarded*

Fiscal year:	*In thousands*
1960	$31, 292
1961	27, 027
1962	27, 434
1963	41, 816
1964	33, 710

Source: U.S. Department of Health, Education, and Welfare, Public Health Service, National Institute of Mental Health.

In addition to the information on expenditures of public institutions for the mentally retarded, data are also available on the 70 projects approved under the Hill-Burton program for the mentally retarded. As will be noted from table 8, the total capital outlay for these projects is about $83.8 million with the Federal share amounting to $24.5 million. The largest capital outlay occurs for projects approved in 1964 and 1965 when over half of the total capital outlay was obligated. Table 8 shows the number of projects, total cost, and Federal share, by year.

TABLE 8.—*Capital outlay for projects approved under Hill-Burton program for the mentally retarded*

[Dollars in thousands]

Fiscal year	Number of projects	Total cost	Federal share
Total	70	$83,755	$24,529
1958	1	508	43
1959	4	1,537	774
1960	8	7,517	2,318
1961	13	7,126	2,989
1962	9	11,435	5,146
1963	8	8,108	3,552
1964	8	22,140	3,306
1965	17	23,154	5,677
1966 (6 months)	2	2,230	724

It should be noted that there may be some overlap between the data presented in tables 7 and 8 for 1960–64. However, information is not available to determine the extent of the overlap, if any.

Obviously, it is not meaningful to attempt any trend analysis of data on capital outlays, because of the fragmentary information. However, it does appear that capital expenditures for facilities for the mentally retarded have been increasing significantly since 1960.

The only available information on sources of financing for capital outlays is for the projects approved under the Hill-Burton program. Of the 70 projects shown in table 8, 55 projects or 79 percent were reported under State ownership. This accounts for the fact that about three-fourths of the applicants' share was obtained from appropriations from State governments. Of course, it is not possible to generalize about the sources of financing for all capital outlays for mental retardation, but it does seem that the Federal and State Governments have been the main source of financing in the building of facilities for the mentally retarded.

D. NEEDS AND PROSPECTIVE CAPITAL OUTLAYS

1. CAPITAL REQUIREMENTS

The capital requirements for community facilities for the mentally retarded during the decade 1966–75 are as follows:

	Millions
Backlog of unmet needs as of June 30, 1965	
Total additional requirements through June 30 1975	$3,016.9
Total estimated need	

(a) As previously mentioned, national statistics regarding community facilities for the mentally retarded are very limited. In view of this, only gross estimates of capital requirements for these facilities can be made, and care should be exercised in their use.

Additional requirements were estimated on the basis of the annual increase in population and appropriate allowance for replacing obsolete facilities, which were translated into costs.

(b) The estimated capital needs for community facilities for the mentally retarded are as follows:

	Millions
Backlog as of June 30, 1965	
Annual increments:	
1966	$251.4
1967	260.4
1968	268.4
1969	278.9
1970	292.2
1971	305.7
1972	319.3
1973	333.1
1974	346.8
1975	360.7
Total	3,016.9
Total, backlog and annual increments	

(c) Facilities for the mentally retarded frequently serve areas much larger than the immediate community in which they are located. In view of this, it is not possible to estimate the distribution of need by size of community. It is expected, however, that most facilities will be located in areas of greater than 50,000 population.

(d) The proportion of the estimated capital outlays to be expended by non-Federal entities, is 100 percent. There is no feasible method for breaking this down among the non-Federal entities.

II. UNIVERSITY-AFFILIATED FACILITIES FOR THE MENTALLY RETARDED

A. Nature and Composition

Because of the importance placed upon the needs for trained specialized personnel for the mentally retarded, the Congress approved part B, title I, of the Mental Retardation Facilities and Community Mental Health Centers Construction Act of 1963 (Public Law 88–164), which provides Federal grants for the purpose of assisting colleges, universities, or hospitals affiliated with a college or university to construct clinical facilities with a full range of inpatient and outpatient services.

1. DESCRIPTION OF THE FACILITIES

(a) *Physical Characteristics*

Structures, generally, are multistory and in some instances, additions, extensions, or remodeled space in existing buildings may be involved. Special consideration must be given to fire safety, structural, mechanical, and electrical aspects in meeting specific require-

ments and at the same time, provide a measure of flexibility for possible future expansion of the structure for training programs. To a degree, the teaching methods will dictate that planning includes space and facilities for lecture rooms, conference rooms, demonstration areas, and direct or audiovisual observation. Consideration must be given for the provision of space for comprehensive day care services for the clinical population selected for teaching programs. These services include diagnosis, evaluation, training and education, as well as recreation. When required by the project program, space will be provided for residential care of short-term inpatients, and living accommodations for their parents may also be included. Faculty and student space will comprise offices, study rooms, conference rooms, libraries, and research areas. Support space for such purposes as administration, lobbies, waiting areas, toilets, lockers, and maintenance is a necessity.

(b) *Services Rendered*

Services rendered to the mentally retarded are primarily clincial and diagnostic in nature which demonstrate the "continuum of care" in the selecting, blending, and using in proper sequence the medical, educational, and social services required by the retardate to minimize his disability in every point of his life span. The kinds and types of services rendered will be influenced by the types of the clinical population in the various levels of retardation—mild, moderate, severe, and profound. The availability of professionals qualified to teach and train students in the most advanced practices of their respective professions, will also have an impact on service. The services rendered to the mentally retarded bear a direct relationship to the training programs and to the clinical practices used for teaching demonstration purposes.

(c) *Standards of Performance*

Professional training programs in mental retardation are not subject to the accreditation programs of any national body. As above indicated, institutions are expected to enforce qualitative as well as quantitative standards of practice and service to the mentally retarded.

2. EXISTING CAPITAL PLANT IN THE UNITED STATES

In 1965 no facilities or structures were in existence of the type envisioned by the legislation.

B. Costs and User Charges

As previously indicated, no projects have been completed to date, therefore, no current or accurate data are available to provide any precise estimate of cost for training facilities; however, a gross estimate by applicants on 10 recently approved projects ranges from $30 to $40 per square foot for total cost, which includes architectural fees, initial equipment, and other associated construction costs. All structures are of longtime durability, and applicants are required to secure an interest in the site sufficient to assure the undisturbed use and possession of the land for 50 years and to assure the Federal Govern-

ment that the facility will continue to be operated as a nonprofit facility for training of specialized personnel for the mentally retarded for a period of not less than 20 years.

1. CONSTRUCTION COSTS AND OPERATING COSTS

Accurate information is not available regarding expenditures for maintenance of these facilities for the reason that none are presently in existence. Due to the varying scope of programs, a range of construction costs or of maintenance and operation costs is not very meaningful. However, of the 13 projects approved up till late July 1966 (to provide university-affiliated facilities for the mentally retarded), the total capital cost per facility has ranged from below $1 million to above $5 million. It has been estimated that the operating cost for such a facility is approximately 75 percent as much *in a single year* as the *total capital cost.* (NOTE.—The total capital cost does not mean simply the depreciation allocated to a single year. It means the total regardless of the number of years over which it might be written off.)

2. USER CHARGES

Data are not available on user charges for any approved training facility for the mentally retarded. It is believed that tuition and other charges to the trainees will constitute a minor part of the expense of occupancy and use of these facilities. Likewise, charges for patient care are made nominal due to the low socioeconomic group normally being served, and the fact that, to a degree, inpatients as well as outpatients are admitted on a selective basis to provide proper training opportunities for trainees.

Since it is anticipated that a majority of approved facilities will be located at State universities and State owned and operated medical schools, the requirement for matching funds is met out of general tax resources and/or general obligation bonds of State governments.

C. TREND OF CAPITAL OUTLAYS

No information is presently available to show the amount of annual capital outlays for the mentally retarded by State governments. It is safe to say that universities have been conducting effective training programs for the mentally retarded particularly in special education, social work, psychology, etc. No basis exists for an estimate of these capital outlays.

D. NEEDS AND PROSPECTIVE CAPITAL OUTLAYS

1. CAPITAL REQUIREMENTS

The capital requirements for the university-affiliated facilities for the mentally retarded for the decade 1966–75 are:

Requirements through June 30, 1975	$327, 000, 000

(a) The projection of the needs was based on experience gained in projects which have been approved as of this date. Due to the prevalence of mental retardation in the general population and the expected

population growth, estimates were made on the basis that, as a minimum, the kind and type of facility envisioned by this legislation should be made available to all of the medical schools in the country. Additionally, training programs which emphasize training in the educational and social aspects of mental retardation with limited training in medical diagnosis and evaluation are also considered necessary to provide the manpower resources needed for the mentally retarded.

(b) The estimated capital annual needs for university-affiliated facilities for the mentally retarded are:

Annual increments 1966–75:	*Millions*
1966	$13.5
1967	13.5
1968	20.0
1969	40.0
1970	40.0
1971	40.0
1972	40.0
1973	40.0
1974	40.0
1975	40.0
Total	327.0

(c) Since, as indicated, approved facilities will be located at institutions of higher learning, it is expected that all approved facilities will be located in metropolitan centers of 50,000 population or more.

(d) The proportion of the estimated capital outlays to be expended by non-Federal entities, is 100 percent. There is no feasible method for breaking this down among the non-Federal entities.

Chapter 27

Health Research Facilities*

A. Nature and Composition of Health Research Facilities

1. Description of Health Research Facilities

(a) *General Physical Characteristics*

Structure and equipment: Structures constructed under the health research facilities program, consist of modern, equipped research laboratories. Most of the laboratories contain laboratory work benches for the researchers, cabinets, tablets, outlets for gas, electricity, water and suction, the arrangement, spacing and equippage of which are suited to the particular discipline of research. For example, a laboratory for biomedical research will be structured quite differently from a laboratory designed for research in anatomy. While some movable laboratory equipment will be contained in each laboratory, larger, more expensive, highly specialized equipment such as spectrophotometers, recording and monitoring equipment, sterilizers, X-ray equipment, etc., will generally be located in a centralized area serving the core needs of several researchers, frequently of different disciplines.

In addition to these types of laboratories, there are those for highly specialized purposes which may bear little or no resemblance to the types just described. These would include biotrons in which tropical, arctic, or any intermediate atmospheric condition can be simulated; high altitude chambers for studies of man's reaction to the stresses of flight in space; hyperbaric chambers, isolation systems, biomedical engineering laboratories, cold rooms, special purpose animal facilities, radioactive chemical and counting rooms, special electronic monitoring systems, specialized clinical research centers, laboratories for electron microscopy, etc. Health research facilities today must be constructed with many built-in features which were not done in facilities of 20 years ago. Today, a facility must be readily adaptable to the swift changes of direction in research. Sufficient electrical power must be provided; special air conditioning and environmental control must be built into the facilities; core laboratory arrangements for efficient research design must be arranged. With the trend for large-scale, complex laboratories, capable of serving not only several disciplines, but entire departments, the design of modern research laboratories has become a new architectural and engineering speciality, one in which the scientist and the architect are only beginning to work constructively together and to understand each other's problems.

*Prepared by Dr. Francis L. Schmehl, Chief, Health Research Facilities Branch, Division of Research Facilities and Resources, National Institutes of Health, with minor editing by committee staff.

(b) *Services Rendered*

As facilities for research and training in the health-related sciences, the *services*, must be expressed in terms of modern, efficient laboratory facilities. In turn, these facilities provide the basic undergirding for research and the quest for knowledge into the diseases of man by professional research workers and their technical assistants. Pursuit of this research provides the promise of scientific discoveries and medical and surgical techniques which will bring superior care and services to the sick of the future than what is possible today.

(c) *Standards of Performance*

Quantitatively, the health research facilities program today is providing an average of about 200 net square feet of laboratory space per professional research worker, postdoctoral research fellow and trainee, graduate student, technician, and ancillary assistant.

(d) *Qualitative Standards of Performance*

The facilities are designed not only for advanced research of today but for adaptation to the changes in direction of future research. It is estimated that the structures and fixed equipment will possess a lifespan (replacement cycle) of 50 years and require some type of remodeling about every 16 to 17 years, or twice during their existence. Movable equipment is given a lifespan of from 5 to 15 years, depending on the durability and obsolescence-ratio of the equipment.

2. EXISTING CAPITAL PLANT IN THE UNITED STATES

General: Definitive data on the capital plant in the United States is not available. Information supplied below relates only to that segment of the capital plant participated in under the Federal health research facilities construction program.

As of December 31, 1965, there were 760 facilities in existence that were financed under the health research facilities program. In addition, 186 facilities were under construction; financing for 99 other projects had been completed, but construction had not yet begun.

The following tables show the distribution of the federally aided facilities by States and by population size of city:

Number of completed health research facilities projects by region and State, as of Dec. 31, 1965

Region and State	Number of projects
Total	760
New England	102
Maine	7
New Hampshire	4
Vermont	4
Massachusetts	63
Rhode Island	10
Connecticut	14
Middle Atlantic	153
New York	83
New Jersey	20
Pennsylvania	50
East North Central	150
Ohio	37
Indiana	22
Illinois	51
Michigan	19
Wisconsin	21
West North Central	94
Minnesota	30
Iowa	20
Missouri	19
North Dakota	5
South Dakota	1
Nebraska	6
Kansas	13

Number of completed health research facilities projects by region and State, as of Dec. 31, 1965—Continued

Region and State	Number of projects
South Atlantic	78
Maryland	15
District of Columbia	7
Virginia	6
West Virginia	4
North Carolina	17
South Carolina	2
Georgia	11
Florida	16
East South Central	35
Kentucky	7
Tennessee	16
Alabama	9
Mississippi	3
West South Central	31
Arkansas	2
Louisiana	6
Oklahoma	8
Texas	15
Mountain	38
Montana	4
Idaho	1
Wyoming	1
Colorado	13
New Mexico	5
Arizona	9
Utah	4
Nevada	1
Pacific	78
Washington	22
Oregon	11
California	43
Hawaii	2
Puerto Rico	1

Number of completed HRF projects as of Dec. 31, 1965, by population size of city (population data based on 1960 census)

	Number of projects
Total	760
Under 2,500	30
2,500 to 9,999	38
10,000 to 49,999	169
50,000 to 99,999	45
100,000 to 499,999	207
500,000 or more	271

According to estimates of the Association of American Medical Colleges, more than half of the medical school basic science buildings in use were built before 1930 and almost one-fourth were constructed prior to 1905. Others have estimated that 40 percent of existing research facilities in institutions of higher education are more than 20 years old.

(e) Facilities now in operation owned by:

(1) State government or State agency (2) City, county or public authority	352 408
(3) Private, nonprofit organization	
Total	760

(f) Estimated current value of facilities, December 31, 1965: $460 million.

B. Costs and User Charges

1. CONSTRUCTION AND OPERATING COSTS

Experience under the health research facilities construction program indicates the following costs:

(a) Standard unit of measure (as of 1965):

New construction, approximately $65 per net square foot.

Renovation, approximately $45 per net square foot.

(b) Current range of typical annual maintenance and operating expenses:

It is conjectured that the annual maintenance and operating expenses over the Nation may range between $1 and $1.50 per gross square foot. Factors which affect such costs are the research purposes and types of facilities constructed; the geographical location of the facilities and the climatic conditions affecting them; wage differentials in the areas containing the facilities.

2. USER CHARGES

It is conjectured that the grantees' user charge (utilities only) over the Nation may range between $0.25 and $0.50 per gross square foot. Factors which affect such costs are the research purposes and type of facilities constructed; the type of equipment contained therein; the geographical location of the facilities and seasonal climatic variations affecting them (e.g., air conditioning and heating); utility rate variations over the country; labor cost differentials from one area to the next. None of the facilities are rented or leased.

C. Trend of Capital Outlays

The following capital outlays were made under the federally aided health research facilities program:

Trend of annual capital outlays, health research facilities program, fiscal years 1957–66

[Dollar amounts in millions]

Fiscal year	Number of awards	Cost of facility	Federal HRF portion
1957	106	$68	$28
1958	174	77	29
1959	199	75	30
1960	158	78	29
1961	138	79	31
1962	97	80	31
1963	172	115	47
1964	122	127	53
1965	115	115	50
1966 [1]	49	78	33
Total	1,330	892	361

[1] 6 months, through Dec. 31, 1965.

The following table shows the type of grantee during the years 1957–65:

Accounting of annual capital outlays under title VII A of HRF program

[In millions of dollars]

Type of grantee	Total	Grantee share	Federal HRF share
(a) State governments or State agencies	[1] 398	[1] 237	161
(b) Cities, counties, public authorities			
(c) Private, nonprofit organizations	[1] 494	[1] 294	200
Total	892	531	361

[1] Estimated.

SOURCES OF FINANCING ANNUAL CAPITAL OUTLAYS

A sample of 50 health research facilities projects provided the following percentages of resources for meeting the grantees' construction costs. These percentages pertain to *total* construction costs of which the health-related research portion (Federal and non-Federal shares) represents approximately half.

	Percent
(a) State appropriations	31.2
(b) Gifts, bequests, donations, drives	14.9
(c) Federal-HRF program	25.1
(d) Other Federal programs	[1] 4.5
(e) State grants-in-aid	-----
(f) Tax-exempt municipal bonds (public)	-----
(g) Capital flotations (private)	.2
(h) Federal-Government loans	-----
(i) Grantees' funds	24.1
Total	100.0

[1] Not eligible for matching under the HRF program.

D. Needs and Prospective Capital Outlays

Year-by-year estimates of 1966–75 capital requirements for health research facilities and structures are presented below. These estimates are based on related projections of research expenditures, graduate enrollment, Ph. D. output in sciences related to health, and postdoctoral training; they assume a backlog of needs amounting to $500 million as of June 30, 1965. While primarily reflecting program needs of the health research facilities program, the projections assume some additional, though limited, non-Federal investments beyond those used for matching purposes under Federal programs.

Projections of health research facility needs, 1966–75 [1]

Year	Amount (millions)	Area (net square feet)
1966	$170	3,200
1967	336	5,500
1968	326	5,300
1969	323	5,300
1970	334	5,300
1971	388	6,000
1972	461	6,700
1973	482	6,900
1974	496	7,000
1975	497	6,900
Total	3,813	58,000
Backlog, June 30, 1965	500	-----
Grand total	4,313	

[1] Limited to the public (non-Federal) and nonprofit sector.

The $4.3 billion total reflects the research facilities of those public and nonprofit institutions presently eligible to participate in the health research facilities program.

The public (non-Federal) and nonprofit sector currently accounts for more than three-fifths of all professional workers engaged in research and health-related research. It is estimated that by 1975,

70 percent of the investigators in medical research will utilize the laboratory and clinical facilities of institutions of higher education, hospitals, research institutes. In addition, this sector is responsible for the training of postdoctoral fellows and graduate students. For this activity, the creation of expanded research facilities and the renovation of outmoded space will be necessary to accommodate an additional 50,000 persons to be trained in the 1966–75 decade.

This sector's needs for a $4.3 billion program compares with a projected need for the next decade of about $500 million for the enlargement of facilities for medical research owned and operated by agencies of the Federal Government and for facilities owned by industrial performers of medical and health-related research.

The Nation's total needs for the 1966–75 period are thus about $4.8 billion.

(a) Factors taken into account in making projections for the public (non-Federal) and nonprofit sector:

The primary factors determining future requirements for health research facilities are (1) the space required to conduct health-related research; (2) the space requirements for research training; and (3) the requirements for renovation and replacement of existing space.

Estimates of additional space needs for the conduct of research have been derived from estimates of the future growth of health research and the research manpower required to man these future levels of research activity. The single most important determinant of the growth of medical and health-related research is that of national policy as reflected in the actions of the Federal Government. The impact of such policy decisions is well illustrated by the fact that Federal funds now account for almost two-thirds of the Nation's total expenditures for health research.

The estimated needs for housing the continuing expansion of research training programs are based upon NIH projections of graduate enrollment and Ph. D. output in the sciences related to health; M.D. output; increasing numbers of postdoctoral research fellows and trainees engaged in advanced research training.

In addition to new space to accommodate the growing programs of research and research training, provision must be made for replacement and renovation at levels which will maintain the usefulness and efficiency of existing space for the conduct of modern research and research training programs. In projecting requirements for this purpose an attempt has been made to assess realistically the high rate of obsolescence characteristic of health research facilities in the nonprofit sector because of the necessary accommodation to rapid advances in scientific technology, instrumentation, and architectural design.

In relating the year-by-year projections of required health research space to financial projections, careful attention has been given to the matter of leadtime between obligation of construction funds and the completion and availability of the space being constructed. Estimates of this timelag are derived from the health research facilities program experience, and from NIH analysis of institutional responses to the recent National Science Foundation facilities survey.

The basic projections rest on conservative assumptions that (*a*) currently used standards of research space per professional worker will

continue to be appropriate throughout the projection period, and (*b*) there will be no further change in the ration of nonprofessional to professional research workers beyond the rise from 1.5:1 to 2:1 which is assumed to occur beginning in 1968.

However, the growth of medical research, particularly in the past 10 to 15 years, has been characterized by increasing complexity, dynamic change, and rapid advances in scientific technology; new requirements for complex utilities and laboratory design; new research equipment, instrumentation and other highly specialized research resources; and increasing demands for training and utilization of technical specialists and other nonprofessional supporting staff. Predictable acceleration of change in the years ahead may necessitate additional increases in both the amount of space needed per research worker, and the ratios of nonprofessional to professional staff.

(b) Estimated capital needs on a per year basis. See item D–1.

(c) Distribution of estimated needs by size of town or city:

Based on an assessment of the current distribution of health research facilities projects, and taking into account accelerating trends toward increased urbanization, it is estimated that in excess of 90 percent of the total estimated facility needs projected above will accrue to cities with populations of 50,000 or more. Cities and towns with populations of 2,500 to 50,000 will probably account for an additional 8 percent, with the remainder—2 percent—accruing to agricultural-rural areas and cities and towns with populations under 2,500. (For the purposes of this analysis, students enrolled at institutions of higher education are counted in the population of the cities where the educational institution is located.)

(d) The distribution of estimated capital expenditures (of the $4.8 billion total) among public and private organizations is assumed, in general, to follow current allocations of funds for facilities in the public (non-Federal) and nonprofit sectors.

	Percent
1. State governments or State agencies 2. Cities, counties, and local public authorities	40
3. Private, nonprofit organizations	50
4. & 5. Other	[1] 10

[1] See discussion under D–1.

CHAPTER 28

Medical and Other Health Schools*

This chapter consists of eight parts, each dealing with a type of school providing professional training in the health field. The eight parts cover (I) medical schools,[a] (II) dental schools,[b] (III) schools of nursing,[c] (IV) optometry schools,[d] (V) osteopathic schools,[e] (VI) pharmacy schools,[f] (VII) podiatry schools,[g] and (VIII) schools of public health.[h] As will be noted, a number of these "health" schools are part of, or attached to, institutions of higher education and conceivably the capital plant of these schools may be regarded by the institutions as part of their capital plant.

I. Medical Schools

A. Nature and Composition

1. DESCRIPTION OF FACILITIES

(a) *General Characteristics*

Medical educational facilities provide space for three interrelated activities—teaching, patient service, and research. In general, teaching during the first 2 years is centered in the medical sciences buildings; during the third and fourth years, it is centered in the patient care facilities of the teaching hospitals. Research is an integral part of the activity of faculty and students in all 4 years and requires special facilities.

Great variation exists among schools in the nature and extent of each of these activities. Teaching may be limited almost entirely to the

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*Each of the parts of the chapter was edited by committee staff as needed.

[a] Prepared by the Division of Hospital and Medical Facilities, Public Health Service, Department of Health, Education, and Welfare.

[b] Prepared by the Manpower and Education Branch, Division of Dental Health, Bureau of State Services, Public Health Service, Department of Health, Education, and Welfare.

[c] Prepared by the Division of Nursing, Bureau of State Services, Public Health Services, Department of Health, Education and Welfare.

[d] Prepared by the Division of Hospital and Medical Facilities, Public Health Service, Department of Health, Education, and Welfare.

[e] Prepared jointly by the Council on Federal Health Programs of the American Osteopathic Association and the Division of Hospital and Medical Facilities, Public Health Service, Department of Health, Education, and Welfare.

[f] Prepared jointly by the American Association of Colleges of Pharmacy and the Division of Hospital and Medical Facilities, Bureau of State Services, Public Health Service, Department of Health, Education, and Welfare.

[g] Prepared jointly by the Council on Education of the American Podiatry Association and the Division of Hospital and Medical Facilities, Public Health Service, Department of Health, Education, and Welfare.

[h] Prepared by the Division of Hospital and Medical Facilities, Public Health Service, Department of Health, Education, and Welfare.

instruction of medical students, perhaps only in the first 2 years, or may include graduate students in the basic sciences, postdoctoral fellows, hospital house staff, nursing and dental students, and others in related health professions. Research services may be at a minimal level consistent with adequate teaching or may be so extensive as to occupy a major portion of the school's effort and the physical plant. Increasingly, the teaching of medical students is carried on in close conjunction with graduate teaching programs in the basic sciences, with the training of hospital house staff in the clinical years, and with other educational activities of the medical school and its parent university.

(b) *Services Rendered*

Although there is variation from year to year in source of students, they come from all the States, most of the territories, and Canada, and a few come from each of many foreign countries. The accompanying table gives some idea of the magnitude of the educational effort, and it can be stated that the graduates from these schools (augmented by graduates of foreign facilities) provide medical care for the population of the Nation. Some foreign students (although precise data are not available) return to their native land to practice their newly acquired medical skills.

Schools, students, and graduates in the medical and basic medical science schools, 1945–65

Year	Schools	1st year	2d year	3d year	4th year	Graduates
1945–46	77	6,060	5,750	5,751	5,655	5,826
1946–47	77	6,564	5,575	5,767	5,994	6,389
1947–48	77	6,487	5,758	5,154	5,340	5,543
1948–49	78	6,688	6,194	5,702	5,086	5,094
1949–50	79	7,042	6,344	6,079	5,638	5,553
1950–51	79	7,177	6,690	6,263	6,056	6,135
1951–52	79	7,436	6,864	6,577	6,195	6,080
1952–53	79	7,425	7,063	6,725	6,475	6,668
1953–54	80	7,449	7,068	6,983	6,727	6,861
1954–55	81	7,576	7,104	6,957	6,946	6,977
1955–56	82	7,686	7,174	6,893	6,886	6,845
1956–57	[1] 85	8,014	7,259	7,023	6,834	6,796
1957–58	[1] 85	8,030	7,504	7,051	6,888	6,861
1958–59	[2] 85	8,128	7,432	7,182	6,872	6,860
1959–60	85	8,173	7,563	7,134	7,134	7,081
1960–61	86	8,298	7,632	7,309	7,049	6,994
1961–62	[2] 87	8,483	7,823	7,528	7,244	7,168
1962–63	[2] 87	8,642	7,964	7,564	7,321	7,264
1963–64	[2] 87	8,772	8,176	7,629	7,424	7,336
1964–65	[2] 88	8,856	8,272	7,815	7,485	7,409

[1] Includes schools in development.
[2] Includes schools provisionally approved.

Source: *The Journal of the American Medical Association*, vol. 194, No. 7, p. 757, Nov. 15, 1965.

NOTE.—In some of the earlier years the number of graduates, as shown, exceeded the number of 4th-year students because of the requirement maintained by some schools that internships must be completed before graduation; this requirement is no longer in effect.

(c) *Standard of Performance*

During the school year 1964–65, the 88 schools in the United States had an enrollment of nearly 32,500 students and graduated 7,409 at the end of the year.

(d) *Qualitative Standards*

(1) Accreditation.—To be *accredited,* a medical school must be *approved* by the Council on Medical Education, by the Executive Council of the Association of American Medical Colleges, and by the Liaison Committee on Medical Education. The accrediting process serves to maintain and to promote improved standards of medical education.

(2) Professional Training Requirements of Licensing Boards.—The minimum requirements for admission to an approved medical school is 3 years of college preparatory study. The Council on Medical Education of the American Medical Association, in accepting this minimum, recommends for most students a full 4-year college course emphasizing humanities and scientific studies in order that a broader educational background may be obtained.

The curriculum of a medical school is of 4 years' duration. A school of basic medical sciences covers only the first 2 years of this curriculum. To complete the medical curriculum, the students of such a school shift to medical schools for the last 2 years. Schools of basic medical sciences are subject to the same accreditation procedures as are medical schools.

2. EXISTING CAPITAL PLANT

(a) *Number of Facilities*

There were 88 medical schools in operation in the United States during the 1964–65 academic year, including 3 schools of basic medical sciences, and 1 "developing medical school—operational." Another 14 are in the process of development.

(b) *Distribution by States*

The following table lists the existing schools by State and presents some of the most pertinent information regarding each school.

Approved medical schools and schools of basic medical sciences

State	No.	Medical schools	Ownership	Year organized	1st-year students	Total	Graduates, July 1, 1964, to June 30, 1965
		APPROVED MEDICAL SCHOOLS					
Alabama	1	Medical College of Alabama, Birmingham	Public	1859	80	300	67
Arkansas	2	University of Arkansas School of Medicine, Little Rock	do	1879	105	361	80
California	3	Loma Linda University School of Medicine, Loma Linda, Los Angeles	Private	1909	83	352	78
	4	University of California, California College of Medicine, Los Angeles	Public	1962	96	371	88
	5	University of California School of Medicine, Los Angeles	do	1951	72	287	71
	6	University of Southern California School of Medicine, Los Angeles	Private	1885	68	274	65
	7	Stanford University School of Medicine, Palo Alto	do	1908	72	286	46
	8	University of California School of Medicine, San Francisco	Public	1864	129	436	100
Colorado	9	University of Colorado School of Medicine, Denver	do	1883	86	318	80
Connecticut	10	Yale University School of Medicine, New Haven	Private	1812	84	321	76
District of Columbia	11	Georgetown University School of Medicine	do	1851	117	430	95
	12	George Washington University School of Medicine	do	1825	115	388	89
	13	Howard University College of Medicine	do	1868	105	392	87
Florida	14	University of Miami School of Medicine, Coral Gables	do	1952	83	302	73
	15	University of Florida College of Medicine, Gainesville	Public	1956	61	224	43
Georgia	16	Emory University School of Medicine, Atlanta	Private	1854	75	290	71
	17	Medical College of Georgia, Augusta	Public	1828	101	383	91
Illinois	18	Chicago Medical School, Chicago	Private	1912	79	276	63
	19	Northwestern University Medical School, Chicago	do	1859	131	518	128
	20	Stritch School of Medicine of Loyola University, Chicago	do	1915	88	330	74
	21	University of Chicago School of Medicine, Chicago	do	1927	73	289	67
	22	University of Illinois College of Medicine, Chicago	Public	1881	200	746	175
Indiana	23	Indiana University School of Medicine, Indianapolis	do	1903	226	759	163
Iowa	24	University of Iowa College of Medicine, Iowa City	do	1850	123	454	100
Kansas	25	University of Kansas School of Medicine, Kansas City	do	1905	112	427	101
Kentucky	26	University of Kentucky College of Medicine, Lexington	do	1954	78	263	46
	27	University of Louisville School of Medicine, Louisville	Private	1837	96	344	68
Louisiana	28	Louisiana State University School of Medicine, New Orleans	Public	1931	142	512	118
	29	Tulane University School of Medicine, New Orleans	Private	1834	134	509	126
Maryland	30	Johns Hopkins University School of Medicine, Baltimore	do	1893	88	342	82
	31	University of Maryland School of Medicine, Baltimore	Public	1807	131	457	91
Massachusetts	32	Boston University School of Medicine, Boston	Private	1873	77	291	68
	33	Harvard Medical School, Boston	do	1783	116	510	133
	34	Tufts University School of Medicine, Boston	do	1893	114	431	101
Michigan	35	University of Michigan Medical School, Ann Arbor	Public	1850	208	759	174
	36	Wayne State University School of Medicine, Detroit	do	1885	157	451	98

Minnesota	37	University of Minnesota Medical School, Minneapolis	do	1883	158	611	148
Mississippi	38	University of Mississippi School of Medicine, Jackson	do	1903	82	286	59
Missouri	39	University of Missouri School of Medicine, Columbia	do	1840	86	324	80
	40	St. Louis University School of Medicine, St. Louis	Private	1903	127	430	89
	41	Washington University School of Medicine, St. Louis	do	1899	88	335	83
Nebraska	42	Creighton University School of Medicine, Omaha	do	1892	76	288	64
	43	University of Nebraska College of Medicine, Omaha	Public	1881	89	328	77
New Jersey	44	New Jersey College of Medicine & Dentistry, Jersey City	do	1956	88	301	66
New York	45	Albany Medical College of Union University, Albany	Private	1839	66	249	58
	46	State University of New York at Buffalo School of Medicine	Public	1846	100	360	71
	47	Columbia University College of Physicians & Surgeons, New York	do	1767	122	458	114
	48	Cornell University Medical College, New York	do	1898	85	334	83
	49	Albert Einstein College of Medicine of Yeshiva University, New York	do	1955	95	369	89
	50	New York Medical College, New York	do	1860	128	509	125
	51	New York University School of Medicine, New York	do	1841	124	488	122
	52	State University of New York Downstate Medical Center, Brooklyn	do	1860	208	685	14
	53	University of Rochester School of Medicine & Dentistry, New York	Private	1920	71	281	73
	54	State University of New York Upstate Medical Center, Syracuse	Public	1834	101	354	73
North Carolina	55	University of North Carolina School of Medicine, Chapel Hill	do	1879	72	274	63
	56	Duke University School of Medicine, Durham	Private	1930	82	333	85
	57	Bowman Gray School of Medicine of Wake Forest College, Winston-Salem.	do	1902	58	206	49
Ohio	58	University of Cincinnati College of Medicine, Cincinnati	Public	1819	103	380	86
	59	Western Reserve University School of Medicine, Cleveland	Private	1843	90	343	84
	60	Ohio State University College of Medicine, Columbus	Public	1914	150	574	144
Oklahoma	61	University of Oklahoma School of Medicine, Oklahoma City	do	1900	108	401	95
Oregon	62	University of Oregon Medical School, Portland	do	1887	81	327	76
Pennsylvania	63	Hahnemann Medical College of Philadelphia	Private	1848	110	406	94
	64	Jefferson Medical College of Philadelphia	do	1825	176	653	157
	65	Temple University School of Medicine, Philadelphia	do	1901	139	530	124
	66	University of Pennsylvania School of Medicine, Philadelphia	do	1765	131	510	124
	67	Woman's Medical College of Pennsylvania, Philadelphia	do	1850	60	217	46
	68	University of Pittsburgh School of Medicine	do	1883	102	370	84
Puerto Rico	69	University of Puerto Rico School of Medicine, San Juan	Public	1949	60	202	43
South Carolina	70	Medical College of South Carolina, Charleston	do	1823	82	312	80
Tennessee	71	University of Tennessee College of Medicine, Memphis	do	1851	[1] 199	713	156
	72	Meharry Medical College, Nashville	Private	1876	68	229	47
	73	Vanderbilt University School of Medicine, Nashville	do	1873	54	206	47
Texas	74	University of Texas Southwestern Medical School, Dallas	Public	1943	102	384	93
	75	University of Texas Medical Branch, Galveston	do	1887	152	537	124
	76	Baylor University College of Medicine, Houston	Private	1900	84	330	77
Utah	77	University of Utah College of Medicine, Salt Lake City	Public	1905	59	216	56
Vermont	78	University of Vermont College of Medicine, Burlington	do	1822	54	187	41
Virginia	79	University of Virginia School of Medicine, Charlottesville	do	1825	79	295	67
	80	Medical College of Virginia, Richmond	do	1838	96	328	78

See footnotes at end of table, p. 488

Approved medical schools and schools of basic medical sciences—Continued

State	No.	Medical schools	Ownership	Year organized	1st-year students	Total	Graduates, July 1, 1964, to June 30, 1965
		APPROVED MEDICAL SCHOOLS—continued					
Washington	81	University of Washington School of Medicine, Seattle	Public	1945	77	302	65
West Virginia	82	West Virginia University School of Medicine, Morgantown	do	1902	61	238	58
Wisconsin	83	University of Wisconsin Medical School, Madison	do	1907	103	387	82
	84	Marquette University School of Medicine, Milwaukee	Private	1913	102	378	86
		Subtotal			8,693	32,141	7,409
		APPROVED SCHOOLS OF BASIC MEDICAL SCIENCES					
New Hampshire	1	Dartmouth Medical School, Hanover	Private	1797	49	97	
North Dakota	2	University of North Dakota School of Medicine, Grand Forks	Public	1905	46	83	
South Dakota	3	State University of South Dakota School of Medicine, Vermillion	do	1907	44	83	
		Subtotal			139	263	
		Total			8,832	32,404	7,409
		DEVELOPING MEDICAL SCHOOL—OPERATIONAL					
New Mexico	1	University of New Mexico School of Medicine, Albuquerque [2] (not yet eligible for approval).	Public	1960	24	24	
		Total			8,856	32,428	7,409

[1] Biannual admission. [2] Admitted 1st students in September 1964.

Source: *The Journal of the American Medical Association*, vol. 194, No. 7, Nov. 15, 1965.

(c) *Distribution of Medical Schools by Population Size of City*

1960 population [1]	*Number of schools*
10,000,000 and over	6
6,000,000 to 9,999,999	9
5,000,000 to 5,999,999	5
3,000,000 to 4,999,999	5
2,000,000 to 2,999,999	10
1,000,000 to 1,999,999	12
500,000 to 999,999	17
100,000 to 499,999	[2] 18
50,000 to 99,000	---
10,000 to 49,000	[3] 8
2,500 to 9,900	[4] 2
Under 2,500	---
Total	88

[1] Population used for the standard metropolitan statistical area where applicable in which the schools are located.
[2] Includes one developing medical school—operational, not yet eligible for approval.
[3] Includes one approved school of basic medical sciences.
[4] Includes two approved schools of basic medical sciences.

(e) *Ownership and Control*

Of the 88 medical schools now in operation, 43 are owned and controlled by States, 43 are owned and controlled by private nonprofit organizations, one is owned and controlled by a city (Cincinnati, Ohio), and one is owned and controlled by a territory (Puerto Rico).

(f) *Estimate of Current Value.*

No estimates are available.

B. Costs and User Charges

1. CONSTRUCTION COSTS

Costs of constructing a medical school vary greatly in relation to the functions for which the medical school is responsible. The diverse programs and responsibilities of medical schools make it impossible to set a narrow range of estimates for construction costs. At one extreme are schools built around a community hospital and remodeled college science building; at the other extreme are schools that required a capital investment of $35 to $50 million.

However, to indicate orders of magnitude, estimates have been developed for the cost of constructing two *hypothetical* schools, school A with an entering class of 64 students and a hospital of 500 beds and school B with an entering class of 96 students and a hospital of 700 beds. The central facilities of the small school, including classrooms and library and various other core services, were planned to permit future expansion of enrollment. In neither school A nor school B was space allowed for teaching students in other health professions such as dentistry or nursing. The numbers of medical students, graduate students, faculty, and fellows for which the two schools were designed were as follows:

Medical students	School A	School B
Entering class	64	96
Total	250	370
Basic science departments:		
Faculty, full time	35	50
Graduate students and postdoctoral fellows	40	55
Clinical science departments:		
Faculty, full time	60	85
Postdoctoral fellows	30	40

Illustrative cost figures should be considered only as a rough estimate. Regional location, differences in programing, the status of the construction industry, and type of construction are some of the factors contributing to substantial variations. In recent years there has been an average increase of 4 percent in construction cost per year.

Average cost of construction of medical education facilities is about $33 per gross square foot, with a range of from $30 to $45. This figure covers only construction costs. It does not include the cost of the site or site improvements, architectural, engineering, and consultant fees, or costs of site surveying and soil testing. Fixed equipment (built in, such as sterilizers, counters, cabinets) is included in the $33 cost, but movable equipment and expendable items and supplies are not included. The cost of movable equipment for medical schools is estimated to be approximately 15 percent of the construction cost. The estimated average cost of movable teaching equipment for a university teaching hospital is approximately $4,500 per bed not including research equipment or consumable supplies. Both hospital and research activities are characterized by an increasing diversity and complexity of instrumentation which is a major factor in increasing equipment costs. Using the $33 average, it is possible to arrive at an *order-of-magnitude* cost estimate for the *hypothetical* schools and staffing levels.

Summary of cost estimates for conventional basic science facilities, for clinical science facilities, for university teaching hospitals, and for auxiliary areas for hypothetical medical centers with entering classes of 64 and 96 students:

[In thousands of dollars]

Type of facility	School A (entering class of 64 students)	School B (entering class of 96 students)
Summary of cost at $33 a square foot, 1963: [1]		
Basic science facility [2]	5,016	6,039
Clinical science facility	2,277	2,640
General administration and supporting facilities	2,805	3,201
Hospital	19,866	26,697

[1] This cost covers construction only including fixed equipment and does not include costs for the site, site improvements, movable equipment, or fees. It is an average figure based on national construction costs and will vary considerably according to regional location, program differences, and type of construction. Recent medical school construction costs in different parts of the country have ranged from $30 to $45 a square foot.

[2] With conventional laboratories.

Source: U.S. Department of Health, Education, and Welfare, Public Health Service. *Medical Education Facilities Planning Considerations and Architectural Guide*, 1964, p. 174.

(b) *Operating Expenses*

For these two hypothetical schools the following annual operation and maintenance expenses are budgeted (in 1963 prices).

	Total	Personal services	Supplies and expenses	Travel
School A (64 entering students):				
Operation and maintenance of physical plant	$485,940	$161,980	$323,960	
Equipment (all departments)	60,000		60,000	
Total budget [1]	3,354,400	2,500,280	831,820	$22,300
School B (96 entering students):				
Operation and maintenance of physical plant	581,240	193,750	387,490	
Equipment (all departments)	90,000		90,000	
Total budget [1]	4,112,100	3,070,550	1,012,050	29,500

[1] Instruction, research, library, administrative, and supportive services.

Source: U.S. Department of Health, Education, and Welfare, Public Health Service, *Medical Education Facilities Planning Considerations and Architectural Guide*, 1964, p. 176.

2. USER CHARGES

In recent years, tuition and fees paid by medical students have amounted to less than 15 percent of the current expenditures for the operating programs of the schools. The portion of these same expenditures paid by teaching hospitals and clinics has amounted to less than 8 percent. Obviously, then, all of capital costs plus the greater part of current expenditures for the operating programs must be financed by funds received from other sources. Data currently available are inadequate for an analysis of capital financing.

C. Trends in Capital Outlay

1. ANNUAL CAPITAL OUTLAY

Available estimated construction and equipment costs for medical school projects completed during the academic years 1953–54—1964–65 are presented as follows:

[In millions of dollars]

Academic years	Total	Construction	Equipment
1953–54	59.7	59.7	(1)
1954–55	99.4	99.4	(1)
1955–56	65.0	65.0	(1)
1956–57	67.5	67.5	(1)
1957–58	42.0	37.5	4.5
1958–59	70.3	63.0	7.3
1959–60	94.7	82.3	12.4
1960–61	53.8	47.9	5.9
1961–62	49.1	42.4	6.7
1962–63	52.3	48.0	4.3
1963–64	101.1	89.9	11.2
1964–65	119.7	103.3	16.4

[1] Amounts for equipment may or may not be included with construction costs.

Source: *The Journal of the American Medical Association*, educational numbers.

2. DISTRIBUTION BY SPENDING UNITS

Proportions of the capital outlays provided by State governments, by cities, etc.: Not available.

3. SOURCES OF FINANCING

Percentage distribution of capital outlays by source of financing (appropriations, gifts, etc.): Not available.

D. Needs and Prospective Capital Outlays

CAPITAL REQUIREMENTS

The capital requirements for medical school facilities for the decade 1966–75 are:

	Millions
Backlog of unmet needs as of June 30, 1965	$1, 868. 1
Total additional requirements through June 30, 1975	2, 391. 0
Total estimated need	4, 259. 1

(a) Available trends in medical student-population ratios have been utilized in estimating the current backlog. Future needs have been estimated using the professional-population ratios plus economic growth factors in an effort to allow, somewhat, for increases in level of demand for these professional services. Deficits, current and future requirements were converted into first-year student places and then the number of places needed was converted into project costs. These methods of estimating do not imply a high degree of precision and must be viewed in proper context; however, the results are believed to be conservative in that per capita demand is increasing steadily and new health programs may be expected to accelerate this trend.

(b) The estimated capital needs for medical student teaching facilities are:

	Millions
Backlog as of June 30, 1965	$1, 868. 1
Annual increments:	
1966	217. 8
1967	225. 9
1968	233. 1
1969	240. 6
1970	250. 2
1971	228. 9
1972	236. 7
1973	244. 5
1974	252. 6
1975	260. 7
Total	2, 391. 0
Total, backlog and annual increments	4, 259. 1

(c) Facilities for educating medical students always serve areas much broader than the immediate vicinity in which they are located. Although there is no precise way to forecast this element, it is believed that most, if not all, of the new facilities anticipated, will be placed in metropolitan areas of greater than 50,000 population.

(d) The proportion of the estimated capital outlays to be expended by non-Federal entities is 100 percent. There is no feasible method for breaking this down among the non-Federal entities.

II. Dental Schools

A. Nature and Composition of Public Work or Facility

1. DESCRIPTION OF FACILITY

(a) *General Physical Characteristics—Structures and Equipment*

Physical characteristics of dental schools vary widely depending on the number of students and the demands for space developed by the training programs. To provide completely for the needs of a dental education, facilities are required for training in the basic and preclinical sciences, for instruction in clinical practice and for guidance and experience in developing research techniques. Schools vary in size from 70,000 square feet of net area to almost 200,000 square feet of such space. Depending upon program needs net space per entering class student will range from 1,000 square feet to more than 2,500 square feet.

Constructions systems used will depend largely upon the area in which the school is being erected. Any system that produces a fire resistant structure in keeping with national and local building codes is appropriate.[1] This includes steel frame structures, cast-in-place reinforced concrete, reinforced masonry or any of the prestressed, precast concrete systems available. The height of buildings for dental education ranges from low 2-story structures on 12 acres of ground in rural areas to 14-story edifices in densely populated urban neighborhoods slated for redevelopment.

In dental school buildings the proportional cost of built-in plus movable equipment as related to total construction costs will be similar to that found in research laboratory buildings.[2] This is about 45 percent of the total construction package. Dental clinical facilities require dental units, chairs, and X-ray equipment and provision for air, water, gas, and vacuum attachments. Cabinetry and laboratory benches of a specialized nature to meet the needs of preclinical and basic science instruction are required in abundance as well as expensive equipment such as electron microscopes, fume hoods, and data processing machines.

(b) *Services Rendered*

Dental schools, through didactic and clinical training produce new dentists who are:

(1) Soundly educated in the biological and health sciences.
(2) Specially prepared to render superior clinical dental care; and
(3) Morally and ethically committed to serve society in a professional capacity.

(c) *Standards of Performance*

During the school year that ended in June 1965, U.S. dental schools had an enrollment of 13,876 undergraduate students, which was

[1] The national codes here mentioned are issued by professional and trade organizations. To some extent, the local codes make use of these same standards; but the local codes are, of course, established by local governments.
[2] A cost breakdown between built-in and movable equipment is not available.

maximum capacity. About 3,225 of the students graduated with D.D.S. or D.M.D. degrees.

(d) *Qualitative Standards of Performance*

The Council on Dental Education of the American Dental Association is the national accrediting agency for dental schools. One requirement for accreditation is that the physical facility of each school, including the teaching equipment, must meet the qualitative standards established by the Council. Failure to do so can be cause for withholding accreditation.

2. EXISTING CAPITAL PLANT IN THE UNITED STATES

(a) *Number of Facilities*

As of mid-1965, 49 dental schools were in operation.

(b) *Distribution by States*

The 49 dental schools are distributed among 26 States, the District of Columbia, and 1 territory, as follows:

Alabama	1	Nebraska	2
California	5	New Jersey	2
District of Columbia	2	New York	3
Georgia	1	North Carolina	1
Illinois	3	Ohio	2
Indiana	1	Oregon	1
Iowa	1	Pennsylvania	3
Kentucky	2	Tennessee	2
Louisiana	1	Texas	2
Maryland	1	Virginia	1
Massachusetts	2	Washington	1
Michigan	2	West Virginia	1
Minnesota	1	Wisconsin	1
Missouri	3	Puerto Rico	1

(c) *Distribution by Size of City*

The distribution of dental schools by population size of city is:

Population:	*Number of schools*
500,000 or more	28
100,000 to 499,999	14
50,000 to 99,999	2
10,000 to 49,999	4
2,500 to 9,999	1
Under 2,500	0
Total	49

Dental schools serve areas in addition to the city in which they are located. They supply dentists to their State, and to other States, especially the 24 States without dental schools.

(d) *Age of Facilities*

The distribution of existing dental school facilities by the year periods in which they were built is:

Year period:	*Number*
(1) Before 1900	0
(2) 1901–20	9
(3) 1921–40	18
(4) 1941–60	20
(5) Since 1961	2
Total	49

(e) *Ownership*

Of the 49 dental school facilities:

Owned by the governments of 23 States and 1 territory	24
Owned by private, nonprofit organizations	25
Total	49

(f) *Current Value*

The estimated value of the 49 dental school facilities, including land, as of the end of 1965 was $176.5 million.

B. Costs and User Charges

1. CONSTRUCTION COSTS AND OPERATING COSTS

(a) *Construction Costs*

Recent experience indicates that the average current dental school construction cost per entering (first year) class student is $100,000. The actual cost of the entering class student in a specific school may range from $50,000 to $150,000. The range reflects local construction costs, the requirements of the school's educational service and research programs, and other factors.

(b) *Operating Costs*

The per student average annual operating cost of dental schools in the academic year 1963–64 was $4,578.

Breakdown of the 1963–64 average

PUBLIC SCHOOLS

Enrollment:	*Cost*
200 and under	$5,253
201 to 300	6,004
301 and over	4,854
All public schools	5,362

PRIVATE SCHOOLS

Enrollment:	*Cost*
200 and under	$4,917
201 to 300	3,727
301 and over	3,618
All private schools	4,005
All schools	4,578

2. USER CHARGES

(a) "User Charges" as applied to dental schools, has these two parts:

(1) Tuition and fees; and

(2) Patient clinic fees.

According to the latest available estimates, these two "user charges" supply the following percentages of operating costs:

(1) Tuition and fees, 26 percent.

(2) Patient clinic fees, 20 percent.

(b) It is apparent from the above, that the "user charges" meet only 46 percent of operating costs. It follows that:

(1) They are not sufficient to meet any part of the annual debt service payments on the indebtedness incurred to finance the capital costs of the facilities; and

(2) There are no situations where "user charges" exceed the operating costs.

(c) The cost of existing (1965) publicly owned dental school facilities and structures usually had been met with the proceeds of State bond issues.

C. Trend of Capital Outlays

A breakdown of new dental schools built and equipped during 1946–65—with pertinent information—is given below:

[Dollar amounts in millions]

	1st class accepted in—	1st year seats	Estimated combined construction-equipment cost
Publicly owned schools:			
University of Washington	1946	65	$3.1
University of Alabama	1948	52	2.5
University of North Carolina	1950	50	4.4
New Jersey College of Dentistry	1956	49	1.3
University of Puerto Rico	1957	36	.5
West Virginia University	1957	54	5.0
University of Kentucky	1962	50	3.5
University of California at Los Angeles	1964	96	9.0
Total publicly owned		452	29.3
Privately owned schools:			
Loma Linda University	1953	61	1.5
Fairleigh Dickinson University	1956	50	1.5
Total privately owned		111	3.0
Grand total		563	32.3

No trend is apparent from the foregoing when considered by itself. However, when considered along with its contribution in behalf of meeting the expanding demand for dental services, there is a trend—it is that too few dental schools were built.

On the basis of available information, the estimated cost of the new dental schools listed in C. 1., above, was met by funds from:

	Millions
Bond issues of State governments	$26.3
Private, nonprofitmaking organizations	3.0
The Federal Government, under the—	
Hill-Burton Act of 1946	1.8
Health Professions Educational Assistance Act of 1963	1.2
Total	32.3

D. Needs and Prospective Capital Outlays

CAPITAL REQUIREMENTS

The capital requirements for dental school facilities or structures during 1966–75 are:

	Millions
Backlog of unmet needs as of June 30, 1965	$318.1
Total additional requirements through June 30, 1975	271.7
Total	589.8

(a) Existing dentist-population ratios were used as the basis for estimating the current and future needs for dentists. The dentist deficits which resulted were translated into estimates of annual

graduates needed, and these estimates were converted to estimates of first-year dental school places needed 4 years earlier. The number of estimated places needed was then translated into project costs. These estimates of need, however, must be viewed as extremely conservative since the per capital demands for such service are steadily rising.

(b) The estimated capital needs on a per year basis are:

	Millions
Backlog as of June 30, 1965	$318.1
1966	25.0
1967	25.4
1968	26.0
1969	26.4
1970	26.9
1971	27.4
1972	27.9
1973	28.4
1974	28.9
1975	29.4
Total	271.7
Total, backlog and annual increments	589.8

(c) There is no basis for making a division by population. However, on the basis of the breakdown in A.2.(c), it would appear that the great bulk of the projected dental school structures and facilities will be in cities of greater than 50,000 population.

(d) The proportion of the estimated capital outlays to be expended by non-Federal entities is 100 percent. There is no feasible method for breaking this down among the non-Federal entities.

III. Schools of Nursing

A. Nature and Composition of Facility

1. DESCRIPTION OF FACILITIES

There are 1,118 schools of nursing in the United States which provide an educational program for students who are to become professional nurses. Seventy-five percent of the schools are hospital-based diploma programs usually 3 years in length; 16 percent are baccalaureate programs in senior colleges and universities; and 9 percent are associate degree programs in community junior colleges.

(a) *General Physical Characteristics*

The existing structures depend to a great extent upon the type of nursing program. For hospital programs, the majority of the educational facilities are combined in a building which is used also as a dormitory. Frequently, the educational facilities are located in the basement and lower floor of the dormitory. Associate degree programs are new and are developing rapidly in existing cramped quarters in whatever space is available in the community college. A number of associate degree programs are planning to build space for the nursing program in buildings which will also provide space for science laboratories, other classrooms, and so forth.

For the baccaluareate and higher degree programs, facilities on the campus are generally in temporary makeshift headquarters such as

basements of old buildings, temporary barracks-type structures and old houses which have been converted for faculty offices, classrooms, and laboratories.

In general, the structures and equipment for the school of nursing should include teaching, administrative, and supporting space and the equipment necessary for nursing instruction. The teaching space includes lecture rooms, classrooms, conference rooms, multipurpose rooms, laboratories, and reading rooms. Faculty space includes offices, conference rooms, research space, lounges, toilets and locker rooms. Administrative space requires lounge, locker and toilet space in addition to offices. Supporting space includes student lockers, lounges and toilets as well as space for duplicating, housekeeping, maintenance and mechanical equipment. Space for continuing education is also provided in some colleges and universities.

Equipment needs of schools of nursing include the general classroom furnishings, such as tablet armchairs, tables, chairs, tack boards, chalk boards, and so forth. The usual faculty office furnishings include desk, chairs, lamp, bookcase, file, and so forth. Specialized equipment which is used includes: laboratory equipment for the biological sciences, (for diploma schools of nursing); laboratory equipment for nursing courses (beds, stretchers, crutches); slides projectors, models, instructional television and other audiovisual teaching materials; office equipment, such as typewriters, dictating machines, duplicating equipment, and so forth.

(b) *Services Rendered*

The service rendered by the school of nursing facility is to provide a setting in which instruction of the student in the art and science of nursing can be provided.

(c) *Standards of Performance*

The completion rate of students is about two-thirds of those who are admitted. Approximately 125,000 students were enrolled in undergraduate programs in the United States as of January 1, 1964.[1]

Hospital space is used by students of nursing for selected clinical experiences. Also conference room space is used in the hospital setting for pre- and post-clinical conferences. Library space is essential for the nursing program. Generally, the college library is used by associate degree and baccalaureate students while diploma students may use the hospital library or they may have a library in the nursing education facility.

(d) *Qualitative Standards*

All schools of nursing have minimum standards and must be approved by State boards of nursing in order to operate. In addition, a voluntary system of accreditation exists under the sponsorship of the National League for Nursing.

2. EXISTING CAPITAL PLANT IN THE UNITED STATES

(a) *Number of Facilities*

In mid-1965 approximately 1,118 schools of nursing existed in the United States. Data on the number of educational buildings per se

[1] American Nurses Association. Facts About Nursing 1965, New York, N.Y. The Association, p. 106.

are not available. Many of the facilities, as pointed out earlier, are located in buildings jointly used for education and residence of students.

(b) *Distribution by States*

Distribution of such facilities by State and ownership is shown in table 1.

(c) *Distribution by Size of City*

Population distribution of such facilities by population size of city will be seen in table 2.

TABLE 1.—*Distribution of facilities by State and ownership, schools of professional nursing*

State	Number of programs	Type of ownership		
		Public		Private [1]
		State	Local	
Total	1,118	117	218	783
Alabama	14	2	3	9
Alaska	0	0	0	0
Arizona	6	3	1	2
Arkansas	6	1	0	5
California	62	11	31	20
Colorado	11	3	1	7
Connecticut	20	1	2	17
Delaware	5	1	2	2
District of Columbia	6		2	4
Florida	21	3	11	7
Georgia	19	4	7	8
Hawaii	4	2	0	2
Idaho	4	1	1	2
Illinois	68	3	7	58
Indiana	27	5	2	20
Iowa	24	0	3	21
Kansas	18	2	1	15
Kentucky	19	5	3	11
Louisiana	13	6	1	6
Maine	5	1	0	4
Maryland	20	1	1	18
Massachusetts	56	1	7	48
Michigan	32	3	7	22
Minnesota	27	3	4	20
Mississippi	11	2	5	4
Missouri	28	3	8	17
Montana	5	1	0	4
Nebraska	14	1	0	13
Nevada	1	1	0	0
New Hampshire	9	0	1	8
New Jersey	38	1	3	34
New Mexico	2	1	0	1
New York	123	19	28	76
North Carolina	32	4	9	19
North Dakota	9	1	0	8
Ohio	57	1	6	50
Oklahoma	11	1	0	10
Oregon	5	1	0	4
Pennsylvania	104	4	22	78
Puerto Rico	8	1	3	4
Rhode Island	7	1	0	6
South Carolina	11	2	2	7
South Dakota	10	2	0	8
Tennessee	17	3	3	11
Texas	33	2	9	22
Utah	7	2	0	5
Vermont	5	2	0	3
Virginia	28	3	3	22
Washington	19	1	5	13
West Virginia	14	3	3	8
Wisconsin	22	1	1	20
Wyoming	1	1	0	0

[1] Nonprofit.

TABLE 2.—*Distribution of facilities by population size of city in which located*

SCHOOLS OF PROFESSIONAL NURSING

Population size of city—	*Number of schools*
500,000 and over	263
100,000 to 499,999	306
50,000 to 99,999	173
10,000 to 49,999	285
2,500 to 9,999	60
Under 2,500	14
No population listed	17
Total	1,118

(d) *Age of Facilities*

Age distribution of such facilities. No data available. Perhaps 10 percent may have been built before 1900. Probably most of the structures were built in the period of 1921–40. They are largely buildings which have been converted to educational use.

B. Costs and User Charges

1. CONSTRUCTION COSTS AND OPERATING COSTS

(a) *Construction Costs*

Estimated construction cost per square foot for new construction of school of nursing is approximately $24.

(b) *Operating Costs*

Current range of typical annual maintenance and operational expenses:

The cost analyses of 19 baccalaureate and 10 associate degree programs studied by the National League for Nursing [1] used as the basis of measurement the credits required to complete the program and the cost per student. The cost per student per year has been selected as the standard for this statement of costs, since it is more nearly comparable to the units reported in the study of 126 diploma programs.[2] The studies were begun in 1958. Because of sampling limitations, it is not possible to state explicitly the degree to which the findings of these studies apply to all programs.

The appropriate size of the school facilities is determined by the number of students enrolled. However, since most of the 10 associate degree programs studied were, at the time of the cost analysis, relatively new programs, planning for future growth, their costs have not been reported by size of program.

For the baccalaureate and associate degree programs the actual operating costs reported by the National League for Nursing have been adjusted downward by deducting expenses for salaries, wages, and staff benefits. For the diploma programs, the league reports costs in terms of educational functions and noneducational functions. The costs of noneducational functions in parent institutions only, are included here.

[1] National League for Nursing. Study on Cost of Nursing Education. Part II, cost of basic baccalaureate and associate degree programs. New York, N.Y.: The League, 1965, 96 pp.
[2] Ibid., pt. I, cost of basic diploma programs, 1964, 101 pp.

Maintenance and operation expenses [1]

Size of school	Number of programs	Average annual cost per student [2]	Range of annual cost per student
Baccalaureate programs:			
Large (120 or more students)	9	$459	$222-$723
Medium (75 to 119 students)	8	497	323- 739
Small (under 75 students)	2	514	460- 553
Total	19	471	222- 739
Associate degree programs: All (27 to 109 students)	10	493	235- 1,311
Diploma programs:			
Large (120 or more students)	50	1,400	813- 2,742
Medium (70 to 119 students)	53	1,300	530- 2,192
Small (under 70 students)	23	1,600	723- 2,373
Total	126	1,400	530- 2,742

[1] National League for Nursing, "Study on Cost of Nursing Education," pts. I and II, New York, N.Y. The League, 1965.

[2] For baccalaureate and associate degree programs unit cost was based on numbers of credits required. Approximately 135 credits are required for completion of a baccalaureate degree program, and approximately 77 credits are required for completion of an associate degree program. For diploma programs a year was considered 43 weeks, and costs included those for student nurse residence.

2. USER CHARGES

The baccalaureate and associate degree cost study does not indicate what portion of the tuition and fees paid by the students was allocated to maintenance and operation expenses. However, for 21 programs, the proportion of total cost of credits required for baccalaureate graduation which was met by tuition and fees ranged from 5.19 to 91.28 percent. The average percent of the cost of the program that was covered by income from tuition and fees was 35.1. In the 12 programs under private control, the proportion of cost covered by such income was approximately 53 percent; in 9 programs under public control, the proportion was 18 percent.

Of the 10 associate degree programs, one made no charges to students. The percent of cost met by tuition and fees in the other nine programs ranged from 7.76 to 51.17. The sum of the income from tuition and fees to the 10 programs was 21.4 percent of the combined gross costs of instruction.

In the diploma school study it was found that the average yearly income per student to defray the cost of the program amounted to $100 for noneducational functions, or 7 percent of the average gross cost of these functions. Only half of the programs, however, had some income identified for noneducational functions.

C. Trend of Capital Outlays

1. ANNUAL CAPITAL EXPENDITURES

There is an increasing trend of capital outlay for construction of nursing schools; but there is no information on such outlays, except those financed in part by Federal assistance. Public Law 88-129 provided matching grants to collegiate schools of nursing for educational facilities. Under this program, 16 schools received Federal grants totaling about $9 million. These projects represent a total construction cost of $15 million.

Under Public Law 88–581, five grants have been made to collegiate programs. The Federal share of these projects is $4.2 million. The total cost is $6.3 million.

2. DISTRIBUTION BY SPENDING UNITS

From the capital outlay of the 21 projects, the proportion provided by—

	Millions
(a) State governments was approximately	$5.8
(b) Cities and other local public bodies	None
(c) Private, nonprofit organizations	6.7
(d) Proprietary or profitmaking organizations	None
(e) Federal dollar amount	13.2
Total	25.7

3. SOURCES OF FINANCING

Sources of finances for capital outlays of 21 nursing school projects—

	Millions
(a) Appropriations from tax resources	$4.7
(b) Gifts, bequests, etc	6.7
(c) Federal Government grant assistance:	
(1) Public Law 88–129	4.2
(2) Public Law 88–581	9.0
(d) State grants-in-aid	None
(e) Tax-exempt-bond market	1.1
Total	25.7

D. Needs and Prospective Capital Outlays

CAPITAL REQUIREMENTS

The capital requirements for nurse training facilities for the decade 1966–75 are—

	Millions
Backlog of unmet needs as of June 30, 1965	$283.5
Total additional requirements through June 30, 1975	1,357.5
Total estimated need	1,641.0

(a) The backlog has been estimated on the basis of a report of collegiate nursing applications under Public Law 88–129 in 1965 which represented less than 3 percent of the 1,148 nursing school programs in the country. Future needs have been estimated on the basis of the Surgeon General's consultant group report plus economic growth factors in an effort to allow, somewhat, for increases in level of demand for professional nursing services. Deficits, current and future requirements, were converted into first-year student places and then the number of places needed was converted into project costs. These methods of estimating do not imply a high degree of precision and must be viewed in proper context; however, the results are believed to be conservative in that their per capita demand is increasing steadily and new health programs may be expected to accelerate this trend.

(*b*) The estimated capital needs for student teaching facilities are—

	Millions
Backlog as of June 30, 1965	$283.5
Annual increments:	
1966	37.5
1967	105.0
1968	120.0
1969	148.5
1970	153.0
1971	202.5
1972	123.0
1973	126.0
1974	171.0
1975	171.0
Total	1,357.5
Total, backlog and annual increments	1,641.0

(*c*) Facilities for educating nursing students always serve areas much broader than the immediate vicinity in which they are located. Although there is no precise way to forecast this element, it is believed that most, if not all, of the new facilities anticipated will be placed in metropolitan areas of greater than 50,000 population.

(*d*) The proportion of the estimated capital outlays to be expended by non-Federal entities is 100 percent. There is no feasible method for breaking this down among the non-Federal entities.

IV. Optometry Schools

A. Nature and Composition

1. DESCRIPTION OF FACILITIES

(a) *General Physical Characteristics—Structures and Equipment*

The physical characteristics of the optometry school vary as widely as the areas in which the schools are located and the student body enrolled. They provide the equipment and tools for the education of the optometrists, who make a significant contribution to the eye care and health of the Nation. More specific information is unavailable.

(b) *Services Rendered*

(1) The professional preparation of the optometry student covers the following typical courses: mathematics, physics, chemistry, zoology, psychology, general anatomy, cranial and neural anatomy, ocular anatomy, physiology, pathology, bacteriology, geometric optics, physical optics, and physiologic optics. In addition to the traditional material of optometry courses, such topics as contact lenses, occupational vision, school vision problems, illumination, and vision screening methods are presented from the theoretical and practical viewpoint.

(2) In addition to a sound education in the biological and clinical sciences, the student is prepared to render a high standard of professional service to the public. Moral and ethical commitment receives emphasis throughout the curriculum.

(c) *Standards of Performance*

During the school year that ended in June 1963 the U.S. optometry schools had an enrollment of 1,566 undergraduate students. About 400 graduated at the end of the school year with an O.D. degree (in some instances the degree of B.S. or M.S. in optometry is awarded).

(d) *Qualitative Standard of Performance*

The laws of all States provide that no one shall be eligible to take a licensing examination unless he is a graduate of a school or college of optometry in the United States. All of these schools are accredited by the Council on Optometric Education, which is an institution of the National Commission on Accrediting.

The curriculum and standards of these optometry schools and colleges have been steadily augmented to keep pace with scientific advancement. All colleges operate outpatient clinics, in which students secure clinical experience.

Generally, graduates are awarded the degree of doctor of optometry. As noted above, some of the accredited schools and colleges of optometry award the degree of bachelor of science in optometry and master of science in optometry.

2. EXISTING CAPITAL PLANT IN THE UNITED STATES

(a) *Number of Facilities*

As of mid-1965, 10 optometry schools were in operation.

(b) *Distribution by States*

Two of the schools are located in California. In eight other States there is one school per State. The schools are as follows:

The Massachusetts School of Optometry	Boston.
The Ohio University College of Optometry	Columbus.
The Pacific University College of Optometry	Forest Grove, Oreg.
The Pennsylvania College of Optometry	Philadelphia.
The Southern College of Optometry	Memphis, Tenn.
University of California School of Optometry	Berkeley.
University of Houston College of Optometry	Houston, Tex.
The Illinois College of Optometry	Chicago.
Indiana University Division of Optometry	Bloomington.
The Los Angeles College of Optometry	Los Angeles.

(c) *Distribution by Size of City*

Distribution of schools by population size of city (standard metropolitan statistical area where applicable)—

Population:	*Number of schools*
500,000 or more	8
100,000 to 499,999	1
50,000 to 99,999	-----
10,000 to 49,000	1
Total	10

(d) *Age of Facilities*

Information is not available as to the age of structures. The following table is a distribution of optometry schools by year-period in which organized:

Year-period:	*Number of schools*
Before 1900	2
1901 to 1920	3
1921 to 1940	2
1941 to 1960	3
Since 1961	-----
Total	10

(e) *Ownership*

Private, nonprofit organizations	6
State	4
Total	10

(f) *Current Value of Facilities*

No reliable estimates are available.

B. Cost and User Charges

1. CONSTRUCTION COSTS AND OPERATING COSTS

(a) *Construction Costs*

Estimates not available.

(b) *Operating Costs*

Estimates not available.

2. USER CHARGES

(*a*) User charges as applied to optometry schools consist of student tuition and fees, and patient clinical fees. These charges are used to defray part of the operating costs.

(*b*) Extent to which these items of income are estimated to cover maintenance and operation expense, plus annual debt retirement, is not available.

(*c*) Extent of costs of such facilities and structures met out of general tax resources, etc., is not available.

C. Trend in Capital Outlay

No analytical studies have been performed that cover capital outlay for optometry schools, so far as the division preparing this chapter has been able to ascertain.

D. Needs and Prospective Capital Outlays

CAPITAL REQUIREMENTS

The capital requirements for optometry school facilities for the decade 1966–75 are—

	Millions
Backlog of unmet needs as of June 30, 1965	$25.2
Total additional requirements through June 30, 1975	32.3
Total estimated need	57.5

(*a*) Available trends in optometry student-population ratios have been utilized in estimating the current backlog. Future needs have been estimated, using the professional-population ratios plus economic growth factors in an effort to allow, somewhat, for increases in level of demand for these professional services. Deficits, current and future requirements, were converted into first-year student places, and then the number of places needed was converted into project costs. These methods of estimating do not imply a high degree of precision and must be viewed in proper context; however, the results are believed to be conservative in that per capita demand is increasing steadily and new health programs may be expected to accelerate this trend.

(*b*) The estimated capital needs for optometry student teaching facilities are:

	Millions
Backlog as of June 30, 1965	$25.2
Annual increments:	
1966	2.9
1967	3.1
1968	3.2
1969	3.2
1970	3.4
1971	3.1
1972	3.2
1973	3.2
1974	3.4
1975	3.6
Total	32.3
Total, backlog and annual increments	57.5

(*c*) Facilities for educating optometry students always serve areas much broader than the immediate vicinity in which they are located. Although there is no precise way to forecast this element, it is believed that most, if not all, of the new facilities anticipated, will be placed in metropolitan areas of greater than 50,000 population.

(*d*) The proportion of the estimated capital outlays to be expended by non-Federal entities, is 100 percent. There is no feasible method for breaking this down among the non-Federal entities.

V. Osteopathic Schools

A. Nature and Composition

1. DESCRIPTION OF FACILITIES

(a) *General Physical Characteristics*

There are five colleges of osteopathic medicine and surgery, each comprising multiple units of buildings constructed of brick and steel reinforced concrete. In each college the building units consist of administration, general classrooms, science and laboratory, library, clinical and research facilities and teaching hospitals.

(b) *Services Rendered*

Osteopathic schools, through curriculums leading to a sound education in biological and health sciences and superior clinical training, produce graduates who are well equipped to serve the public in the professional capacity of a physician.

(c) *Standard of Performance*

During the school year 1964–65, the 5 schools of osteopathy had an enrollment of nearly 1,700 and graduated almost 400 students at the end of the year.

(d) *Qualitative Standard of Performance*

The American Osteopathic Association is the national accrediting agency for schools of osteopathy.

2. EXISTING CAPITAL PLANT IN THE UNITED STATES

(a) *Number of Facilities*

As of mid-1965, there were five osteopathic schools in operation.

(b) *Distribution of Facilities by States*

Missouri	2
Iowa	1
Illinois	1
Pennsylvania	1
Total	5

(c) *Distribution of Facilities by Population Size of Cities* (standard metropolitan statistical area)

500,000 or more	3
100,000–499,999	1
50,000–99,999	-
10,000–49,999	1
Total	5

(d) *Age Distribution of Facilities*

Before 1900: No building units in existence.

1921–40: Four schools have had some buildnig units constructed.

1941–60: Five schools have had one or more building units constructed.

Since 1961: Four schools have had one or more units constructed.

(e) *Ownership of Facilities*

All of the five osteopathic schools are privately owned and are nonprofit.

(f) *Estimated Current Value*—$20 million.

B. Costs and User Charges

1. CONSTRUCTION AND OPERATING COSTS

(Additional data, including a breakdown of the data shown here, are unavailable.)

(a) *Construction Costs*

Costs per square foot for 1965 are estimated to range from $26 to $30, depending upon the area in which construction is undertaken.

(b) *Operating Costs*

Maintenance and operating costs per square foot are estimated to range from $12 to $15 for 1965.

2. USER CHARGES

(*a*) Tuition and fees from students and clinical fees are used to defray part of the operating costs.

(*b*) Tuition and fees are never adequate for all costs, and other sources must be utilized to cover deficits. Data are not currently available for detailed analysis.

(*c*) One college receives approximately 45 percent of its regular operating program expenses (exclusive of capital outlays) from general tax sources of the State. The other four schools receive no tax moneys for support. Data are not currently available for detailed analysis.

C. Trend in Capital Outlays

1. ANNUAL CAPITAL EXPENDITURES

During the period 1946–65, 11 building units have been added at an estimated cost of $16 million.

2. CAPITAL OUTLAY

On the basis of general information available capital outlays for osteopathic schools have been provided by gifts, bequests, donations, and fund drives. Information is not available as to the percentage distribution.

D. Needs and Prospective Capital Outlays

CAPITAL REQUIREMENTS

The capital requirements for osteopathy school facilities for the decade 1966–75 are—

	Millions
Backlog of unmet needs as of June 30, 1965	$84. 0
Total additional requirements through June 30, 1975	107. 4
Total estimated need	191. 4

(*a*) Available trends in osteopathy student-population ratios have been utilized in estimating the current backlog. Future needs have been estimated, using the professional-population ratios plus economic growth factors in an effort to allow, somewhat, for increases in level of demand for these professional services. Deficits, current and future requirements were converted into first-year student places and then the number of places needed was converted into project costs. These methods of estimating do not imply a high degree of precision and must be viewed in proper context; however, the results are believed to be conservative in that per capita demand is increasing steadily and new health programs may be expected to accelerate this trend.

(*b*) The estimated capital needs for student teaching facilities are—

	Millions
Backlog as of June 30, 1965	$84.0
Annual increments:	
1966	9.6
1967	10.2
1968	10.5
1969	10.8
1970	11.4
1971	10.2
1972	10.5
1973	10.8
1974	11.4
1975	12.0
Total	107.4
Total, backlog and annual increments	191.4

(*c*) Facilities for educating osteopathic students always serve areas much broader than the immediate vicinity in which they are located. Although there is no precise way to forecast this element, it is believed that most, if not all, of the new facilities anticipated, will be placed in metropolitan areas of greater than 50,000 population.

(*d*) The proportion of the estimated capital outlays to be expended by non-Federal entities, is 100 percent. There is no feasible method for breaking this down among the non-Federal entities.

VI. Pharmacy Schools

A. Nature and Composition

1. DESCRIPTION OF FACILITIES

(a) *General Physical Characteristics*

The physical characteristics of the schools of pharmacy vary as widely as the 43 States and 1 territory in which they are located. Variance is also determined by the number of students enrolled and space demands of the training program. To provide for the needs of the pharmacy students, equipment and facilities are required to fulfill a curriculum leading to the undergraduate professional degree. In the 5-year program, a minimum of 3 years of work in the professional subject is required in addition to a 2-year basic science program. In the 6-year program, at least 4 years are required beyond the 2 years of science. Type of construction depends largely upon the area in which the school is located and the school's affiliations. More specific information is unavailable.

(b) *Services Rendered*

The schools of pharmacy throughout the Nation are dedicated to a system of training and education in the art and science of pharmacy, planed to produce competent personnel through all phases of the practice of pharmacy and to the training of pharmacists as the means of providing the greatest protection for the public.

(c) *Standards of Performance—Capacity*

During the 1964–65 school year nearly 5,000 students were enrolled in the Nation's pharmacy schools; about 2,000 were graduated.

(d) *Standards of Performance—Qualitative*

The American Association of Colleges of Pharmacy is the national accrediting agency for pharmacy schools. To become accredited, a school must meet the qualitative standards established by the association with regard to physical plant and curriculum effectiveness.

2. EXISTING CAPITAL PLANT IN THE UNITED STATES

(a) *Number of Facilities*

Seventy-three accredited schools of pharmacy, including 1 in Puerto Rico and 2 unaccredited schools (Ohio Northern University College of Pharmacy, Ada, Ohio, and Hampden College of Pharmacy, Williamsett, Mass.) were in operation at mid-1965.

(b) *Distribution by States*

Alabama	2	New York	6
Arizona	1	North Carolina	1
Arkansas	1	North Dakota	1
California	3	Ohio	3
Colorado	1	Oklahoma	2
Connecticut	1	Oregon	1
District of Columbia	1	Pennsylvania	4
Florida	2	Puerto Rico	1
Georgia	2	Rhode Island	1
Idaho	1	South Carolina	2
Illinois	1	South Dakota	1
Indiana	2	Tennessee	1
Iowa	2	Texas	3
Kansas	1	Utah	1
Kentucky	1	Virginia	1
Louisiana	2	Washington	2
Maryland	1	West Virginia	1
Massachusetts	2	Wisconsin	1
Michigan	3	Wyoming	1
Minnesota	1	Alaska	None
Mississippi	1	Delaware	None
Missouri	2	Hawaii	None
Montana	1	Maine	None
Nebraska	2	Nevada	None
New Jersey	1	New Hampshire	None
New Mexico	1	Vermont	None

(c) *Distribution by Population Size of Metropolitan Area*

Population:	*Number of schools*
500,000 or more	33
100,000–499,999	19
50,000–99,999	-----
10,000–49,999	17
2,500–9,999	6
Under 2,500	-----
Total	75

(d) *Age Distribution of Facilities*

For periods prior to 1947, no reliable information is available. From 1947 to 1960, 20 new buildings have been erected for use of the phar-

macy schools, many of which are shared with other schools within the university complex; 2 additional research buildings were also constructed. Since 1961, 13 new buildings (generally shared) and 1 new research building have been erected.

(e) *Ownership*

Of the 75 pharmacy schools, 50 are owned by the State governments; 1 is owned by a territory; 2 are owned by cities (each of which will soon be receiving some State support); 22 are privately owned.

(f) *Current Value*

No reliable estimate of the current value of these facilities is considered feasible.

B. Cost and User Charges

1. CONSTRUCTION COSTS AND OPERATING COSTS

(a) *Construction Costs*

No reliable estimates of unit construction costs are available.

(b) *Operating Costs*

The average cost of the regular operating program for pharmacy schools in the United States was estimated to be $450,000 for a recent year. Of this amount, 12.3 percent, $55,350 is for operation and maintenance of the physical plant; 22.2 percent, $95,400 is for general administration, student services, public services and information. The remainder, 66.5 percent, $299,250, is for education and general expenses.

2. USER CHARGES

(*a*) "User charges" as applied to pharmacy schools are composed of tuition and fees and are levied to help pay for school operations.

(*b*) Financial information pertaining to pharmacy schools is generally lacking; involvement with larger school complexes has discouraged detailed analysis. However, it is fairly certain that tuition and fees do not exceed the prorated operating and maintenance costs, education, and general expenses of the schools.

(*c*) The State, city, and territory schools are principally supported from general revenue funds provided by the respective legislative bodies. The private schools are supported through the fund raising efforts of the schools and gifts of benevolent citizens. A detailed analysis by sources is not currently available.

C. Trend in Capital Outlay

Not available.

D. Needs and Prospective Capital Outlays

CAPITAL REQUIREMENTS

The capital requirements for pharmacy school facilities for the decade 1966–75 are—

	Millions
Backlog of unmet need as of June 30, 1965	$129. 6
Total additional requirements through June 30, 1975	177. 3
Total estimated need	306. 9

(*a*) Available trends in pharmacy student-population ratios have been utilized in estimating the current backlog. Future needs have been estimated, using the professional-population ratios plus economic growth factors in an effort to allow, somewhat, for increases in level of demand for these professional services. Deficits, current and future requirements were converted into first-year student places and then the number of places needed was converted into project costs. These methods of estimating do not imply a high degree of precision and must be viewed in proper context; however, the results are believed to be conservative in that per capita demand is increasing steadily and new health programs may be expected to accelerate this trend.

(*b*) The estimated capital needs for student teaching facilities are—

	Millions
Backlog as of June 30, 1965	$129.6
Annual increments:	
1966	16.2
1967	16.7
1968	17.3
1969	17.9
1970	18.5
1971	17.0
1972	17.6
1973	18.1
1974	18.7
1975	19.3
Total	177.3
Total, backlog and annual increments	306.9

(*c*) Facilities for educating pharmacy students always serve areas much broader than the immediate vicinity in which they are located. Although there is no precise way to forecast this element, it is believed that most, if not all, of the new facilities anticipated, will be placed in metropolitan areas of greater than 50,000 population.

(*d*) The proportion of the estimated capital outlays to be expended by non-Federal entities, is 100 percent. There is no feasible method for breaking this down among the non-Federal entities.

VII. Podiatry Schools

A. Nature and Composition of Facility

1. DESCRIPTION OF FACILITIES

(a) *Physical Characteristics—Structures and Equipment*

The facilities consist of offices, waiting rooms, classrooms, conference rooms, laboratories,[1] outpatient clinics, libraries and reading rooms, student lounges and locker rooms, surgical operating suites, teaching and training aids, diagnostic and therapeutic devices and equipment, public and personnel lavatories, parking spaces, and in 1 case a 13-bed hospital.

[1] For anatomy (gross, microscopic and developmental), physiology, biochemistry, pharmacology, pathology, bacteriology and mycology, clinical medicine, and foot appliances and devices. Some are multidisciplinary.

Each school has three to five classrooms and two to four conference or seminar rooms. Classroom capacity ranges from 90 to 363 students (average equals 214). Laboratory spaces range from 65 to 176 (average equals 125). Outpatient clinics service from 18,000 to over 50,000 patient visits annually and have from 30 to 100 student stations (average equals 63). Libraries accommodate from 12 to 32 students at 1 time (average equals 24). In the classrooms, the square footage per student ranges from 10 to 25 (average equals 16 square feet per student), in laboratories from 17 to 43 (average equals 30 square feet per space), in the clinics from 60 to 150 square feet (average equals 120 square feet per station) and in the library from 22 to 106 square feet (average equals 56 square feet per student seat). These facilities can accept from 45 to 60 first-year students per school and will graduate from 210 to 225 students 4 years later. The classroom, laboratory, and clinical facilities are made adequate only by careful scheduling in some cases.

(b) *Services Rendered*

Podiatry schools provide training for the doctorate degree in podiatry, refresher and more extended training for graduates including internships, training for podiatric assistants, clinical investigations, some limited research, and clinical and hospital service to patients. Each school serves the entire Nation, Canada, and other foreign countries. One serves primarily the Pacific Coast and Mountain States, two the Midwest, Southwest and South, one the Middle Atlantic States and Southeast, and one New York and the Northeast. The patients are from the metropolitan area of the school.

(c) *Standard of Performance*

The recommended standard for library space for podiatry schools of the sizes described in A. 1. (a) above is 6,000 square feet, three to four times the present average size, the average deficit being 4,000 square feet.

(d) *Qualitative Standard of Performance*

School performance is evaluated regularly by the Council on Education of the American Podiatry Association and when it is adjudged adequate, the school is accredited. All five schools are accredited, one intitially, since it will not graduate its first class until 1967.

2. EXISTING CAPITAL PLANT IN THE UNITED STATES

(a) *Number of Facilities*

There are five podiatry schools (mid-1965) in existence and operating;

(b) *Distribution by States*

There are one each in States of New York, Pennsylvania, Ohio, Illinois, and California; and

(c) *Distribution by Size of City*

All in cities over 500,000.

(d) *Age of Facilities*

Part of one school was built before 1900. In the other schools part of their facilities were constructed between 1921 and 1940.

Four schools made substantial additions between 1921 and 1940. One school made two additions between 1941 and 1960 and two schools each one addition. Three schools have made additions since 1961.

(e) *Ownership*

All of these facilities are private nonprofit organizations.

(f) *Current Value*

As of the end of 1965, the total estimated current value of these five facilities is $3,520,000, ranging from $590,000 to $830,000.

B. Costs and User Charges

1. CONSTRUCTION AND OPERATING COSTS

(a) *Construction Costs*

Construction costs for one new school (250 students) of podiatry have been estimated between $6 and $7 million at $35 per square foot. This includes built-in equipment in the amount of $1,250,000. Construction costs to build new or additional structures in cities where podiatry colleges operate range from $25 to $40 per square foot. Cost for renovation ranges from $14 to $28 per square foot. Movable equipment cost estimates range from $450,000 to $1,250,000 (average $755,000).

(b) *Operating Costs*

Present podiatry college student bodies range from 86 to 200 and total 713. One school has only three classes enrolled. Annual maintenance and operations expenses (including repairs and replacements) for the five podiatry colleges in 1965 ranged from $132,065 to $490,919, with an average of $207,750.

2. USER CHARGES

(*a*) User charges are comprised of student tuition and fees and expenses paid by affiliated institutions. These charges are expressed in the following table as a percent of the regular operating program and maintenance cost (excluding capital financing):

School:	*User charges as a percent of operating costs*
No. 1	Less than 50.
No. 2	Less than 90.
No. 3	Less than 98½.
No. 4	Less than 109.
No. 5	Less than 123.

(*b*) Three of the five schools have no capital indebtedness. One school utilized approximately 1½ percent of user charges to reduce capital indebtedness. Two other schools set aside excess user charges (9 and 23 percent) to replenish resources.

(*c*) None of the costs of podiatry school facilities and structures have been met, as yet, from State or local government reserves. One school will have received approximately 15 percent of its operations and maintenance costs in 1965–66 from a State government.

C. Trend of Capital Outlay

1. ANNUAL CAPITAL EXPENDITURES

One new school was started and two major additions and four minor additions to existing schools have been made in the period 1946–65. Capital outlay for these totals $1,302,000, an average of $65,100 per annum. The new school anticipates additional outlay of more than $2,250,000.

(*a*) The need for more podiatrists, the lack of space to accept many qualified applicants, the improvement in the quality of the education, the increasing amount of new knowledge, the demands for more and better service, and obsolescence and deterioration of facilities, dictate a more rapidly accelerating trend in rehabilitation and renovation, major expansion of present facilities, and construction of new ones. The present five schools all have plans for rehabilitation, renovation, and expansion in the next 2 to 5 years, totaling $10 to $12 million.

The lack of support from public funds and the inability to acquire sufficient support from private resources have delayed and prevented a much needed greater capital outlay prior to this time.

2. DISTRIBUTION BY SPENDING UNITS

To date, all capital outlay for podiatry schools has been by private nonprofit organizations.

3. SOURCES OF FINANCING

The source of these capital outlays has been from gifts, bequests, donations, fund raising drives, and borrowing. Information is not available as to the percentage distribution.

D. Needs and Prospective Capital Outlays

CAPITAL REQUIREMENTS

The capital requirements for podiatry school facilities for the decade 1966–75 are—

	Millions
Backlog of unmet needs as of June 30, 1965	$21. 0
Total additional requirements through June 30, 1975	27. 0
Total estimated need	48. 0

(*a*) Available trends in podiatry student-population ratios have been utilized in estimating the current backlog. Future needs have been estimated using the professional-population ratios plus economic growth factors in an effort to allow, somewhat, for increases in level of demand for these professional services. Deficits, current and future requirements were converted into first-year student places and then the number of places needed was converted into project costs. These methods of estimating do not imply a high degree of precision and must be viewed in proper context; however, the results are believed to be conservative in that per capita demand is increasing steadily and new health programs may be expected to accelerate this trend.

(*b*) The estimated capital needs for student teaching facilities are—

	Millions
Backlog as of June 30, 1965	$21.0
Annual increments:	
1966	2.7
1967	2.4
1968	2.7
1969	2.7
1970	3.0
1971	2.7
1972	2.4
1973	2.7
1974	2.7
1975	3.0
Total	27.0
Total, backlog and annual increments	48.0

(*c*) Facilities for educating podiatry students always serve areas much broader than the immediate vicinity in which they are located. Although there is no precise way to forecast this element, it is believed that most, if not all, of the new facilities anticipated, will be placed in metropolitan areas of greater than 50,000 population.

(*d*) The proportion of the estimated capital outlays to be expended by non-Federal entities is 100 percent. There is no feasible method for breaking this down among the non-Federal entities.

VIII. Schools of Public Health

A. Nature and Composition

1. DESCRIPTION OF FACILITY

(a) *General Physical Characteristics*

Public health schools are all integral parts of universities, either as independent units or as parts of the division of medical sciences or medical schools. The physical characteristics of these facilities are as varied as are the universities of which they are a part. More specific information is unavailable.

(b) *Services Rendered*

Schools of public health train doctors, nurses, engineers, and other professional health workers to identify diseases and health hazards affecting the community, to find their causes, and to develop control methods. The students in these schools are primarily public health workers who have already completed their basic professional training. Many of them are employees of State and local health departments, the U.S. Public Health Service, the Armed Forces, or other agencies, and are sent by the agencies which employ them to receive further training to enable them to discharge more effectively the responsibilities of their respective positions.

(c) *Standard of Performance*

Currently, about 1,200 students can be trained per year in the existing schools.

(d) *Qualitative Standard of Performance*

The American Public Health Association is the agency which accredits the graduate schools of public health.

2. EXISTING CAPITAL PLANT IN THE UNITED STATES

(a) *Number of Facilities*

As of mid-1965, there were 13 schools of public health in operation.

(b) *Distribution of Schools by States*

California	2	Maryland	1	New York	1
Connecticut	1	Massachusetts	1	North Carolina	1
Hawaii	1	Michigan	1	Pennsylvania	1
Louisiana	1	Minntsota	1	Puerto Rico	1

(c) *Distribution of Public Health Schools by Population Size of City*

Population: *	*Number of schools*
500,000 and over	10
100,000 to 499,999	2
50,000 to 99,999	---
10,000 to 49,999	1
Total	13

*Standard metropolitan statistical area in which school is located.

(d) *Age of Facilities*

Information is not available as to the age of the structures. The following is a distribution of existing public health schools by year in which they were established:

Year:	*Number*
Before 1900	---
1901–1920	2
1921–1940	4
1941–1960	6
Since 1961	1
Total	13

(e) *Ownership of Facilities*

The United States has 13 public health schools currently in existence; 6 are private nonprofit and 7 are owned by State and territorial governments.

(f) *Estimated Current Value*

These 13 public health schools are each a part of a university which also operates a medical school. The complexity of the organizational arrangements is such that an estimate of current value would be unrealistic.

B. Costs and User Charges

1. CONSTRUCTION AND OPERATING COSTS

(a) *Construction Costs*

Costs per square foot are estimated to range from $25 to $35 depending upon the area in which the construction is undertaken and the type of structure designed.

(b) *Operating Costs*

Basic operating costs for a recent year averaged about $800,000 per school. Costs are constantly rising and this figure would probably be much higher on a current year. Maintenance costs are not currently available because of the complex organizational structure of the schools.

2. USER CHARGES

(*a*) Student tuition and fees provide a portion of the income used to defray operational costs.

(*b*) Tuition and fees are never adequate for all costs and other sources must be utilized to cover deficits; data are not currently available for detailed analysis.

(*c*) In a recent year, funds for total expenditures for these schools were derived from the following sources in the proportions shown:

[Dollar amounts in millions]

Source of funds	Amount	Percent
All sources	$17.8	100.0
Nongovernment	5.1	28.6
Government:		
Federal	10.9	61.2
State and local	1.7	9.6
Other	.1	.6

The amounts have increased and the distribution has probably changed over the years; however, more current analyses are not available.

C. Trend of Capital Outlay

Not available.

D. Needs and Prospective Capital Outlays

The capital requirements for public health school facilities for the decade 1966–75 are—

	Millions
Backlog of unmet needs as of June 30, 1965	$49.0
Total additional requirements through June 30, 1975	63.0
Total estimated need	112.0

(*a*) Available trends in public health student-population ratios have been utilized in estimating the current backlog. Future needs have been estimated, using the professional-population ratios plus economic growth factors in an effort to allow, somewhat, for increases in level of demand for these professional services. Deficits, current and future requirements were converted into first-year student places and then the number of places needed was converted into project costs. These methods of estimating do not imply a high degree of precision and must be viewed in proper context; however, the results are believed to be conservative in that per capita demand is increasing steadily and new health programs may be expected to accelerate this trend.

(*b*) The estimated capital needs for public health student teaching facilities are—

	Millions
Backlog as of June 30, 1965	$49.0
Annual increments:	
1966	5.8
1967	5.9
1968	6.2
1969	6.3
1970	6.6
1971	6.0
1972	6.2
1973	6.5
1974	6.7
1975	6.8
Total	63.0
Total, backlog and annual increments	112.0

(*c*) Facilities for educating public health students always serve areas much broader than the immediate vicinity in which they are located. Although there is no precise way to forecast this element, it is believed that most, if not all, of the new facilities anticipated, will be placed in metropolitan areas of greater than 50,000 population.

(*d*) The proportion of the estimated capital outlays to be expended by non-Federal entities, is 100 percent. There is no feasible method for breaking this down among the non-Federal entities.

CHAPTER 29

State and Federal Outdoor Recreation Facilities *

A. NATURE AND COMPOSITION OF PUBLIC WORK OR FACILITY

1. DESCRIPTION OF FACILITIES

Recreation facilities on Federal and State lands are of two types: Natural resources of land and water, and developed facilities.

Federal and State Governments have designated 312 million acres of land and water areas for public recreation in 20,822 areas with developed recreation facilities. Among the principal Federal recreation areas are all the units of the national park system; many areas in the national forests; shoreland around multiple-purpose reservoirs constructed by the Bureau of Reclamation, the Corps of Engineers, and the Tennessee Valley Authority; portions of the public domain; and selected areas in national wildlife refuges. State recreation areas include State parks, State forests, fishing and hunting areas constructed or operated by State fish and game commissions, State-administered areas along Federal reservoirs, and picnicking and rest areas provided by State highway departments. State lands comprise but 35 million acres just 11 percent of the total area in Federal and State ownership, but are more intensively developed and used than are Federal areas.

Outdoor recreation facilities serve people in all types of areas, residential, commercial, industrial, and agricultural. Participants come from all walks of life and from all sections of the Nation. In addition to direct recreation services, such areas also contribute to the economy of the communities near which they are located by attracting visitors who spend money on food, services, lodging, equipment, and souvenirs.

Standards of performance are usually measured by the number of visits to recreation areas for any portion of a day. In 1965, Federal areas reported 320.1 million visits and State areas 303.4 million visits. Many areas were seriously overcrowded on summer weekends. However, most are capable of handling additional numbers of visitors on summer weekdays and at other times of the year. Measures of daily capacity, then, are largely meaningless, for visitor-use patterns are generally beyond the control of the agencies providing the facilities.

Acceptable qualitative standards of performance for recreation facilities have not been developed. Usual methods of evaluation are not applicable because there are great differences in individual tastes, perceptions, and appreciation of enjoyment derived from recreation. Some persons prize solitude and escape from crowds. Others are insecure when alone in wooded areas and prefer the company of large

*Prepared by the Bureau of Outdoor Recreation, U.S. Department of Interior, with minor editing by committee staff.

numbers of people. However, recreation opportunities which provide nationally famous scenery in uncrowded conditions usually are rated of high quality while facilities of indifferent beauty which are heavily crowded are regarded as having low quality.

2. EXISTING CAPITAL PLANT

State and Federal agencies provided a wide range and variety of outdoor recreation facilities and structures in mid-1965. There were 83,118 acres of picnic lands containing 307,810 picnic tables. To serve swimmers, there were 18,164 acres of beach and 5,102,215 square feet of swimming pools. Boaters enjoyed 17,985 acres of boat access areas, 144,508 parking places, and 5,173 acres in marinas. Ski slopes covered 31,628 acres. Golfers could enjoy 3,372 holes of golf covering 34,899 acres.

Overnight accommodations also were extensive. For camping enthusiasts, there were 171,722 tent spaces on 61,776 acres; 32,538 trailer spaces on 13,319 acres, and 30,643 acres devoted to group camping. Cabins and motels provided 17,903 units.

Many facilities are not provided within the limits of an incorporated city. Limited data are available for those within corporate limits by size of city.

Most of the recreation facilities on State and Federal lands have been constructed since 1941. Approximately 1 percent of existing facilities were constructed between 1901 and 1920, 23 percent between 1921 and 1940, 50 percent between 1941 and 1960 and 26 percent between 1961 and 1965.

The proportion of State to Federal facilities varies widely among the types of facilities and from State to State. For example, States maintain 5,070,938 square feet of swimming pools, the Federal Government but 31,277 square feet. On the other hand, the Federal Government provides 25,471 acres of ski slopes, the States but 6,157 acres.

Federal outdoor recreation facilities are heavily concentrated in the public land States of the West. Thus, the 8 Mountain States have 133,615,959 acres of Federal recreation lands, but only 1,858,271 acres of State recreation lands. In the 8 Mountain States, the Federal Government provides 20,538 tent camping spaces; the 8 States but 1,083. On the other hand, in the three Middle Atlantic States where there is almost no Federal land, the Federal Government provides but 788,059 acres of recreation lands, the States 6,692,729. In that region there are 1,332 Federal tent spaces, 12,038 State.

No estimate has ever been made of the current value of Federal and State outdoor recreation lands and facilities. The compilation of such an estimate would be well-nigh impossible. Many of the land and water areas dedicated to outdoor recreation were acquired from Great Britain by the Treaty of Paris and the treaty of 1848; the Louisiana Purchase; the treaty of 1819; and the treaty with Mexico of 1845. The Louisiana Purchase, for example, cost 15 cents per acre. No one has ever attempted to set a value on Yellowstone National Park, which was a part of that transaction. Moreover, except for national parks, most of the Federal lands are managed for multiple purposes including timber, forage, watershed management, and mining.

Capital investments in outdoor recreation facilities have often been made with other purposes in mind. Thus, many improvements were

made by the Civilian Conservation Corps in the 1930's primarily to aid the enrollees. Current replacement costs have never been estimated.

The only Federal agency managing its lands primarily for outdoor recreation is the National Park Service. It reports assets of $1.7 billion, of which 58 percent is in land. However, this prices our national park land at $38 per acre. Current mean land acquisition price within existing parks is approximately $4,500 per acre.

Total expenditures by Federal and State agencies for outdoor recreation purposes offer some indication of the volume of investment. Between 1951 and 1965, these agencies spent an estimated $7.7 billion.

Ownership of facilities on Federal and State lands varies with the type of facility as well as with the agency. For example, the Federal and State governments retain the ownership of the land and water used for developing such facilities as picnic areas, campgrounds, and swimming beaches. However, facilities such as ski tows, cabins, stores, boat docks, hotels, and lodges, may be developed by private enterprise under various types of lease agreement and possessory interests. At the end of 1965, 2,471 individual concessionaries owned privately developed facilities on Federal lands valued at $319.5 million. Current statistics of similar facilities on State lands are not available. However, State governments are tending to emphasize State construction and operation of such highly developed facilities.

B. Costs and User Charges

1. CONSTRUCTION AND OPERATING COSTS

Construction costs for outdoor recreation facilities vary widely depending upon the remoteness of the location, terrain, soil conditions, and the design of the facility required. Estimated average construction costs for several typical recreation facilities are as follows: campgrounds (including water supply, sanitary facilities, parking space, table and fireplace)—$2,405 per site; visitor information service center—$30 to $35 per square foot; parking spaces $2,000 per site; picnic table and bench—$100 per site; trails—$5,000 per mile.

Annual maintenance and operating expenses for different recreation facilities also are quite variable depending upon the age of facility, design of the original construction, and intensity of use. Annual maintenance and operating expenses for campgrounds and picnic sites are estimated to be 5 to 10 percent of the original cost of construction. A similar estimate for roads is 10 to 15 percent per mile of the original construction cost.

2. USER CHARGES

Neither the States nor the Federal Government have depended, primarily, upon entrance fees or user charges to finance the acquisition of lands and waters or the construction of facilities for outdoor recreation. In 1960, the Outdoor Recreation Resources Review Commission found that the States and the Federal Government collected entrance and user charges totaling $20.9 million, but that this sum represented only 5.4 percent of their total expenditures for outdoor recreation that year.

Many States have depended more heavily upon fees and charges than has the Federal Government. In 1960, the States collected $15.9 million, 75 percent of the total, which provided on the average 52 percent of their operating and maintenance costs. However, some States, such as Nevada and Wyoming, have maintained a policy that all State-provided outdoor recreation areas should be free of charge.

A variety of patterns of fees and charges has developed in State and Federal outdoor recreation areas. Information on typical patterns of fees and charges at State recreation areas is available from a 1964 study by the Minnesota Outdoor Recreation Resources Commission.

The study included only States where the users of outdoor recreation facilities are expected to pay for some portion of the costs of operation of the facilities. The percent of costs covered by fees and charges varied from over 100 percent in Indiana to less than 20 percent in Pennsylvania.

Illustrations of variations and similarities for a few of the States are shown below, for camping fees and entrance charges. Data are for the year 1964.

Campground charges at State areas

Minnesota State parks: Tourist campground fees are $1.50 per-day per campsite, 25 cents for electricity hookup, where available, and 25 cents a bundle for firewood.

California: The camping charge is $2.50 per automotive trailer. For automotive vehicles with or without trailer the charge is $2 in type "A" campgrounds, $1.50 in type "B," and $1 in type "C."

Illinois: The tent camping charge is 50 cents per unit, and the cost of electricity hookup is 25 cents.

Indiana: The charge for campsite use in State parks is $1, and the cost for electricity hookup is 50 cents.

New York: Charges are $1.50 per unit and 25 cents for electricity if available.

Oregon: The charge on improved sites is $1.50 for campers on trucks or trailers or $1 for tents. On semi-improved sites the charge is 75 cents.

Pennsylvania: In State parks the usual charge is $1 for the first day and 50 cents for each additional day. Three campgrounds charge $1.25 the first day and 75 cents each additional day.

Entrance fees at State areas

Minnesota: $2 for annual permit or 50 cents daily.

California: Charge of 50 cents per automotive vehicle per day for picnicking, use of parking areas, beach facilities, or other facilities provided.

Illinois: No admission charge.

Indiana: 20 cents per person admission fee (children under 12 free); 35 cents per automotive vehicle admission fee.

New York: 50 cents per vehicle entrance fee or parking charge. Up to $5 for buses.

Oregon: None reported.

Pennsylvania: None reported.

For all outdoor recreation purposes, the States spent $186.6 million in 1960. Thus, user charges in that year accounted for less than 10

percent of the combined expenditure for outdoor recreation areas and facilities and their operation and maintenance.

Federal user charges in 1960 amounted to only 4.9 percent of operating and maintenance costs. No Federal capital investments thus can be said to have been met from user charges.

Entrance fees at Federal areas

An annual permit, selling for $7, admits the purchaser to all Federal recreation areas at which entrance or admission fees are charged. It also admits all persons who accompany the purchaser in a private, noncommercial vehicle to designated Federal areas commonly entered by motor vehicles.

A temporary permit is valid for 30 days at the Federal area indicated on the permit. The charge is in the range of $3 to $6 for an individual and those who accompany him in a private noncommercial vehicle, or from $1.50 to $3 for an individual. The exact fee is selected by the head of the agency or department administering the designated area in accordance with criteria set by the Secretary of the Interior.

A day-use permit is valid at all designated areas for the calendar day when it is purchased. The charge is 50 cents for an individual or $1 for an individual and those who accompany him in a private noncommercial vehicle.

User fees at Federal areas

User fees are payable for the use of sites, facilities, equipment, or services provided by the Federal Government especially for recreationists in designated areas. These include well-developed campsites, picinic areas, bathhouses, lockers, boat launching facilities, boats, other marine equipment, guide services, firewood, and winter sport facilities.

Examples of the authorized fees are listed below:

Camp and trailer sites: $1 to $3 for overnight use.

Picnic sites: 50 to 75 cents per site per day.

Group camping and picnicking sites: Up to 50 persons in group, $5 to $10 per group per day; 51 to 100 persons in group, $10 to $20 per group per day.

Boat launching sites: 50 cents to $1.50 daily fee.

Bathhouses: 25 to 50 cents per day per person 6 years and over.

The Land and Water Conservation Fund Act and the Federal Water Project Recreation Act marked a new Federal policy on fees. Henceforth, Federal agencies, managing recreation areas that are developed at Federal expense and meet other criteria, will charge entrance, admission and/or other user fees in the expectation that as much as $25 million can be raised each year. Proceeds go into the land and water conservation fund. In fiscal year 1966, however, entrance and user fees are expected to yield only about $8 million. Revenues from the sale of surplus Federal real property and from a tax on motorboat fuel will provide the bulk of approximately $100 million expected to accumulate in the fund that year. In 1967, the Bureau of Outdoor Recreation estimates the fund will receive $110 million, and larger sums in future years.

Except for the development of statewide outdoor recreation plans and administrative costs, moneys in the land and water conservation

fund will be used exclusively for capital investment. Forty percent of the fund ordinarily will be allocated among the National Park Service, the Forest Service, and the Bureau of Sport Fisheries and Wildlife for the acquisition of lands and waters for outdoor recreation and the preservation of endangered species of wildlife. Sixty percent will be allocated for equal matching grants to the States for the planning, acquisition, and development of outdoor recreation areas and facilities.

The Federal Water Projects Recreation Act encourages non-Federal public agencies to administer recreation areas at Federal multiple-purpose water resource projects. If a letter of intent is supplied by a non-Federal agency before project authorization and a contract signed before project construction, under which the non-Federal public agency agrees to repay half the separable costs attributable to outdoor recreation and to operate and maintain the facility at its expense, the Federal construction agency may incorporate into the project complete land and facilities to meet the full public demand for outdoor recreation. The Federal Government will then pay the remaining separable costs and all joint costs from general tax revenues as nonreimbursable costs. The land and water conservation fund cannot be charged to repay such costs.

Non-Federal public bodies may elect several ways to repay their share of project recreation costs. They may provide the sum outright from taxes, borrowing, other available sources; they may provide land or other property; or they may agree to repay the amount with interest over a 50-year period from tax revenues or by pledging the proceeds from entrance and user charges for the area. The authority now available to pledge revenues from user charges may become the most popular method among non-Federal public agencies for repayment of capital costs at Federal water projects.

Private entrepreneurs operating facilities as concessions on State and Federal recreation lands impose user charges intended to recover the costs of operation, depreciation, debt service, and a profit.

Until the advent of the land and water conservation fund, most Federal expenditures both for capital investment in land, water, and facilities, and for operation and maintenance of recreation areas were met out of general tax resources. Unless subsequent legislation is enacted, future Federal investments in facilities and all operating and maintenance costs of Federal recreation areas will continue to be met from general tax resources. By the end of fiscal year 1966, the Federal Government had not issued any general obligation bonds to finance specific recreation projects.

Most States have heretofore depended upon general tax resources also for funding of capital investments. In the past 5 years, general obligation bonds have become more popular as a source of capital for recreation purposes. In the future, the States are expected to depend heavily on three sources: Grants-in-aid from the land and water conservation fund, the open space program, and the Greenspan program of the U.S. Department of Agriculture; bond issues, and taxes, both general and special.

The less populous States seem likely to depend upon Federal grants-in-aid for half of their capital investments. The equalization

factors Congress established in the allocation formula for the land and water conservation fund assures them funds which may be adequate to meet their needs.

The more populous States, however, have already enacted bond issues which greatly exceed the revenues which they can expect to receive from all Federal grant programs combined. Thus, these States will depend heavily upon bonded indebtedness for capital investment and upon general taxation for operation and maintenance costs.

C. Trend of Capital Outlays

1. TREND AND FEDERAL-STATE PROPORTIONS

Annual capital outlays for outdoor recreation have been increasing at a rapidly accelerating pace since 1946 (see table 2). Between 1951 and 1960, Federal capital investments increased over two and one-half times. State expenditures increased 59 percent during the same period. The actual change of Federal expenses was from $69.8 million in 1951 to $194.2 million in 1960. For State expenditure, the actual change was from $117.4 million in 1951 to $186.6 million in 1960. From 1960 to 1964, Federal expenditures escalated to $430 million, an increase of 45 percent in 4 years.

The rapid increase in expenditures for outdoor recreation was stimulated primarily by a greatly increased public demand for recreation opportunities. Attendance figures at State and Federal recreation areas jumped from 419.9 million in 1960 to 623.5 million in 1965. Other contributing factors were the backlog of maintenance which had accumulated during the Second World War and the increasing cost of land, labor, and materials.

2. SOURCES OF FINANCING

Financing of capital outlays for recreation facilities on Federal and State lands traditionally has been primarily by appropriations from taxes. However, there is a strong trend toward financing capital outlays from special funds at the Federal level and from grants-in-aid and bond issues at the State level.

The Federal Government also receives special gifts of land and money for recreation from States and other governmental units, individuals and organizations. The major recipient, the National Park Service, has received $14.5 million in such gifts since 1920. Figures on gifts to other agencies are not available.

In September 1964, Congress created the land and water conservation fund. Three Federal outdoor recreation agencies, the National Park Service, the Forest Service, and the Bureau of Sport Fisheries and Wildlife, have since been dependent upon the fund for acquisition of land for outdoor recreation purposes and to protect endangered species of wildlife.

The land and water conservation fund also makes grants-in-aid available to the States and their political subdivisions for the planning, acquisition, and development of outdoor recreation areas. However, no outdoor recreation acquisition or development projects were

financed through the grant-in-aid program by the close of fiscal year 1965.

The open space program of the Department of Housing and Urban Development also has been made available grants-in-aid to States as well as their political subdivisions for the acquisition of land and the development of facilities. Aimed primarily at cities, however, the program has been little used by States agencies.

During the past 6 years, 10 States have issued bonds with a value of $430.8 million to finance outdoor recreation facilities. In 1960, New York led the parade of recent major efforts by enacting a $75 million bond issue. In 1961, New Jersey followed with $60 million and Wisconsin with $50 million. In 1963, Connecticut issued $3 million in recreation bonds; Pennsylvania $70 million. In 1964, California topped the list with a $150 million issue followed by Washington with $10 million, Rhode Island with $5 million, and Massachusetts with $3.3 million. In 1965, Kentucky floated a $4.5 million bond issue.

D. Needs and Prospective Capital Outlays

1. CAPITAL REQUIREMENTS

Federal and State Governments expect to invest approximately $11 billion for outdoor recreation during the decade 1966 through 1975. The States will spend $3.4 billion of their own funds and $1 billion in land and water conservation fund grants. See table 3 for the annual estimated expenditures.

Investments are needed to improve existing State and Federal recreation areas to accommodate more intensive use and to develop new areas.

Expanding public demand for outdoor recreation, growth of the Nation's population, the rising standard of living, and increasing amounts of leisure time are the principal factors creating pressures for additional recreation facilities. During the period 1960 through 1976, the U.S. population is expected to increase by 50 percent. The demand for camping will increase between 89 and 149 percent; the demand for swimming will grow between 76 and 90 percent; and the demand for picnicking will expand from 50 to 67 percent.

2. SOURCES OF FINANCING

The Federal Government will fund its capital outlays from the land and water conservation fund and from general taxation.

Acquisition of recreation lands and water by the National Park Service and the Forest Service and by the Bureau of Sport Fisheries and Wildlife, including acquisitions to protect endangered species of wildlife, are expected to be financed from the land and water conservation fund. In any one year, 40 percent of the proceeds ordinarily would be devoted to Federal acquisition programs. However, the fund act authorizes the President to recommend that the Federal portion be as much as 55 percent or as little as 25 percent in any one year during the first 5 years of the program, which began January 1, 1965. Because the act also authorizes Congress to advance a total of $480 million

for Federal acquisition and State grants-in-aid during the 8-year period beginning in fiscal year 1968, substantial funds during the next few years could be made available for such Federal land acquisition if Congress wishes. Rapidly escalating price of recreation lands during the last few years suggests that such advances of funds at an early date may be wise and prudent investments. The schedule indicated by table 3 includes accelerated advance appropriations.

Acquisition of recreation lands around multiple-purpose reservoirs built by the Corps of Engineers, the Bureau of Reclamation, and the Tennessee Valley Authority are generally financed from general appropriations. Under the terms of the Federal Water Projects Recreation Act, enacted in 1965, full recreation development will be provided on most reservoirs only if non-Federal public bodies agree to operate and maintain the facilities and to repay to the Federal Government one-half the separable costs attributable to outdoor recreation.

Payments to the Treasury from the land and water conservation fund under provisions of section 6(a)(2) of the Conservation Fund Act may be made to help offset Federal costs allocated to recreation and fish and wildlife enhancement at projects which are not cost-shared by local public bodies.

Because State or local government bodies may elect to pledge revenues from entrance fees and other user charges to pay their share of the costs of recreation features, half of the directly identifiable costs attributable to outdoor recreation on many Federal multiple-purpose water projects are expected to be paid in the future by the visitors to such projects.

Construction of recreation facilities for Federal agencies generally will be financed from general taxation. However, facilities constructed at multiple-purpose reservoirs will be subject to the same cost-sharing requirements as will recreation land acquisitions.

The States generally are expected to finance most of their land and water acquisition from direct tax funds, matched by Federal grants-in-aid from the land and water conservation fund, from the open space program, and from the Greenspan program. Federal grant programs are expected to provide only 10 to 15 percent of the estimated annual investment needed to develop the necessary non-Federal public facilities. Many States will issue bonds to acquire the initial capital necessary, then repay the funds from tax revenues.

TABLE 1.—*Inventory of Federal and State recreation areas and selected facilities by census divisions*

	U.S. totals	New England	Middle Atlantic	East North Central	West North Central	South Atlantic	East South Central	West South Central	Mountain	Pacific
Number of Federal areas	1,746	59	69	98	153	249	85	139	404	490
Number of State areas	19,076	1,977	936	5,526	2,507	1,650	1,786	1,127	1,297	2,270
Total areas	20,822	2,036	1,005	5,624	2,660	1,899	1,871	1,266	1,701	2,760
Number of Federal acres (thousands)	276,960	1,119	788	6,080	15,346	10,450	3,740	8,173	133,616	97,648
Number of State acres (thousands)	35,359	999	6,693	6,775	4,700	4,589	2,561	2,728	1,858	4,456
Total acres (thousands)	312,319	2,118	7,481	12,855	20,046	15,039	6,301	10,901	135,474	102,104
Number picnic tables—Federal	78,158	1,777	2,531	5,323	8,670	9,569	2,799	12,056	19,043	16,390
Number picnic tables—State	229,652	24,998	59,870	65,650	19,472	22,686	8,087	8,859	3,862	16,168
Total number picnic tables	307,810	26,775	62,401	70,973	28,142	32,255	10,886	20,915	22,905	32,558
Acres, swimming beach—Federal	9,377	84	286	152	5,313	1,945	164	624	188	621
Acres, swimming beach—State	8,787	1,998	370	740	547	1,062	540	612	144	2,774
Total acres, swimming beach	18,164	2,082	656	892	5,860	3,007	704	1,236	332	3,395
Acres, boat access—Federal	10,668	239	82	454	5,795	1,318	1,393	261	420	706
Acres, boat access—State	7,317	487	499	1,095	1,512	934	1,087	641	355	707
Total acres, boat access	17,985	726	581	1,549	7,307	2,252	2,480	902	775	1,413
Acres, ski slopes—Federal	25,471	1,492	36	365	117	----------	----------	----------	14,471	8,900
Acres, ski slopes—State	6,517	2,735	146	729	9	23	----------	----------	----------	2,515
Total acres, ski slopes	31,988	4,227	182	1,094	126	23	----------	----------	14,471	11,505
Spaces, camping tent and trailer—Federal	102,661	2,118	1,496	3,662	9,128	6,580	3,219	12,991	25,793	37,674
Spaces, camping tent and trailer—State	101,649	8,492	13,875	32,757	9,476	9,558	3,107	7,595	1,721	15,068
Total spaces, camping tent and trailer	204,310	10,610	15,371	36,419	18,604	16,138	6,326	20,586	27,514	52,742
Acres, golf courses—Federal	28,388	2,746	1,301	1,647	2,999	5,876	2,046	4,457	2,639	4,677
Acres, golf courses—State	6,511	490	336	593	351	2,565	1,011	727	251	187
Total acres, golf courses	34,899	3,236	1,637	2,240	3,350	8,441	3,057	5,184	2,890	4,864

TABLE 2.—*Total Federal and State annual direct outlay for outdoor recreation expenditures,*[1] [2] *1951–65*

[In millions of 1965 dollars]

	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	Total
Federal	87.3	95.5	97.9	102.2	110.5	122.1	162.9	243.6	257.9	242.8	287.5	337.5	375.0	330.0	430.0	3,283
State	146.8	155.9	168.5	175.6	187.9	186.1	192.4	214.4	222.9	233.2	250.0	282.5	287.5	300.0	312.5	3,316
Total																6,599

[1] Expenditures include operation and maintenance, land acquisition, development, and construction.
[2] Expenditures for the ORRRC data 1951–60 were: 5.03 percent land acquisition; 48.07 percent development and construction; 28.74 percent operation and maintenance; 15.05 percent grants-in-aid; 3.11 percent other.

Source: 1951–60 data from table B, p. 6, Outdoor Recreation Resources Review Commission Study Report 25; 1964 and 1965 Federal data from Bureau of Outdoor Recreation Budget Review Studies; 1962 State data from Bureau of Outdoor Recreation Publication No. 2, State Outdoor Recreation Statistics 1962; 1961, 1962, 1963 Federal data and 1961, 1963, 1964, and 1965 State data were interpolated.

TABLE 3.—*Estimated annual expenditures for outdoor recreation on Federal and State lands, 1966–75*

[In millions of dollars]

	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	Total
Federal:											
Land and water conservation fund [1]	[2] 39.2	[2] 41.7	122.0	122.0	122.0	92.0	57.0	66.8	61.6	61.6	785.9
Other, appropriations, taxes [3]	493.0	535.5	570.5	608.5	639.5	682.5	719.0	755.0	790.0	828.5	6,622.0
Total, Federal	532.2	577.2	692.5	730.5	761.5	774.5	776.0	821.8	851.6	890.1	7,407.9
State:											
Land and water conservation fund [4]	[2] 84.4	[2] 65.7	100.0	100.0	100.0	135.0	95.0	100.2	92.4	92.4	965.1
Other, appropriations, taxes [3]	268.0	272.0	290.0	315.0	331.0	350.0	370.0	390.0	410.0	435.0	3,431.0
Total, State	352.4	337.7	390.0	415.0	431.0	485.0	465.0	490.2	502.4	527.4	4,396.1
Total, Federal and State	884.6	914.9	1,082.5	1,145.5	1,192.5	1,259.5	1,241.0	1,312.0	1,354.0	1,417.5	11,804.0

[1] Land acquisition only.
[2] As appropriated by the Congress; all other years estimated.
[3] Estimates based on projections of needs reported by Outdoor Recreation Resources Review Commission studies, 1961.
[4] Planning, land acquisition, and development; Federal portion only.

CHAPTER 30

Urban Local Outdoor Recreation Facilities*

A. NATURE AND COMPOSITION OF FACILITY

1. DESCRIPTION

(a) *Physical Characteristics*

This chapter covers local, publicly owned facilities having value for outdoor recreation and park purposes. It includes lands and outdoor recreation equipment and structures administered by regional, county, city, or special district bodies. It excludes State and Federal facilities, and agricultural recreation areas which are covered in other chapters. It also excludes large county-owned forests and lands of special non-recreation districts which are not used primarily for recreation purposes.

Among the recreation facilities considered in the study are public parks and recreation areas, playgrounds, ball diamonds, bathing beaches, outdoor swimming pools, tennis courts, recreation buildings, and indoor recreation centers. Among those buildings specifically designed for community recreation are arts and crafts centers, cultural centers, centers for older adults, sports buildings, and teen centers.

(b) *Services Rendered*

County and city parks serve the outdoor recreation needs of city and county residential areas within from one-half to 2 hours drive from home. The specific service area of a park will depend on its character and location. Playgrounds and neighborhood recreation parks may serve an area within a radius of one-eighth to one-fourth mile, or generally the equivalent of an elementary school district. District parks serve several neighborhoods, or an area comparable to junior or senior high school districts. Large urban and suburban parks serve the whole community, as do special facilities, such as golf courses and bathing beaches. Some county and large metropolitan parks are of sufficient size and quality to serve interurban or regional needs.

In addition to serving as facilities for outdoor recreation, local parks have a broader value to the community. They may serve to preserve scenic, historic, and natural resources. They may also be used to promote the formation of distinct cohesive communities, provide relief from extensive urbanization, or open up congested city centers so that buildings or landmarks can be viewed.

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(c) *Standards*

There is no single approved standard for measuring need for park and recreation areas. However, general guidelines have been developed by national organizations, recreation planners, and local and State planning departments throughout the country. Most commonly, these guidelines are based on projected recreation uses, but they also embrace other open space purposes, such as conservation, and the preservation of scenic and historic resources. All of these sources are useful in an attempt to assess the rough dimension of national need for local park and recreation facilities.

A review of available State outdoor recreation plans prepared in 1964 and 1965, as well as pertinent literature, reveals that common standards for adequate local parkland range from 15 to 35 acres per 1,000 population. These are presented in table I. Local plans have an even greater range: from 14 to 60 acres per 1,000. The range in standards is due to the variation in local conditions, density of population, degree of urbanization, availability of private recreation, climate, terrain, and other factors.

A standard close to the national average is 10 acres for small and large urban parks and 15 acres for metropolitan, county, or "extra-urban" parks per 1,000 served.

Standards also may be expressed for specific recreation facilities such as swimming pools and golf courses. Swimming pools should be able to accommodate anywhere from 1 to 3 percent of the total city population, at a given time, with from 15 to 30 square feet of water per swimmer. A 9-hole golf course should have a minimum acreage of 50 acres; an 18-hole course, 100 acres—and it is estimated that there should be 1 hole for every 3,000 population. In addition, commonly accepted standards provide for 1 baseball diamond per 6,000, 1 softball diamond per 3,000, and 1 tennis court per 2,000.

The adequacy of parkland is more than a question of acres, however. It is a question of the right number of acres in the right place. As noted by Thomas Hoving, New York Commissioner of Parks, New York had some 37,000 acres of parks. However, only 14,500 acres are in parkland located in the "immediate environment." He added that more than "half our recreation space is peripheral, underutilized and relatively inaccessible." [1]

Acreage standards provide a useful guideline, or test of adequacy, even though they vary considerably from place to place. High acreage standards are based primarily on the simple fact that demand for outdoor recreation opportunities is increasing at a faster rate than the population growth. Growing mobility, disposal income, and leisure time should continue this trend. Marion Clawson, a leading recreation planner, estimates that the use of municipal and county parks will expand from roughly 1 billion visits in 1955 to over 3 billion visits in 1985 and to 3.7 billion visits in the year 2000. Land preserved in permanent open spaces for recreation purposes will also help preserve the quality of urban life. While simple standards cannot define quality, they help dramatize the urgency of the problem.

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[1] New York Times magazine, Apr. 10, 1966, p. 12.

TABLE I.—*Selected standards for local recreation areas*

[Acres per 1,000 population]

Agency	Playgrounds or neighborhood parks	Playfields or district parks	Large urban parks	Total urban	County or "extra-urban"	Tota local
National Recreation Association [1]	2.5	2.5	5		15	25
Indiana				10.	15	25
Maryland				10	15	25
Missouri						25
New Jersey				8	12	20
New Mexico						16
Ohio [2]						30
Oklahoma	2.8	3	10		20	35.8
Pennsylvania						15
Washington						30
West Virginia	4	3	10		20	37
Wisconsin				10	15	25

[1] "Outdoor Recreation Space Standards," National Recreation and Park Association, January 1966. This publication revised standards is for discussion purposes, and is not yet an "official" standard.

[2] Ohio is one of the few States that has a standard which varies with the year, taking into consideration increased use of outdoor recreation areas per capita. The 30 acres per 1,000 is for 1971, the 1964 standard is 24 acres per 1,000, while the 1980 standards is 35 acres. The Northern Illinois Metropolitan Planning Commission also has a variable standard increasing with the target year.

(d) *Qualitative Standards*

Since parks serve a wide variety of functions, there can be no single set of qualitative standards. In this sense, parks are not like roads which can be engineered to national specifications to carry given volumes of traffic. However, certain general criteria can be applied to judge park quality. A park or recreation facility can be said to be of adequate quality if it is safe, attractive, accessible, easy to maintain, and continues to meet the demands placed upon it.

The application of these criteria would depend on the judgment of the group reviewing park adequacy; and the relative weights of the criteria would vary with the purpose of the facility. In fact, there might be a disagreement over which criteria to select, since little attention has been given to quality standards. Most of the planning and professional literature is devoted to standards of quantitative adequacy, not quality.

(1) *Safety*—In considering the safety of parks, a number of factors might be noted: adequacy of lighting, visibility from the street or roads, existence of fencing where it is needed, condition of equipment and facilities, protection from major hazards, provisions for traffic safety, and separation of different age groups and incompatible functions.

(2) *Attractiveness*—Atrtactiveness is a subjective judgment, but an important one. The National Recreation and Park Association recommends that playgrounds be combined with parks wherever possible so that play spaces can be integrated into the neighborhood and made as attractive as possible. And obviously, a rundown or neglected park cannot serve its primary function well.

(3) *Accessibility*—Accessibility is a key element. A park which cannot be easily reached is not serving its proper function. For this reason, small parks scattered throughout the city are often more valuable, acre for acre, than larger areas which are difficult to reach. In turn, larger regional parks must have adequate access roads or trails and be developed to the point of usefulness for the particular purposes to be served.

(4) *Maintenance*—An important factor in park quality is cost and difficulty of maintenance. This is one of the reasons that the NRPA recommends that playground and school recreation facilities be jointly operated wherever possible, so that maintenance efforts can be combined. Once a park is built, a key to its continued quality is how well it is maintained.

(5) *Adequacy to meet demand*—Most local parks are user rather than resource oriented. Therefore, a key index as to their quality is their ability to meet the needs of the people they are supposed to serve. Lands acquired, but not developed with facilities are not yet very useful to the park user. And those existing parks which have facilities which do not meet the current and changing needs of the population are not fulfilling their function. Changing ethnic or age characteristics of a neighborhood or city require a periodic re-examination of the adequacy of facilities to meet emerging needs of the new population groups.

Another approach to quality was provided in the Outdoor Recreation Resources Review Commission Study Report 5, "The Quality of Outdoor Recreation: As evidenced by User Satisfaction." This study was a report of user opinion surveys to determine the degree of satisfaction with the facilities being evaluated. In addition, forms were developed for professional evaluation of the quality of the facility. Among the factors graded by the examiner according to a scale ranging from excellent to poor were: quality of access roads, quality of the main attraction of the park, quality of the specific activities occurring in the park, site quality, design quality, and quality of maintenance or operation.

2. EXISTING CAPITAL PLANT

(a) *National Estimates for 1965*

There are no authoritative figures for the total number of local recreation facilities for the years since 1960, when the last detailed survey was undertaken by the National Recreation Association. Such surveys by the NRA have been the primary source of statistics on the subject since early in the 1900's. The Bureau of Census provides overall government expenditures on local park and recreation, but relies upon the NRA for detailed park and recreation figures. Even the NRA surveys are limited in that they do not cover every city and county. In 1961, the survey covered 2,762 cities and counties.

To supplement the 1960 survey material, a number of sources have been used, including the following: an International City Managers Association survey conducted in 1965 with the cooperation of the Urban Renewal Administration; a sample survey conducted by the Bureau of Outdoor Recreation, Department of Interior; a review of the 35 State outdoor recreation plans prepared in 1964 and 1965; and statistics on the number of acres acquired from 1961 to 1965 with assistance from the open-space land program.

Acreage estimates—Based on these sources, it is estimated that there were over 1,730,000 acres in county, city and special district parks, and other recreation lands in 1965. In some State plans local acreage was not specifically identified as county or city. Of those areas designated, 781,000 acres were city or special district, and 538,000 were county. By contrast, the total acreage listed for 1960 in the 1961 NRA yearbook was 1,015,461, with 584,754 acres in municipal

parks, 430,707 in county parks, and 86,152 in county and municipal school recreation areas.

The new figures are subject to the following qualifications:

1. They exclude certain nonurban county or municipal forests or recreation areas which perform a function more closely related to State parks. There are probably at least 3 million acres under county or special district control which have some value for recreation purposes, but are not within easy reach of urban areas. This total includes 229,133 acres reported in county and municipal parks and recreation areas in Georgia; 64,599 acres of "local recreation lands" and 164,866 acres of parish (county) recreation lands in Louisiana; some portion of a total of 333,087 acres reported by the California State Recreation Office to be in "lands designated for recreation purposes under local, county, or special district control"; and the 2.2 million acres in county forests in northern Wisconsin. In these cases, 1960 NRA figures were used, supplemented by information concerning lands acquired with assistance under the open-space land program.

2. They include some park acreage not reported in the previous NRA surveys because of nonreporting or underreporting of counties and cities.

3. They probably include some acreage figures which the NRA survey excluded as not being in the category of parks or recreation areas.

4. The increase in park acreage from 1960 to 1965 is probably due primarily to the increased coverage in the sources used for this study, rather than a large acquisition program. It is doubtful if more than 130,000 acres have been acquired during the period by local agencies, with 75,000 acres acquired with assistance under the open-space land program. The State-by-State increase is shown in table III.

Special Facilities—There are no official current figures for most of the special recreation facilities. The last fairly complete figures are for 1960. An estimate for 1965 was made by extrapolating limited surveys undertaken by the NRA for the year 1964.

TABLE II.—*Selected special facilities (1960 and 1965)*

Special facilities	1960			1965 total (estimate)
	Municipal	County	Total	
1. Playgrounds under leadership	18,403	1,704	20,107	20,932
2. Recreation buildings	3,502	326	3,828	4,978
3. Indoor recreation centers	12,049	1,093	13,142	(1)
4. Baseball diamonds	11,952	1,642	13,594	(1)
5. Bathing beaches	679	272	951	976
6. Golf courses	502	83	585	685
7. Ice skating rinks	3,739	250	3,898	4,013
8. Softball diamonds	13,725	1,107	14,832	(1)
9. Swimming pools	2,669	177	2,846	3,181
10. Tennis courts	14,721	955	15,676	16,616

[1] Unknown.

Source: *Park and Recreation Yearbook—1961* per 1960 figures.

To fill the gap in data between 1960 and 1965, use was made of the results of a sample NRA survey for new public recreation activity during 1964. Since this survey is a smaller sample than the regular 5-year effort, these 1964 figures are a conservative base for estimating total activity during the 5-year period. The 5-year estimates were added to the 1960 figures to arrive at a total 1965 figure for selected facilities.

TABLE III.—*Estimated construction of recreation facilities (1960–65)*

Facility	1964 activity	Estimated, 1961–65
Playgrounds	165	825
Recreation buildings and indoor centers	230	1,150
Ball fields (including basball, soccer, football)	169	845
Bathing beaches	5	25
Golf courses	25	125
Ice skating rinks	23	115
Swimming pools	67	335
Tennis courts	188	940

Source: Special NRA Survey for 1964.

Even if the estimate for 1961–65 activity were correct, there is no guarantee that the 1960 figures are complete. In fact, there is some evidence that the NRA figures are somewhat underreported. In 1964 a special survey was undertaken of all swimming pools in the continental United States, excluding the small above-ground pools commonly seen in backyards. Over 490,000 of these pools were defined as private, most of them enjoyed by single families on private homesites. The remaining 110,000 pools were listed as "public facilities," but fewer then 20,000 of these are publicly owned, tax-supported facilities. The balance of the pools were privately owned, but open to the public for a fee. Those listed as private were individually owned or open only to dues-paying members.[2]

The 20,000 publicly owned pools listed in this survey is contrasted with the 2,846 listed in the 1960 NRA survey.

While there are no independent figures of the number of publicly owned golf courses, the total number of courses is available. There were 7,477 golf courses in play in the United States in January 1964. The total acreage of these courses is 703,700.[3]

(b) *Distribution by States*

Table IV contains a breakdown of (*a*) selected recreation facilitier for 1960, and (*b*) total estimated local recreation area acreage fos 1965. The sources of these estimates are as follows:

(1) Where acreage figures were obtained from the State outdoor recreation plans undertaken in 1964 and 1965, they are designated by the letter "S."

(2) Where no State plan data existed, information was obtained from the 1961 Park and Recreation Yearbook. These figures are designated by the letters "NRA" and are for the years up to 1960.

(3) If no State figures were obtained from the State plan, but the State has received assistance under the open space land program, the figures are designated with "OS." This reflects the 1960 NRA figure, plus the acreage acquired in county and city parks with title VII assistance.

(4) In a few cases, the Bureau of Outdoor Recreation survey revealed additional acreage not reflected in other sources. These figures are designated by "BOR."

(5) If data was uncovered on local parks which appeared to fall outside of the scope of the survey, the figure is marked with a footnote, with the total acreage appearing in the footnote.

(6) The data on the special recreation facilities was obtained from the 1961 NRA Yearbook.

[2] Lloyd S. Hubbard, "Feasibility Studies Relative to Public Swimming Pools," Illinois Parks (January-February 1966) p. 13.

[3] Col. Harry C. Eckhoff, "Guidelines for Planning a Golf Course."

TABLE IV.—*Selected recreation statistics by State, 1960 and 1964–65*

State	1960					1964–65			
	Park acreage			Total playgrounds under leadership	Total recreation buildings and indoor centers	Total local acreage, 1964–65 (estimate)	Source of data	Acreage acquired with title VII assistance	
	City	County	Total					Local	State
1. Alabama	4,990	131	5,121	212	97	5,121	NRA	0	
2. Alaska	850		850	4	1	850	NRA	0	
3. Arizona	23,756	32,777	56,533	275	256	56,533	NRA	0	
4. Arkansas	3,487		3,487	11	21	7,377	BOR	57	
5. California	56,945	78,575	135,520	2,957	5,128	140,880	OS [1]	5,360	18,582
6. Colorado	28,417	3,606	32,023	157	228	52,520	S	216	
7. Connecticut	14,410		14,410	432	315	30,000	S	1,972	871
8. Delaware	1,066	226	1,292	36	19	1,292	NRA	0	
9. District of Columbia	39,478		39,478	110	117	39,478	NRA	0	
10. Florida	8,545	8,850	17,395	454	311	17,541	OS	146	
11. Georgia	5,000	929	5,929	236	140	6,953	OS [2]	1,024	
12. Hawaii		3,358	3,358	155	93	4,168	S	751	110
13. Idaho	2,656		2,656	59	55	2,656	NRA	0	
14. Illinois	26,755	53,074	78,849	888	820	90,553	S	13,411	
15. Indiana	14,550	305	14,855	484	329	23,892	S	145	
16. Iowa	9,323	4,103	13,426	263	128	54,955	S	991	
17. Kansas	7,824	464	8,288	191	94	14,500	S	165	
18. Kentucky	5,370	2,805	8,175	213	234	16,638	S	761	
19. Louisiana	3,007	1,747	4,754	306	83	4,754	NRA [3]	0	
20. Maine	1,243		1,243	93	43	1,293	OS	50	
21. Maryland	6,708	5,806	12,514	415	475	62,812	S	7,813	
22. Massachusetts	14,732	16,082	30,814	836	296	31,490	OS	676	647
23. Michigan	21,211	25,338	46,549	1,130	847	93,318	S [4]	2,581	2,020
24. Minnesota	17,828	321	18,149	529	438	41,536	S	335	358
25. Mississippi	2,118	4,356	6,474	134	70	6,474	NRA	0	

26. Missouri	17,729	1,603	19,332	297	127	100,000	S	227	
27. Montana	3,434	11,000	14,434	58	91	14,434	NRA	24	
28. Nebraska	6,232		6,232	105	30	14,418	S	1,087	
29. Nevada	235	887	1,122	13	14	1,122	NRA	0	
30. New Hampshire	2,111	1,000	3,111	73	45	5,671	S	0	
31. New Jersey	5,977	19,300	25,277	821	558	41,956	S	6,410	24,398
32. New Mexico	1,674		1,674	67	80	19,033	S	0	
33. New York	54,323	20,646	74,969	2,020	1,339	117,094	S	9,147	10,036
34. North Carolina	10,054	206	10,260	345	206	10,260	NRA	1,446	
35. North Dakota	2,662	938	3,600	42	51	3,600	NRA	0	
36. Ohio	32,731	80,540	113,271	1,083	642	194,438	S[5]	6,405	3,662
37. Oklahoma	10,650	152	10,802	114	79	121,750	S	534	
38. Oregon	9,228	4,400	13,628	130	144	35,077	S	801	
39. Pennsylvania	19,886	7,114	27,000	1,500	776	43,149	S	5,450	8,323
40. Rhode Island	1,120		1,120	126	71	1,796	OS-BOR	71	471
41. South Carolina	1,962		1,962	120	84	1,968	OS	6	
42. South Dakota	1,564		1,564	49	26	1,578	OS	14	
43. Tennessee	10,991	1,145	12,136	306	201	12,886	OS	750	
44. Texas	40,671	2,858	43,529	602	505	78,400	S[6]	437	
45. Utah	931	3,190	4,121	150	149	4,256	OS	135	
46. Vermont	1,691		1,691	51	82	1,691	NRA	0	
47. Virginia	7,093	2,062	9,155	482	298	12,236	OS	3,081	
48. Washington	11,375	2,599	13,974	264	236	19,906	S	1,021	
49. West Virginia	2,867	530	3,397	248	91	12,953	S	26	
50. Wisconsin	7,820	20,764	28,584	445	388	45,173	S[7]	1,673	210
51. Wyoming	454	6,920	7,374	16	19	7,374	NRA	0	
Total	583,754	430,707	1,015,461	20,107	16,970	1,730,403		75,345	69,688

[1] Reflects only part of 1965 total estimated by California State Recreation Office of 333,087 acres in "lands designated for recreation purposes under local, county, or special district control."

[2] Reflects only part of 229,133 acres reported in Georgia State plan in county and municipal parks.

[3] Reflects only part of 64,599 acres in local ownership and 164,866 in parish (county) control reported in Louisiana State plan.

[4] Does not reflect 68,742 in school forests and 107,263 in community forests.

[5] Total may not all be under local control. Ohio State plan lists acreage by class. Total includes classes I and II, which covers intensively used recreation lands or general use recreation lands within 20 miles of population center of 50,000 or more.

[6] Total acreage excludes 55,000 in water which is locally owned.

[7] Total does not reflect 2,200,000 acres in county forests in the northern part of the State.

Source: See text, sec. A2(a).

(c) *Distribution of Facilities by City Size*

Information on the distribution of recreation facilities by the size of cities can be obtained by a review of (1) the population-facility ratios for selected cities, (2) the distribution of expenditures on local park and recreation by size of city.

Table V was prepared by the National Recreation Association in 1963, based on the 1961 Park and Recreation Yearbook data. (*Recreation*, January 1963, p. 21). This table reflects the difficulty of meeting recreation standards by larger cities. Only the smaller cities seem able to meet accepted recreation standards.

TABLE V.—*Population per facility in top quartile cities, 1960, by population groups*

Population group	Baseball diamonds			Holes of golf			Softball diamonds			Tennis courts		
	Number of cities	Median	Average	Number of cities	Median	Average	Number of cities	Median	Average	Number of cities	Median	Average
5,000 to 9,999	87	2,727	2,571	5	469	416	70	1,807	1,817	71	1,463	1,379
10,000 to 24,999	126	4,534	4,354	12	750	735	118	2,617	2,522	114	1,910	1,886
25,000 to 49,999	73	6,322	5,910	16	1,492	1,471	73	3,000	3,057	71	2,475	2,464
50,000 to 99,999	38	6,914	7,053	15	2,280	2,255	38	3,556	3,434	39	3,017	2,833
100,000 to 249,999	17	8,847	8,109	12	2,983	2,952	17	3,200	3,611	17	3,035	3,031
250,000 to 499,000	7	8,682	10,300	6	4,066	4,094	7	3,147	3,146	7	4,164	3,692
500,000 to 999,999	4	15,113	14,994	3	8,611	8,253	4	5,293	5,034	4	5,706	5,786
1,000,000 and over	1	16,848	----------	1	16,014	----------	1	1,994	----------	1	5,912	----------
Total	353	----------	----------	70	----------	----------	328	----------	----------	324	----------	----------

Source: National Recreation Association.

TABLE VI.—*Expenditure for park and recreation by size of city for selected years*

IN MILLIONS OF DOLLARS

Year	Total	Over 1,000,000	500,000 to 1,000,000	300,000 to 500,000	200,000 to 300,000	100,000 to 200,000	50,000 to 100,000	Under 50,000
1963–64	732	161	125	72	43	67	79	185

Year	Total	Over 1,000,000	500,000 to 1,000,000	250,000 to 500,000	100,000 to 250,000	50,000 to 100,000	25,000 to 50,000
1955	322.5	89.0	55.6	53.6	52.1	40.6	31.4
1953	259.0	68.2	52.1	42.9	38.1	29.0	34.1

PER CAPITA, IN DOLLARS

1955	5.20	5.11	6.06	6.51	5.50	4.55	3.61
1953	4.19	3.92	5.68	5.21	4.02	3.28	3.29

Source: City government finances, 1955 and 1963–64, U.S. Document, Bureau of Census.

(d) *Age Distribution of Facilities*

Table VII covers general age distribution of parks for cities over 100,000 and selected recreation facilities for all counties and cities included in the various NRA surveys. The table is incomplete in that it shows many facilities as having been constructed from 1921–40, when they were actually constructed during previous periods. This is due to the fact that the NRA surveys had not been undertaken for previous periods for certain of the facilities. The table is also deceptive in that no information is provided on which facilities have been renovated or completely rebuilt during the timespan under consideration.

It should be noted that the total park acreage does not include the more complete 1965 figures listed in a previous section.

TABLE VII.—*Age distribution of selected local public recreation facilities, 1880–1965*

Facility [1]	Before 1900	1901–20	1921–40	1941–60	1961 [2]
Parks, number	1,054	1,762	5,283	13,997	----------
Parks, acres	32,880	60,360	174,513	317,001	100,000+
Tennis courts	(3)	(3)	12,075	3,601	825+
Softball diamond	(3)	(3)	1,042	4,790	(3)
Baseball diamond	(3)	(3)	3,904	9,690	(3)
Swimming pools	(3)	359	841+	1,646+	335+
Ice skating rinks and areas	(3)	(3)	2,912	1,077	115+
Golf courses	(3)	(3)	387	198	125+
Beaches	(3)	260	312	379	25+
Playgrounds under leadership	(3)	4,293	5,628	10,186	825+
Recreation buildings and indoor centers	(3)	1,197	4,539	18,199	1,150+

[1] Parks for cities over 100,000. Other facilities for all county and municipal areas covered in National Recreation Association Surveys.
[2] Estimated.
[3] Not available.

Source: Marion Clawson, "Statistics on Outdoor Recreation," Resources for the Future, 1958. Table 28 Municipal and County Parks: Number, Acreage Facilities, Workers, and Expenditures, 1910–55; table 31 Municipal Parks: Number and Acreage of Parks—Cities of 100,000 and over (in 1950) by regions, and for selected years, 1880 to 1955. 1960 Data from the Yearbook of Parks and Recreation, 1961. The yearbooks of previous years are the source of the tables in Clawson's book.

(e) *Ownership*

This study has excluded facilities owned by private groups, cooperatives, and Federal and State Governments. The breakdown as to county and municipal government ownership is provided in previous tables.

(f) *Estimated Current Value*

It would be difficult to place a value on all of the local public recreation facilities. The market value of the land in Central Park, Golden Gate Park and the Cook County Forest Preserve might equal the total value of a million acres in the total local system. However, the mechanical task of multiplying estimated unit cost figures by the number of recreation facilities would at least put a floor on the value of existing capital plant. This has been done in table VIII below.

TABLE VIII.—*Estimated minimum value of local recreation facilities, 1965*

Facility	Unit	Cost per unit	Number of units	Total estimated value
				In millions
Premium city park acreage (cities over 100,000)	Acre	$75,000	[1] 180,000	$13,575
Other city parks	do	[2] 4,000	600,000	2,400
County parks	do	[2] 3,000	538,000	1,614
Playgrounds	do	[3] 3,000	[4] 20,000	120
Ball diamonds	Diamond	10,000	[5] 14,000	140
Bathing beaches	Acre	[3] 5,000	[6] 100	25
Golf courses	Hole	[3] 15,000	[7] 6,587	98
Swimming pools	Pool	75,000	3,200	240
Tennis courts	Court	1,500	17,000	225
Buildings	Building	([8])	([9])	([9])
Other improvements	Acre	3,000	1,730,000	5,190
Total				23,600

[1] Estimated.
[2] Acquisition cost.
[3] Development cost.
[4] At 2 acres each.
[5] In 1960.
[6] At 5 acres each.
[7] Number of holes estimated in 1960.
[8] Variable.
[9] Unknown.

The rationale for most of the costs for table VIII appear in a later section. The number of facilities are based on estimates of current physical plant which appear in table II.

The estimates on the value of land deserve special mention. Lacking any precise breakdown of the number of parks within the various property value zones of our cities and counties, all that can be done is to apply some educated guesses. Experience with the acquisitoin of small parks in downtown areas of large cities has indicated that costs per acre might run about $75,000. This is conservative, considering as of December 1964, the average cost per acre of all lands acquired under the urban renewal program was $2.23 a square foot or over $97,000 an acre. It is estimated that roughly one-half of the 360,000 acres in parks of cities over 100,000 reported in 1960 fell into this "premium park" category with an average value of $75,000 an acre. The balance of the acreage estimated for 1965 might fall into a $4,000 an acre category. Ordinarily, this land would be closer to residential areas and have more value than that acquired with title VII assistance from 1961 to 1965. Falling into a third category would be county or metropolitan parks which might run an average of $3,000 an acre.

B. Costs and User Charges

1. CONSTRUCTION COSTS

(a) *Land Acquisition and Development Costs*

In the context of this study, construction costs are useful in determining the current value of the capital plant of local recreation facilities and in projecting needs for the next decade. A major part of both of these determinations is the value of the land in current park acreage and the projected value of land during the acquisition period.

Based on experience to date with the open-space land program, the following current costs are estimated for various types of parkland, depending on location:

[Dollar cost per acre]

Facility	Cities over 50,000	Cities under 50,000	Urban fringe
State parks			$235
Regional parks		$1,895	1,365
Town or community parks	$2,465	1,840	978
Neighborhood parks	13,000	4,200	2,900
Park lots (under 2 acres)	75,000	15,000	

By comparison, the State of Pennsylvania has estimated an average $2,700 cost per acre in local parks for the eastern portion of the State; a cost of $400 for the rest of the State and an average for the whole State of $700 per acre. On the other hand, Oklahoma estimated average cost per acre for local playground and playfields to be $4,000 per acre in the northeast, $1,000 in the southwest, $800 in the southeast, and $1,400 in the northwest section of the State.

Based on continued escalation of land costs in urbanized areas, an average cost of $4,000 per acre is projected for closer-in parks throughout the Nation in the coming decade. For the county and metropolitan parks further out, a figure of $3,000 is a reasonable average projected cost. The actual costs will depend on the portion of land acquired near metropolitan centers, the degree of urbanization, and how soon the land is acquired during the decade.

A $3,500 average development cost is assumed for the type of urban-fringe land acquired with title VII assistance during the first years of its operation. Similarly, $3,000 per acre is assumed to be the average current value of development on the parks—in addition to the specific facilities covered in table VIII.

(b) *Specific Development Costs*

The actual cost of a given facility will vary greatly according to local terrain, cost of labor, and other factors. The development costs given in table VIII require certain qualifications. In general, they apply to "normal" situations. For example, the average of $3,000 per acre of playground development would not apply to New York City. Mr. Thomas Hoving, the New York Park Commissioner, has estimated that 200-vest pocket parks, totaling only 28 acres would cost about $7.2 million, spread out over the next 4 years.

Among the qualifications for the figures for special facilities on chart VIII are the following:

1. Ball diamond development of $10,000 is without bleachers.

2. Bathing beach development of $5,000 per acre includes parking facilities.

3. The $15,000 per hole estimate for golf course development falls within the general estimates by the National Golfing Association. Col. Harry Eckhoff, of the eastern division of the association has estimated that a 9-hole course should cost anywhere from $40,000 to $150,000; and an 18-hole course, from $75,000 to $350,000. Both of these figures exclude the cost of land and large structures, such as clubhouses.

4. Tennis court costs vary from $500 to $1,500, depending on the subsurface. This cost does not include drainage systems.

5. The $75,000 cost for a fully equipped outdoor swimming pool can be compared with another estimate of cost by square foot: $10 per square foot for water area, $2 per square foot for deck, and $18 for bathhouse area.

2. MAINTENANCE AND OPERATING COSTS

Ordinarily, separate maintenance and operating costs are not reported for the specific facilities listed in this chapter. A typical city budget has a total maintenance and operating budget for all city-owned recreation areas and programs. However, some sources of information are available on the general level of maintenance costs for city park departments. A recent survey conducted by the International City Manager's Association dealt in part with maintenance costs for the previous year, and projected maintenance costs for the next 5 years.

From nearly 200 responses to the survey, 106 were selected as having complete data. These 106 communities were located in 33 States. Their population ranged from under 10,000 to 1.9 million, with a total population of over 12 million (1960 population figures). The projected 5-year maintenance costs in the sample totaled $151 million. This was three times the $45 million in projected acquisition costs, and about double the $79 million in project development costs for the period. This 5-year maintenance projection for the sample was nearly $12 per capita. Applying this per capita figure to the 1960 SMSA population, a reasonable estimate of projected municipal expenditure for maintenance over the next 5 years might be $1.3 billion.

3. USER CHARGES

(a) *Degree of Use*

The Outdoor Recreation Resources Review Commission indicated that less than 30 percent of public outdoor recreation areas report any fee at all. However, those that do collect fees at the local level for the use of special facilities have raised substantial sums of money. The National Recreation Association reported that in 1960, over $51 million was collected in fees and charges by cities and counties for use of recreation facilities. Of this amount, over $20 million was turned back to city and county treasuries. The balance of over $31 million was used for operating expenses. An additional $5 million was obtained from refectories and concessions and $7 million from private sources.

(b) *Extent of Coverage Costs*

User charges cover only a fraction of total operating and maintenance costs for local recreation areas. Total operating and maintenance costs for cities were $407 million in 1960. Added to this was about $138 million of county operating expenses and maintenance. Thus, the $51 million received from fees and charges was less than 10 percent of this total.

(c) *Tax and Borrowings*

It appears that the bulk of income for local park and recreation expenditure comes from current Government revenues. Table IX, based on a survey by the International City Managers Association, shows revenue sources, as reported by nearly 200 cities, in terms of sources actually used or explored.

TABLE IX.—*Sources of funds for city park and recreation expenditures (1965)*

Source of funding	Number of cities	
	Actually used	Explored
Special mileage levy	25	5
Local improvement districts for park purposes	8	17
Special revenue bonds	33	20
Bonds redeemed by future revenues	13	14
State assistance	26	46
Current general revenues	131	4
Title VII assistance (Federal)	58	52
Small Watershed Act (Federal)	3	23
Land and water conservation fund (Federal)	5	53
Direct entrance fees and charges	47	10
Private donations	89	6

Source: Survey conducted by the International City Managers Association of cities.

C. TREND OF CAPITAL OUTLAYS

1. LOCAL EXPENDITURES

Table X indicates the trend of capital and other expenditures for local park and recreation for selected years from 1942 to 1964–65. The table also provides the following information for selected years: (1) total expenditures for local park and recreation; (2) total expenditures for construction of local park and recreation facilities; (3) city capital outlay, expenditure on operations and maintenance, and total expenditures for local park and recreation; and (4) total per capita expenditures for local park and recreation for selected years.

This same material is shown in chart form on chart I.

The chart and table show the dramatic increases in total expenditures and capital outlays during the 20-year period. Among the highlights of this increase are—

Total capital outlay increased over five times from 1952 to 1963, at an average rate of over $20 million a year.

Total local expenditures increased over five times from 1946 to 1963.

Nonmunicipal (primarily county) capital outlay and total expenditures increased significantly during the period.

The per capita expenditure more than doubled from 1950 to 1963.

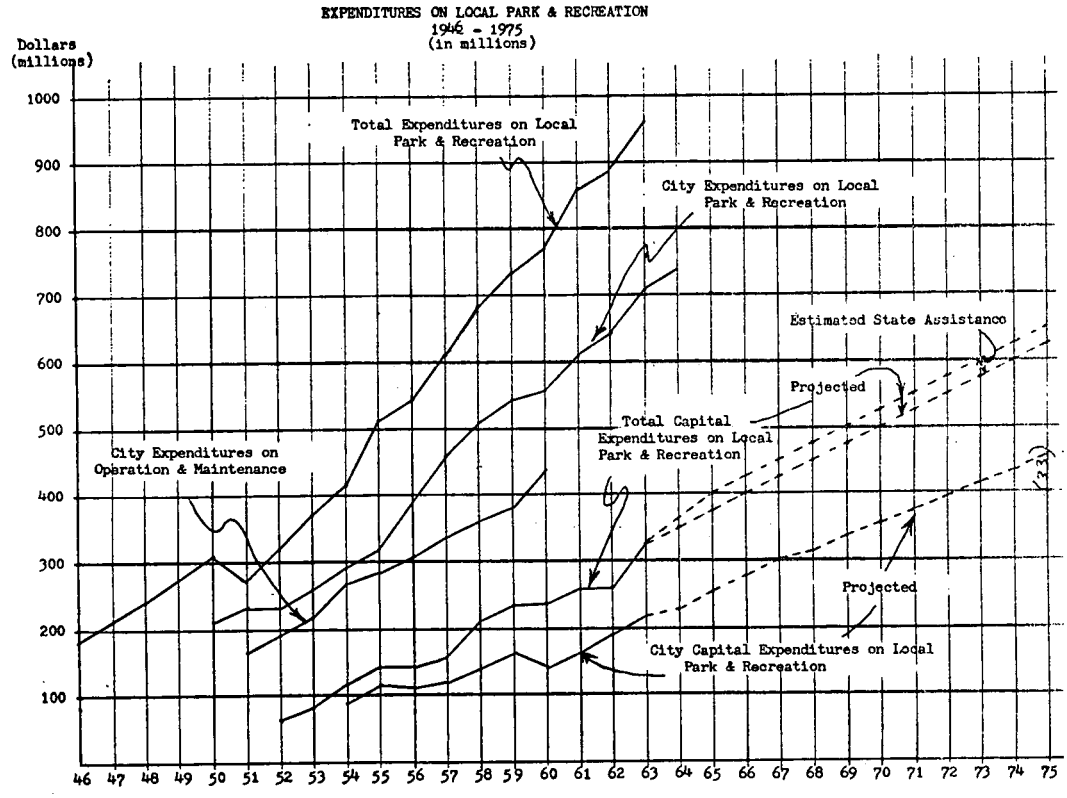
TABLE X.—*Outlays for local park and recreation, 1942 and 1946–65*

[In million of dollars]

Local park and recreation	1964–65	1963	1962	1961	1960	1959	1958	1957	1956	1955	1954	1953	1952	1951	1950	1949	1948	1947	1946	1942
Total expenditure	1,104	978	886	857	770	729	685	608	541	509	424	374	324	270	304	(1)	243	(1)	179	128
Total capital expenditure	360	317	269	254	235	229	205	156	144	142	112	74	63	------	------	------	------	------	------	------
Expenditures on construction	266	234	208	189	183	176	152	110	111	108	91	67	52	------	------	------	------	------	------	------
Total city expenditures	775	711	640	604	551	540	501	459	420	408	370	324	277	231	222	------	------	------	------	------
Capital outlay	224	221	186	157	144	161	140	123	115	118	98	------	------	------	------	------	------	------	------	------
Operations and maintenance	551	490	454	446	407	379	361	336	------	------	------	------	------	------	------	------	------	------	------	------
Total per capita (in dollars)	5.69	5.19	4.77	4.68	4.28	4.13	3.95	3.23	3.08	3.08	2.61	2.34	2.06	------	2.00	------	------	------	------	.95

[1] Not available.

Sources: 1, Census of Governments, 1962, "Historical Statistics on Governmental Finances and Employment"; 2, Statistical Abstract of the United States, 1965; 3, Compendium of City Finances, in 1963, U.S. Department of Commerce.


EXPENDITURES ON LOCAL PARK & RECREATION
1946 - 1975
(in millions)
Dollars
(millions)
1000
900
800
700
600
500
400
300
200
100
Total Expenditures on Local
Park & Recreation
City Expenditures on Local
Park & Recreation
Estimated State Assistance
Projected
Total Capital
Expenditures on Local
Park & Recreation
City Expenditures on
Operation & Maintenance
Projected
City Capital Expenditures on Local
Park & Recreation
46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75

2. SOURCE OF CAPITAL OUTLAYS

(a) *State Assistance*

Available information indicates that there has been some State assistance for local parks and recreation, at least from 1962 to the present time. Table XI shows the current State assistance programs. Of those programs listed below, New York, New Jersey, and Pennsylvania have expended, obligated, or programed their local assistance funds from 1962 to 1965. Other State programs have obligated part of their funds, but have a balance for future acquisitions. It is noted that New York is preparing a new bond issue which would provide a new source of funds for local assistance.

TABLE XI.—*List of larger State open-space land programs* [1] *(November 1964)*

[Dollar amounts in millions]

State	Type of program	Total	Local grants	Local grant, percent of land cost
New York	Local grant-in-aid, State park acquisition.	[2] $100.0	$45.0	75 percent of non-Federal share.
New Jersey	do	[2] 60.0	20.0	50 percent of acquisition cost.
Pennsylvania	Local grant-in-aid, State park acquisition; wildlife area acquisition.	[2] 70.0	20.0	Do.
Connecticut	Local grant-in-aid, State park acquisition.	5.0	5.0	50 percent of the non-Federal share.
Massachusetts	Local grants-in-aid to communities with conservation commission.	3.2	3.2	Up to 50 percent of total cost.
Rhode Island	Local grant-in-aid, State park acquisition: State conservation areas.	[2] 5.0	([3])	50 to 75 percent of non-Federal share.
California	State park acquisition, local grant-in-aid, wildlife area acquisition.	[2] 150.0	40.0	Up to 100 percent of total cost.
Washington	(1) Bond issue program: State park acquisition.	[2] 10.0	None	
	(2) Motorboat fuel tax: State water oriented facilities and local assistance.	[4] 15.0	([5])	40 percent.
Wisconsin	State park acquisition, State conservation areas.	[4] [6] 50.0	([7])	
Florida	State park acquisition	[4] [6] 50.0	None	
Minnesota	State park and forest acquisition	43.0	None	
Ohio	State park and recreation	[2] 25.0	None	

[1] "Preserving Urban Open-Space Land—The First Three Years" (mimeo) Urban Renewal Administration, HHFA, 1964, as updated.
[2] Financed by State bonds.
[3] One-third total.
[4] Estimate.
[5] One-half total.
[6] Financed by 1-cent cigarette tax increase.
[7] 1 grant.
[8] Financed by excise tax on recreation equipment.

Source: Ann Louise Strong, "Open-Space for Urban America, 1966."

(b) *Federal Assistance*

There are two primary sources of Federal financial assistance for acquisition and development of local parks and open-space land: the land and water conservation fund of the Department of the Interior and the open-space land program of the Department of Housing and Urban Development. Assistance for creating and developing parks in redevelopment areas is also provided by the urban renewal program, administered by the Department of Housing and Urban Development. Other agencies also provide assistance. The Office of Economic Opportunity may pay for part of the cost of labor to redevelop parks under the Nelson amendment, which is designed to train low-skill personnel for useful jobs. The Department of Agriculture has a new

"greenspan" element of the cropland adjustment program which will provide assistance to localities to acquire and conserve farmlands which have been taken out of production in urban areas. Also the Department of Agriculture's Public Law 566 program provides assistance for the purchase of lands around small watershed lakes.

Of these programs, the largest contributor to urban open-space acquisition has been the open-space land program. From 1962 to December 1965, it helped acquire over 75,000 acres of city, county, and special district open-space land. Grants totaled $33 million, or about 30 percent of total acquisition cost.

As of March 1966, the Land and Water Conservation Fund had made grants of $896,000, through the States, to localities. Of this total, $506,000 was for development, and the balance for acquisition cost. The first grant under this program was made in November 1965.

(c) *County and Special Districts*

County and special district outlays for total park and recreation expenditures and for capital outlays has been increasing at a rapid rate. In 1955 the noncity local expenditure for park and recreation was $101 million, roughly one quarter of city expenditure. During the same year the noncity capital outlay was only $24 million, also less than one-fourth of city capital expenditure. By contrast, in 1963, noncity total park and recreation expenditure was $267 million, about 35 percent of total city expenditure; and noncity capital outlay was $96 million or 43 percent of city capital outlay. The bulk of this increased activity was accounted for by counties. (See chart I.)

This increase in county activity was reflected in pending applications for open-space land program grants. As of the end of February 1966, pending applications were: $31 million for cities, $20 million for counties, and $9 million for special districts.

(d) *Private*

Table IX indicates that 89 of 200 communities sending back responses to the International City Manager's survey reported the use of private donations for park and recreation. However, there is some evidence that the value of private donations does not play a large part in local capital development for parks and recreation. A 1960 NRA survey showed only $7 million in private funds out of a total income of $505 million reported.

Perhaps the main role of the private sector is in the donation or dedication of land for park and recreation purposes. The Regional Plan Association reported that roughly one-third of the land in the New York metropolitan area had been donated by private groups. In addition, organizations like the Nature Conservancy acquire land and resell at cost to the government.

Another source of local recreation land is by subdivision dedication. Counties have assembled considerable amounts of local parkland by the use of variable density zoning. This permits the developer of a subdivision to place certain dwelling units in greater density on part of the subdivision site on the condition that a certain percent of the land be devoted to park purposes. Ordinarily, this land is of primary use to the residents of the subdivision and is not a substitute for true public parkland open to all regardless of race, color, or place of residence.

3. SOURCE OF FINANCING FOR LOCAL GOVERNMENTS

There has been little borrowing from the Federal Government for public outdoor recreation facilities. However, limited funds have been made available for planning public works under the "Advances for public works planning program," administered by the Department of Housing and Urban Development.

The primary source of local funding has been from taxes, with some use of revenue bonds. (See table IX.) However, the use of bonds seems to be increasing. The NRA reported in June 1965 that the amount of money voted on and approved for bond issues and tax levies in 1964 more than doubled over the previous years: 148 local referendum elections were reported: 124 of these were bond issues, 81 passed, 41 failed and the outcome of 2 was not reported. A total of $58 million was approved in 75 of the bond issues. Thirty-three of the bonds that failed total over $40 million.[4]

D. Needs and Prospective Capital Outlays

1. ESTIMATED NEEDS

To meet the quantitative standards for the year 1975 outlined previously and the qualitative standards set forth above, would require a total capital outlay of $17.6 billion for the next decade. This would include the following elements:

Purchase of 1 million acres of urban parks at an average projected cost of $4,000 per acre	$4, 000, 000, 000
Purchase of 1,000 acres of small neighborhood "vest pocket" parks at $75,000 an acre	75, 000, 000
Purchase of 3 million acres of extraurban county or metropolitan parks and open space at $3,000 per acre	9, 000, 000, 000
Development of 1 million of existing and newly acquired land at $3,500 an acre. (Includes selected recreation facilities)	3, 500, 000, 000
Redevelopment and modification of 250,000 acres existing urban parks, recreation areas and facilities to bring them up to quality standards	1, 000, 000, 000
Total	17, 575, 000, 000

(a) *Basis of Projected Need*

Basic to the first three categories of need listed above are the following factors: Increase in disposable income, mobility, and leisure time should continue to accelerate the growth in demand for outdoor recreation opportunities near urban areas at double the rate of population growth. The 1975 urban population is expected to be 71 percent of the projected national population of 230 million. (This would be 163.3 million.) As demand for recreation is growing, so is urbanization at about 1 million acres a year. It is consuming lands having value for recreation as well as scenic, historic, and conservation purposes at rapidly increasing rates.

Of the existing inventory of city owned parkland of 781,000 acres, a substantial portion is not "user-oriented." The BOR survey and State plans indicate that a large amount of locally owned parkland is actually resource-based and far from major urban concentrations. This acreage is nontransferrable. That is, local parkland in northern

[4] Arthur Todd, "Highlights of Public Recreation 1964" *Recreation* (June 1965, p. 283).

Michigan cannot meet the requirement for urban parks in Detroit. For this reason, only a portion of 781,000 acres in city and district parks should be counted as meeting the 10 acre national standard. If. 150,000 acres in remote portions of Texas, Missouri, and the Mountain States were excluded from the total, the current inventory of user-oriented local parkland would be about 630,000 acres. It is probably even less. Projecting a 1975 need of 1,630,000 acres based on a 10 acre per 1,000 standard for the 163 million 1975 urban population, would produce a deficit of 1 million acres. At $4,000 per acre, this land would cost $4 billion during the next decade.

Very few studies have been done on the adequacy of neighborhood and downtown park acreages. However, based on experience to date with the "small parks program" of the Department of Housing and Urban Development, a minimum need of 1,000 acres of small parks is "projected" for congested neighborhood and downtown areas of large cities. Further experience with this program might indicate a larger need. At an average cost of $75,000 an acre for this premium land, the total cost would be $75 million for the decade.

The extraurban or metropolitan open space need of 15 acres per 1,000 population is met only in part by the 538,000 acres in county owned parkland.

Much of this land is remote, accessible only for long drives and vacations. Excluding roughly 100,000 acres in nonuser oriented county parks, current extraurban lands would be short roughly 3 million acres to meet the standard of 15 acres per 1,000, based on the national 1975 population of 230 million. At an estimated projected cost of $3,000 per acre, this acreage would cost roughly $9 billion.

It is assumed that during the next decade only a portion of total existing and newly acquired parks must be developed to meet priority needs. Once the land is acquired, then it can be developed at a more leisurely pace. If a million acres were developed during the next decade, it might meet at least the most pressing recreation needs. At $3,500 per acre this would cost $3.5 billion.

A substantial portion of city parks constructed before 1940 need considerable upgrading. While there is no precise estimate of the condition of these parks, a reasonable estimate might be that 250,000 acres of city parkland may need redevelopment. At $4,000 an acre, this would cost $1 billion.

No category of need is indicated here for specific recreation facilities, such as swimming pools and golf courses. There is not enough information about the location, cost and accessibility of private facilities to determine the need for publicly owned facilities.

(b) *Capital Needs per Year*

The capital needs estimated above would gradually increase each year during the next decade, with an emphasis of land acquisition, minor development, and redevelopment during the early part of the decade, and major land development toward the end of the decade. Early land purchase would reduce the unit cost of land because of escalating prices.

(c) *Need According to Size of Community*

Probably 75 percent of the need is for communities over 50,000. if the trends indicated in table VI continue. The exception to this

should be small communities which are in large metropolitan complexes. To preserve the quality of their environment, land should be preserved as soon as possible.

(d) *Source of Capital Outlay*

(1) *State.*—It would be reasonable to expect the more populous States to follow the leadership of New York, New Jersey, and California and provide expanded assistance for local park and recreation capital expenditure. This trend should accelerate as reapportionment begins to have a real impact and greater attention is given to the needs of urban areas. It is assumed that the States will provide at least $200 million during the 10-year period.

(2) *Cities, counties, and special districts.*—Assuming that the capital outlay trend from 1952 to 1962 continues to 1975, a total local outlay of $5.5 billion from 1966 to 1975 could be expected. This trend is projected on chart I. Thus, by 1975 total local capital expenditures should be $625 million.

The county and special district capital outlay should assume a constantly larger proportion of this total, consistent with the trend from 1952 to 1962. Thus, by 1975, the county and special district expenditure might be $170 million.

City outlay should continue to rise at a slower rate than total capital outlay, totaling $455 by 1975.

It is believed that total projected capital outlay would bear a consistent relationship with total local expenditure for local park and recreation, assuming the continued upward trend of per capita expenditure for local park and recreation of the last decade. From 1950 to 1963 per capita expenditure increased from $2 to over $5. A reasonable extension of this growth would be to $7 by 1975. Based on the expected 230 million population by 1975, the total local park and recreation expenditure for that year would be around $1.6 billion. The $625 million capital outlay projected for that year would be 38 percent of the total projected expenditure. This ratio of capital to total outlay is consistent with the earlier trends. In 1952, it was only 20 percent of the total; in 1962 it was 33 percent of the total.

TABLE XII.—*Projected local capital outlays for local park and recreation, 1966–75*

[In millions]

	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
Total, local	$400	$425	$450	$475	$500	$525	$550	$575	$600	$625
City	275	290	305	330	355	375	390	415	430	455
Other	125	135	145	145	145	150	160	160	170	170

(3) *Profitmaking organizations.*—Profitmaking groups are expected to continue to meet a major part of the demand for golf courses, beach facilities, and swimming pools. However, they would continue to serve users with high mobility and ability to pay.

(e) *Sources of Financing for Local Government*

It is assumed that appropriations from tax resources will continue to play a key role in meeting the local part of the total capital outlay during the decade. However, bond issues should play a more impor-

tant role than they have in the past. Currently, there are no major programs available to provide loans from the Federal Government for park land. The only program is the recently enacted advance acquisition of public facilities program. To date there has been no experience with it. Loans are available to private recreation businesses under various programs and to farmers for providing income-bearing recreation facilities. But they are beyond the scope of the program.

Gifts and bequests could play a role in acquisition of land, particularly with the use of tax incentives.

CHAPTER 31

Rural Outdoor Recreational Facilities*

A. NATURE AND COMPOSITION OF FACILITIES

1. THE PRIVATE RECREATION BUSINESS: DESCRIPTION OF FACILITIES

Physical characteristics of privately owned recreation facilities vary from rustic to contemporary; from rundown and outdated to new and ultramodern. Observations show that the present surge of demand is causing revolutionary changes in the physical plant. In northern Wisconsin, for example, the changing pattern of demand is creating problems for the older, small resorts designed to serve families vacationing there for 1 or 2 weeks. Vacationers are now more mobile. They stay for shorter periods and they want more luxuries. As a result, motels, and facilities designed to serve a very transient trade are needed to fit the new demands.

Another general change is demonstrated by the growth of facilities designed to serve the recreation needs of all ages in the family. Thus, a family may stay in a campground, a resort, or a motel which offers certain types of facilities but which depends on other off-property facilities for the variety of recreation desired by families of mixed ages, sexes, and recreational interests.

While the growth or even the overall importance of recreation enterprises has not yet been measured, it is evident that private enterprise is more directly involved in providing some kinds of recreational opportunities than others. For example, farm vacation and sky diving opportunities are generated almost entirely within the private sector.

Interests of the private sector in providing recreation facilities generally fall into four categories depending upon the motives involved. First and probably foremost is the profit motive. It is estimated that about two-thirds of all recreation facilities provided by private interests are profit-oriented business ventures. The second most important motive is to provide recreation for groups such as members of private clubs. Another is social welfare, educational, youth or religion oriented which relates outdoor living experiences with particular group programs. The fourth is reflected by private industries which provide recreational facilities as added fringe benefits to their employees or for public use as part of goodwill and public relations programs.

Demand for outdoor recreation is growing. It will continue to grow. The ORRRC report, Outdoor Recreation for America, 1962, predicts an estimated threefold increase in demand for recreation during the 40 years between 1960 and 2000.[1] Increased efforts by

*Prepared within the Economic Research Service, U.S. Department of Agriculture with minor editing by committee staff. The authors were Judith M. Huff, Hugh A. Johnson, Gary C. Taylor, and J. Patrick Madden.

[1] Outdoor Recreation Resources Review Commission (ORRRC). Outdoor Recreation for America. Government Printing Office, January 1962. P. 5.

private and public sectors will be required to meet the surging demand for a widening variety of recreational opportunities. Neither sector will be able to supply the needed facilities by itself. But between them, they can provide sufficient quantities and satisfactory qualities of recreation opportunities for the American people. Private investment and private enterprise can complement public efforts as public efforts can complement private ones. On the other hand, it is equally possible for the two sectors to be in competitive positions. It is precisely this magnitude, diversity and quality of recreation needs which require that public and private sectors act cooperatively. Projects planned by each sector can be closely related and interdependent. Cooperation between the two sectors will help to insure that recreation developments are complementary, not competitive, and may result in a more concentrated supply and a wider range of recreational opportunities.

Private Land Resources for Recreation—More than 70 percent of the land area within the contiguous 48 States is in private ownership.[2] Private land ownership is prevalent in regions where population, and consequently demand for outdoor recreation, is greatest. Federal and State lands account for only 8 percent of the land area in the Northeast and 2 percent in the Corn Belt. These data contrast sharply with the 48 percent of Federal and State ownership in the Pacific States and 57 percent in the Mountain States. These proportions reflect the suitability of lands for varying purposes which help explain why western areas are renowned for providing certain wilderness and other extensive recreation experiences at National Parks and Forests and, conversely, why pressures for private development of new recreation facilities are occurring in eastern areas.

Many privately owned forest lands and farms, idle or of declining agricultural importance, are located near densely populated regions of the Nation. Technological changes now permit conversion or even multiple-use of these lands for recreation. The fortuitous location of some of these lands relative to population centers provides unique opportunities for developing private land resources to satisfy recreation needs.

A study of potential new sites in 10 Northeastern States showed a substantial number of holdings physically suited for outdoor recreation.[3] Within a 25-mile zone outside of suburban developments, the land was about 55 percent forest, 9 percent idle, 7 percent pasture, and 29 percent cropland and other uses.

Five types of recreation sites were defined. These five types were headwater or ridgetop; gorge and ravine; stream, river, lake or pond frontage; small stream or brook; and potential pond site.

One or another of these sites occurred within the 25-mile zone once per 129 acres of forest land, once per 258 acres of idle land, and once per 320 acres of pasture. The frequency with which these sites occurred in the outer zone was once per 132 acres of forest, once per 303 acres of idle land, and once per 645 acres of pasture.

This study emphasizes the existence of potential resources for outdoor recreation near urban concentrations where the demand for

[2] ORRRC, "Hunting in the United States—Its Present and Future Role." ORRRC Study Report 6. Government Printing Office, 1962, table D-26.
[3] ORRRC, "Potential New Sites for Outdoor Recreation in the Northeast." ORRRC Study Report 8. Government Printing Office, 1962, pp. 33-35.

recreation is greatest. It suggests that the major problem revolves around the utilization of this potential, rather than its existence.

2. EXISTING CAPITAL PLANT

(*a*) *Sources of Data.*—Two unpublished manuscripts provided much of the data used in this chapter. The older report, entitled "The Role of the Private Sector in Outdoor Recreation," was developed by a six-man study group of Federal employees appointed by the Recreation Advisory Council (RAC) to develop data and source material as background for a RAC policy statement. This draft manuscript, hereafter called the "RAC study report" was dated December 14, 1964. The second manuscript, entitled "Private Sector Study of Outdoor Recreation Enterprises," is a report of a nationwide survey prepared by a private firm, Chilton Research Services, under contract with the Bureau of Outdoor Recreation (BOR), U.S. Department of the Interior. This source is hereafter called the "Chilton report." No other analysis or inventory of the private recreation sector on a nationwide basis is available.

(*b*) *Private Outdoor Recreation Enterprises.*—The sample survey conducted for the Bureau of Outdoor Recreation indicates that there are about 132,000 outdoor recreation enterprises in the private sector. The regional distribution of these enterprises, by Census Division, is shown in table 1.

The regional enterprise percentage distribution, when compared with the 1960 regional population distribution, is considerably lower in the middle Atlantic and east south central regions and considerably higher in the west south central and mountain regions. The proportion of enterprises in the west south central is high, partly because many ranches offering deer hunting were reported there.

TABLE 1.—*Comparison of regional distribution of outdoor recreation enterprises in 1965 with 1960 population*

[In percent]

Region	Regional distribution	
	Recreation enterprises	Population
New England	5.0	5.9
Middle Atlantic	13.0	19.0
East north central	19.9	20.2
West north central	10.6	8.6
South Atlantic	15.8	14.5
East south central	3.0	6.7
West south central	14.5	9.5
Mountain	8.3	3.8
Pacific	9.9	11.8
U.S. total	100.0	100.0

Source: Chilton Research Services, Private Sector Study of Outdoor Recreation Enterprises, text table A, ch. II, p. 2, 1966.

In about one out of every three recreation enterprises less than $5,000 had been invested. Between $5,000 and $24,999 was invested in about 46 percent of the enterprises; $25,000 to $99,999 was invested in about 23 percent; more than $100,000 was invested in about 14

percent of the enterprises. The estimated value of capital investment in outdoor recreation enterprises is shown below: [4]

Value of investment:	*Percentage of recreation enterprises*
Under $500	14.8
$500 to $999	6.2
$1,000 to $4,999	13.8
$5,000 to $9,999	11.0
$10,000 to $24,999	15.2
$25,000 to $99,999	22.8
$100,000 to $500,000	10.3
Over $500,000	3.5
Uncertain	2.4

About 44 percent of the enterprises offered multiple activities, at least one of which was water based.[5] Fourteen percent offered only a single water-based activity. About 21 percent of the enterprises offered multiple activities, all of which were land based, and about 16 percent offered a single land-based activity.

The 15 types of recreation enterprises, classified on the basis of their "dominant" activity or facility, are listed below.[6] These 15 types accounted for about three-fourths of all recreation enterprises. The remaining 25 percent was scattered among 48 other categories of enterprises.

Recreation enterprise:	*Percent of all recreation enterprises*
Swimming pool	14.8
Hunting—big game	8.5
Land-based facilities	6.2
Water-based facilities (multiple facilities)	5.9
Golf course, golf and country club	5.5
Fishing, warm water	5.1
Resorts and hotels	4.9
Playfield	3.9
School fields (other than stadiums)	3.8
Cabins, cottages	3.7
Picnicking	3.1
Motels	2.9
Fishing, cold water	2.4
Swimming beach	2.1
Horseback riding (including pony rides)	2.0
Other	25.2
Total	100.0

The forms of ownership of these enterprises were reported as follows: [7]

Form of ownership:	*Percent*
Sole owner	33.2
Co-owner or partnership	26.3
Corporation	21.6
Cooperative association	7.0
Voluntary—quasi public	11.8
Miscellaneous	.1
Total	100.0

[4] Chilton report. Table 42, p. 52.
[5] Chilton report. Table 5. P. 9.
[6] Source: Derived from the Chilton report. Table 3. Pp. 3–5.
[7] Source: Derived from the Chilton report. Table 2. P. 2.

Relative to urban proximity, the greatest concentration of facilities such as swimming pools, bicycling, golf courses, drive-in movies, playfields, and sports stadiums, was reported in "primary county in a metro area." [8] However, the majority of the facilities were located in "nonmetro counties contiguous to a metro area" or in "counties with one county separation from a metro area." This was particularly noticeable for activities generally located in rural areas such as swimming beaches, boating, fishing, horseback riding, camping, picnicking, hunting, and hiking.

Resident organized youth camps and adult camps tended to be located in "nonmetro counties contiguous to a metro area," although the second most frequent locations were within the "primary counties in a metro area." Cabins, cottages, motels, hotels and other lodgings used as recreation enterprises tended to be located further away from the metro areas. Vacation farms are definitely of rural character.

(*c*) *Recreational Facilities of Nonprofit Groups and Individuals.*—Civic, church, and youth groups commonly provide recreation facilities at or below cost. Membership in or affiliation with such groups afford opportunities for many people to participate in recreation activities. These groups usually sponsor programs of an educational nature which encourage appreciation of the natural environment, stress the need for conservation, and emphasize the importance of sound resource management.

Individuals and private nonprofit organizations have long been engaged in acquiring and maintaining land to preserve and conserve natural areas and recreation resources. Substantial amounts of land have been donated by individuals to government and private nonprofit conservation organizations. Approximately 15 percent of the acreage in our national park system was donated by individuals.[9] Donations of individuals and organizations represent contributions in excess of $50 million.

The efforts of conservation groups and foundations and nonprofit recreation programs of numerous industries should also be considered in this framework. Well-known groups such as the Nature Conservancy, the Izaak Walton League, the National Wildlife Federation, Ducks Unlimited, and others directly or indirectly affect the conservation and development of recreation resources.

Most of the major commercial forest-owning corporations allow free use of their forests and waters for suitable recreation purposes. Arrangements are sometimes made for public agencies to regulate and supervise recreation use of these lands. Some timber owners welcome recreation uses, such as hunting, which help to control destruction caused by wild game. These positive values are weighed by the owners against the constant dangers of recreationist-caused fires, damage to facilities, vandalism, and other possible risks from allowing free recreational use of their properties.

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[8] Derived from the Chilton report. Table 78. Pp. 92–97.

[9] Recreation Advisory Council Study Group No. 3. The Role of the Private Sector in Outdoor Recreation. December 1964. P. 61.

An unpublished survey made in 1964 by the Soil Conservation Service showed that private rural-urban groups, primarily nonprofit types, owned or leased more than 39 million acres of land and water for recreational purposes.[10] More than 51,000 groups were involved, and their memberships totaled nearly 9 million people. The lands leased by these groups belonged to more than 47,000 owners, more than half of whom received income for the leases.

Information about real estate investment in these lands is unavailable. But assuming that the average acre is worth $100, the value of these 39 million acres would approximate $4 billion. No information is available about the value or capacity of recreation facilities provided on these 39 million acres.

Neither is information available about the number, value, or services provided by other private, nonprofit facilities such as cooperative swimming associations, tennis and golf clubs, hunt clubs, and many others.

B. Costs and User Charges

1. CAPITAL AND OPERATING COSTS

Construction costs for recreation facilities vary according to the size, shape, and quality of the structures utilized. Generally, construction costs for recreation facilities need not be more expensive than those for comparable commercial, industrial, or residential uses. A minor exception might arise from the need for safety features required by regulation due to public use of specific facilities.

Similarly, a great range exists in capital invested in various enterprises. It is easier, financially, to enter some types of recreation businesses than others. Some require little capital outlay. For example, a farmer can start a vacation farm enterprise using resources already available, whereas a shooting preserve requires investment in specialized equipment and facilities. Capital investment for recreation increases as the size of the operation increases and as specialized services are provided.

The range in value of capital investments for certain types of recreation enterprises in selected States is shown in table 2.[11] Income, expenses, and net returns are also shown.

Only about 60 percent of the enterprises showed a positive return to family labor and management after allowing a 5-percent return on capital investment. Guide services, hunting areas, and youth camps most often showed a positive return to family labor and management. The first two yielded supplementary income with small capital investment. The latter required considerable capital investments and management ability. Most of these enterprises had been in operation for 5 years or more. During this period, the successful operators had expanded demand for their ventures through satisfactory services and advertising.

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[10] RAC study report, p. 65.

[11] Bird, Ronald, and Inman, B. T., "Income Opportunities for Rural Families from Outdoor Recreation Enterprises," U.S. Department of Agriculture, AER No. 68, March 1965, pp. 7–8.

TABLE 2.—*Investment, income, and expenses for recreational enterprises in Arkansas, Missouri, New England, Ohio, Oregon, and South Carolina, 1962*

Enterprise	Number reported	Capital investment		Annual cash income		Annual cash expenses [1]		Net cash income		Return to management and family labor [2]	
		Average	Range	Average	Range	Average	Range	Average	Range	Average	Range
Fishing lake (warm water)	35	$14,379	$3,250–$48,330	$1,254	$55–$7,000	$716	$20–$5,049	$538	−$260–$2,200	$181	−$1,160–$1,426
Fishing lake (trout water)	10	39,267	1,626–105,100	9,953	450–30,000	6,426	52–26,021	3,527	28–7,665	1,564	−1,749–4,830
Guide service	8	1,750	0–7,500	2,301	500–8,450	807	4–4,660	1,494	238–2,740	1,406	196–3,469
Vacation farm or dude ranch [3]	12	50,277	9,365–130,000	7,034	400–32,500	5,322	54–27,936	1,712	−600–4,564	−802	−1,100–1,757
Vacation farm [4]	7	206	0–960	757	42–2,650	413	54–1,325	344	−12–1,325	334	−12–1,322
Hunting area	22	3,250	0–23,000	2,170	75–11,000	1,261	0–6,950	909	75–3,850	746	75–2,567
Shooting preserve	10	62,728	11,750–152,850	20,877	2,500–50,600	17,386	4,953–45,000	3,491	−3,440–14,850	355	−8,050–11,625
Campground	19	12,262	1,205–34,800	2,184	125–9,600	575	0–2,502	1,609	−446–7,819	996	−1,215–7,134
Picnic area	8	15,047	700–83,150	446	50–1,468	202	8–857	244	−150–792	−508	−3,985–592
Riding stable	15	17,644	5,115–40,000	4,369	400–21,000	2,353	368–6,200	2,016	−2,290–15,210	1,134	−3,985–13,210
Youth camp	6	69,147	7,460–140,000	25,472	6,300–56,000	17,124	3,270–44,280	8,348	3,030–23,090	4,891	1,215–16,880
Minnow farm	11	67,316	2,490–503,000	19,009	50–160,000	10,948	54–91,400	8,061	−265–68,600	4,695	−378–43,450
Boat rental	9	32,719	3,300–54,500	10,350	325–37,000	7,681	210–32,705	2,669	115–5,484	1,033	−385–3,684
Real estate development	4	13,386	4,850–21,240	9,569	3,500–14,700	1,395	545–2,692	8,174	2,255–13,286	7,505	1,193–12,676
Recreational complex	4	90,180	28,850–223,500	27,025	2,550–87,500	18,770	1,045–61,400	8,255	1,505–26,100	3,746	−1,676–14,925

[1] Includes annual cash expenses including property taxes. No depreciation expense is included.

[2] Annual income less annual expenses and a 5-percent charge for invested capital.

[3] Major use of farm or ranch.

[4] Secondary use of farm.

Most of the businesses returned less than $10 a day to management and family labor. Part-time enterprises provided supplementary incomes for many farmers on an investment of less than $15,000. But the full-time efforts of at least one worker and an investment of over $50,000 were required for an income sufficient to support a family. This investment is comparable to that required in many types of farming.

Experience with enterprises.—Six types of recreation enterprises are briefly discussed to demonstrate the variety of situations represented.[12]

Fishing waters include streams, lakes, ponds, reservoirs, and tidal waters. There are wide variations in the type of services offered by fishing enterprises. Some operators merely place a money receptacle at the entrance of their farm pond or stream where the user deposits a fee. There is no regular attendant, and the cost of operation is small, as are the returns. At the other extreme is the specialist who has separate ponds or lakes for trout and for warm-water fish. Ponds are stocked regularly. The operator may also rent boats and sell bait, cold drinks, sandwiches, and tackle. A picnic area may also be provided.

Capital required for building a farm pond or lake varies from a few thousand dollars to more than $50,000, depending on the size, the value of the land, and the facilities developed to accommodate the fishermen. In the Arkansas study, cost of construction averaged $175 per surface acre of water.

A fishing guide service consists of guiding individuals or parties over large bodies of water. The customer is provided with a guide, boat, motor, tackle, and necessary supplies. The capital requirements for guide services are not large. Many camps that cater to fishermen and hunters provide guides as an added service. The usual fee for guide services is about $1 an hour.

Commercial shooting preserves provide facilities where domestically bred gamebirds are released for fee hunting. An analysis of 10 shooting preserves in 4 States showed that those having net returns to family labor and management of more than $4,000 had capital investments of over $40,000.

Nineteen private campgrounds in three States showed that receipts from camping fees alone did not cover operating costs and depreciation. These operators sold food and camping supplies or provided other services for a fee to their customers. They usually had a few cabins for rent. Some campgrounds cater to the transient trade, and fees are usually higher than those charged at vacation grounds because special facilities such as showers, laundries, and snack bars have been added

Riding stables in six States were analyzed. The most successful businesses were located near population centers or large recreation complexes. Stables near public riding trails had the highest intensity of use and the lowest capital investment. When stables were located near a suburb and the operator used his own land for trails, his major investment was in land. To cover the high fixed cost on this type of enterprise the facility had to be intensively used. Riding school

[12] Bird and Inman, pp. 9-16.

operators often supplemented their incomes by training and boarding horses.

Children's camps commonly have a 4-week program, and 2 sessions are usually offered during the summer. The average fee in 1961 for privately operated camps was $300 for a 4-week session. The average camp reporting handled 120 children per session. An operation of this size requires a capital outlay of $100,000 to $200,000 to insure adequate facilities. Well-managed camps may be operated at a profit.

Other studies by the Economic Research Service, the Forest Service, and other research groups in various parts of the United States tend to bear out and expand upon results of the research reported above by Bird and Inman. Many enterprises have been unprofitable; relatively few have been profitable. Operators of unprofitable enterprises were usually inexperienced and often had misjudged demand for their facilities. Recreation enterprises, to be successful, must be well managed, provide adequate facilities, be reasonably close to population centers, and be well advertised.[13]

2. USER CHARGES

The growing pressures for land and the resulting trends toward a more widespread application of fees for recreational use of land are discussed below.

Traditionally, private entrepreneurs have provided many of the facilities and services to those seeking outdoor recreation. Many outdoor recreation opportunities have been associated with a wide range of personal needs that have traditionally been provided through the private market. These have included facilities for a variety of outdoor sports and activities that have changed and varied with personal tastes.

Historically, individuals have made free use of the extensive private wild lands, including those of farmers and timber companies. Now with our increasing population, growth of urban regions, and proliferation of commercial development over the countryside, these opportunities are rapidly diminishing. Former recreation areas, pastoral countryside and wild lands are being preempted by other uses. Much of our remaining private lands are becoming posted and the public denied access. This later trend is due, in part, to the development of vacation homes and private clubs, and to the sheer numbers threatening the interests of the private landowner. At the very time that demands by the public for outdoor recreation opportunities are soaring, the opportunities are becoming more and more restricted.[14]

Fees for services rendered are necessary for private recreation enterprises to operate at a profit. Nonprofit groups and corporations may operate recreation facilities without direct charges for their use, but the operating costs still must be met from contributions, donations, or levies on funds from other departments. Several industrial corporations charge their free recreation services to public relations and advertising.

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[13] Selected research reports reflecting these results include:
Davis, Jeanne M. Farm Vacation Enterprises in Ohio. U.S. Dept. Agr., ERS-164. May 1964.
Johnson, Hugh A. The Role of Recreation Enterprises in Rural Areas. In The Outdoor Recreation Phenomenon. N.Y. State College of Agriculture, Cornell U., Ithaca. 1964.
McCurdy, Dwight R. and Michon, Raymond M. A Survey of Ohio's Forest Picnic Businesses. U.S. Forest Serv. Res. Note CS-37. 6 pp. illus. July 1965.
McCurdy, Dwight R. The Forest Recreation Provider—Who Is He? J. Soil and Water Cons. 20 (3) May-June 1965.

[14] RAC study report, p. 2.

Whether or not charges should be made for recreation on public lands has been argued pro and con for many years. Growing pressures on all recreation resources and growing realization of the economic interrelationships between public and private recreational facilities and services have been factors tending to predispose public recreation agencies toward more widespread use of fees for the use of recreation facilities. Recent legislation, such as the Land and Water Conservation Fund Act of 1964, is indicative of the growing acceptance of this practice.

Complaints from private investors about competition from free public facilities have added impetus to public policy decisions to require fees for an increasing array of services and facilities. Judging from current trends, fees for the use of public facilities will become increasingly important in the future. These, in turn, can encourage profit-motivated private investors to develop recreation enterprises. However, it should be emphasized that the proper or desirable roles of private and public recreation developments are poorly defined. Studies are needed to determine the multiplier effect of public investments in various recreation facilities, how they encourage complementary private development, the role of concessionaires in the desired composite pattern of development, and related economic problems.

The level of fees and charges for various kinds of recreation varies widely depending on the quality of the specific services offered, as well as the general location of the recreation enterprises, the degree of competition, and whether the firm is profit or nonprofit oriented.

Fully one-third of the firms operating recreational enterprises, covered in a survey, made no charges for recreational use of their facilities.[15] In addition, an unknown number of nonprofit, quasi-public, and cooperative groups may have assessed only nominal charges for services, but have operated essentially on a nonprofit basis.

In two out of three enterprises, charges were made for recreational opportunities. Average dollar charges for 14 separate kinds of services and for situations where a single charge was made covering many types of services are shown in table 3. These are nationwide averages and may bear little relationship to fees charged in a single region or by a single firm.

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[15] Chilton report, table 34, p. 40.

TABLE 3.—*Average user charges for specific recreation facilities or services*

Specific service or method of charging fees	Number of enterprises reporting	User charge per person per—			User charge per party per—				User charge per car per—		User charge per boat per—	
		Hour	Day	Visit	Hour	Visit	Day	Week	Visit	Day	Hour	Day
Boating	10,746				$1.22		$4.47				$1.14	$3.43
Lodging	7,855		$5.02	$9.16			7.70	$45.50				
Camping	6,899		1.25				2.58	12.11		$1.00		
Fishing	5,851		2.37	6.61	.84		2.21					
Picnicking	4,102		.65	.53			4.42			.85		
Swimming	3,877		.59	.54			3.09					
Horseback riding	2,098	$1.75	6.00	.99								
Golfing	2,022					$1.66	2.36					
Entrance	1,371		.55	.69			1.00			.62		
Hunting	1,049		11.50	120.00			7.48	33.84				
Parking	941				1.00				$0.52	.67		
Hayride	117	1.01										
Playfields	106			.50								
Skiing	74		1.00									
Single fee for all services	71,864	3.49		1.85		7.34						

Source: Adapted from table 35, "Private sector study of outdoor recreation enterprises," Chilton Research Services, manuscript for Bureau of Outdoor Recreation, 1966.

C. Trends in Capital Outlay

Total capital investment in recreation facilities and related services has been increasing rapidly for several years. Several indexes may be used: Sales of boats and motors, trailers, camping equipment; sales of licenses; attendance data; construction of motels, ski facilities, second homes; gasolines sales, and others.

Data indicative of the recreation pattern of specific types of recreation activities are given below.[16] The estimated number of recreational boats in use grew from 2.4 million in 1947 to 7.8 million in 1965. Total retail sales income from boat sales, motors, equipment, club memberships, and services for 1965 was approximately $2.7 billion. There are 4,000 private marinas in the country, providing slips for 3 million boats. These marinas grossed approximately $300 million in 1965. Private yacht clubs, numbering 1,300, grossed approximately $180 million for the same period.

It is estimated that the number of travel trailers in use in 1968 will be 1 million—2½ times as many as in 1964.[17] Increases in pickup coaches and tent trailers will be substantial too. In 1964, there were 120,000 pickup coaches in use and 45,000 tent trailers, almost all acquired since 1960.

The rental of small, rural cabins or cottages for family vacations is becoming very prevalent. Vacation farms and dude ranches are growing in numbers. This kind of vacation opportunity has always been and still is almost wholly provided by the private sector.

The 1960 National Survey of Fishing and Hunting found that the number of hunters has increased 19 percent from 1955 to 1960, with the largest increase in big game hunting.[18] More women are hunting than ever before; their numbers more than doubled during the same period. Economic data on hunting equipment also demonstrates the increased interest in hunting. Sales of shotguns increased 7 percent from 1954 to 1958 and of rifles 38 percent.[19] A 40-percent increase in gross receipts of all sporting goods stores occurred between 1954 and 1958. While gross expenditures for hunting in 1960 were up 14 percent over 1955, the number of recreation days per hunter was slightly lower, as were the number of trips, but the length of trips increased.

Private land now produces 80 percent of the game and includes 85 percent of the habitat that can be economically improved and managed for hunting.[20] The potential for hunting on private lands is great; however, the lack of fees to compensate for economic losses may restrict the amount of private land made available to hunters.

In 1964 the National Golf Foundation reported 6,804 regulation golf courses and 673 par-3 courses.[21] Fifty percent of these were private country clubs where 20 percent of the Nation's golfers played. Private commercial courses accounted for 35 percent of the golfing facilities which accommodated 35 percent of the golfers. Public facilities

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[16] Unpublished 6-page information sheet prepared by the National Association of State Parks Directors, Dec. 10, 1965, p. 4.
[17] RAC study report, p. 78.
[18] 1960 National Survey of Fishing and Hunting. U.S. Department of the Interior, circular 120. September 1961.
[19] RAC study report, p. 89.
[20] RAC study report, p. 85.
[21] RAC study report, p. 96.

represented only 15 percent of the courses, yet handled 45 percent of the golfers. These data indicate the importance of private commercial ventures and the significant role played by municipal areas in supplying golfing facilities. At present, more than half of the 7 million golfers are being served by the private sector. Over 750,000 persons took up the game for the first time in 1963. There are now 40 golfers per thousand population as compared with 16 in 1936. Thus, the growth of golf participation is far greater than the population growth. In this same period the sales of golfing equipment went from $11 million to $130 million per year. This growth will be strengthened by the broader market for variants of the game such as par-3 courses, driving ranges, and minature golf courses, as well as for standard golfing facilities.

Financing.—Generally, 1 out of 3 operators had borrowed to finance the development of the outdoor recreation enterprise.[22] A sample survey representing approximately 45,000 operators reported the sources from which money was borrowed to finance development. The following sources of all loans were utilized:[23]

Source of loans	*Percent* [1]
Banks	69. 9
Friends or relatives	15. 6
Private lending agency	15. 7
Federal Government agency	4. 1
Other governmental agencies	. 2
Other private or nongovernmental	4. 0
Don't know	. 4

[1] Note: Adds to more than 100 percent because some operators used more than one source of credit.

The most frequent size of loans for recreation enterprises was between $25,000 and $99,999.[24] Only 4.1 percent of the loans were obtained from Federal agencies. Of these, loans from the Small Business Administration tended to be in higher amounts (62.2 percent being $25,000 or more), while Farmers Home Administration loans were concentrated in the $10,000 to $24,999 range (60.2 percent). Federal Land Bank loans were concentrated in small loans ranging from $1,000 to $4,000.

The Farmers Home Administration reported that as of May 1, 1966, it had made 794 loans for recreation purposes totaling $30,188,599. This was broken down into 546 loans to individual farmers, totaling $3,419,359, and 248 loans to nonprofit associations and public bodies totaling $26,769,240. The money for the greater part of these loans was put up by private investors and insured by the Federal Government.

These loans covered a broad range of recreation facilities, including vacation farms, cabins and cottages, picnicking, sports and camping areas, swimming facilities, golf courses, winter sports, horseback riding, fishing, boating, travel trailer parks, hunting preserves, pack services for big game hunting, youth camps, trap shooting, nature trails, bait farms, marinas, ball fields, fairgrounds, and one rodeo grounds. The average loan to an individual was $6,262; the average loan to an association was $107,940.

[22] Chilton report. Table 43, p. 53.
[23] Source: Derived from the Chilton report. Table 44, p. 54.
[24] Chilton report. Table 46, p. 57.

The Area Redevelopment Administration (ARA) had, as of June 30, 1964, extended $27 million in loans to retail and service businesses related to recreation and to recreation enterprises.

The Rural Electrification Administration approved two loans totaling $133,000 for electric cooperatives to relend to their consumers to help finance electrical equipment for commercial winter recreation resorts.

Concessionnaires have been asked by the National Park Service to invest around $70 million over a 10-year period.[25] There are over 1,000 public service businesses owned by concessionaires operating under special-use permits in the national forests.[26] These businesses have annual net sales of about $60 million and represent a total of $100 million in capital investment. In 1960 the National Planning Association conducted a thorough examination of the concession system and concluded that the private sector is by far the most promising potential source of new funds for recreation facilities. State and local agencies have tended to rely much less than Federal agencies on the private sector in financing and managing facilities. However, State and local agencies may increase their efforts to interest private investors as the pressures for recreation facilities increase and additional capital outlay is required.

D. Needs and Prospective Capital Outlays

The potential for the private sector in providing outdoor recreation to the public is, in general, high.[27] However, this potential varies greatly, with the kind of recreation provided, the area involved, and will depend to a considerable extent upon what public policies are followed, especially by State and local governments.

About half of the private outdoor recreation enterprises surveyed reported a capital investment of less than $13,000.[28] Also, about 23 percent of the enterprises planned to expand their facilities within the next 5 years.[29] The types of facilities mentioned most frequently were lodging, picnicking, swimming, and camping. Eleven percent of the enterprises with decreased patronage planned additions or expansions of facilities in the next 5 years compared to almost 30 percent of those with increased patronage.[30]

One should be cautioned against overoptimistic projections. Nine-tenths of the enterprises reported on the relationship between capacity and number of visitors. Of these, 62 percent reported underuse of facilities on weekends, other than holiday weekends, during the 1964 season.[31] Average underuse was about 52 percent. Fourteen percent of the enterprises reported overuse of facilities, and 24 percent operated at capacity. Of the enterprises that could not have handled more people, about 64 percent reported that they did not lose or turn away people.[32]

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[25] RAC study report, p. 68.
[26] "Outdoor Recreation in the National Forests." Forest Service, USDA, Agriculture Information Bulletin 301. September 1965, p. 71.
[27] RAC study report, p. 113.
[28] Chilton report, p. 8.
[29] Chilton report. Table 29, p. 34.
[30] Chilton report. Tables 27 and 28, pp. 32-33
[31] Chilton report. Table 19, p. 24.
[32] Chilton report. Table 21, p. 26.

No single published statistic of the capital investment in rural outdoor recreation facilities is known to exist. A rough approximation, based on estimates derived from calculating midpoint values for data from which the text table on page 561 was derived, was utilized to develop a basis for estimated capital investment in 1966 and 1975.[33] Considerable range for error existed, due to the way the basic data for the frequency distribution were collected. From these calculations, $9 billion was derived as the approximate private capital investment in outdoor recreation enterprises in 1965.

Discussion with informed personnel indicated that the survey data probably had a statistical standard error of about 10 percent. For projecting estimated capital investment to 1975, a range of ±2 standard errors (±20 percent) was suggested. Thus, a low level estimate of $7.2 billion and a high level of $10.8 billion were used as parameters.

Among basic assumptions provided by the staff of the Joint Economic Committee for making projections were that gross national product would grow at a rate of 5.5 percent and gross private domestic fixed investment at 4.5 percent from 1966 to 1975. Consultation with knowledgeable persons provided agreement that an average annual private capital investment in outdoor recreation facilities at about 5 percent was reasonable. Among factors considered were: that private capital investment in recreation facilities probably is growing slightly faster than the average of all fixed investments; much of the significant capital investment will be in large-scale corporate, multiuse types of recreation facilities as contrasted to the larger numbers of small facilities; facilities for recreation need not grow as rapidly as GNP because a general tendency to overbuild with a resultant underutilization of facilities will be less likely to occur under large-scale corporate management.

Using the above assumptions for the low-level estimate of $7.2 billion capital investment in 1965 and the assumed 5-percent average annual rate of increase produced estimated investments of $7.5 billion in 1966 and $11.7 billion in 1975.

Using the high-level estimate of $10.8 billion in 1965 produced estimated capital investments of $11.3 billion in 1966 and $16.6 billion by 1975.

The increase from 1966 to 1975 based on the low-level estimates would be $4.2 billion and based on the high-level estimate would be $5.3 billion.

Chilton report. Table 42, p. 52.

CHAPTER 32

Neighborhood Centers for Recreation, Health, and Social Services*

INTRODUCTION

This chapter is a summarization of the material gathered by the National Social Welfare Assembly from the following affiliated agencies: Boy Scouts of America, National Council; Boys' Clubs of America; Girl Scouts of the U.S.A.; National Federation of Settlements and Neighborhood Centers; National Jewish Welfare Board; Young Men's Christian Associations of the United States of America (National Council of); and Young Women's Christian Association of the United States of America.

The material is presented with certain qualifying information and remarks which have seemed necessary to provide a comprehensive picture of the subject matter.

It should be noted that each national agency's figures are based on its knowledge of its local membership agencies, and do not include such independent centers as may exist of which they have no knowledge.

A. NATURE AND COMPOSITION OF PUBLIC WORK OR FACILITY

1. DESCRIPTION OF THE PARTICULAR PUBLIC WORK OR FACILITY

(a) *General Physical Characteristics*
(b) *Services Rendered*
(c) *Standards of Performance*
(d) *Qualitative Standards of Performance*

Individual Agency Statements

Boy Scouts of America

(a) Physical facilities include camp properties, camp facilities, training facilities, and office buildings.

(b) Boy Scout camps are year-round training centers for the use of chartered Boy Scout troops and explorer Posts coming to camp under their own home leadership (adult volunteer leaders) to practice Scouting skills and ideals. They serve all areas, as boys come from all areas. Council-owned Boy Scout offices also serve all areas, as volunteer leaders work or live in all types of areas.

(c) A typical camp serving 200 Scouts requires 200 acres of usable land. Terrain and environmental factors increase total need to about 500 acres for a 200-boy camp. Offices are built to business standards.

(d) Sanitary treatment of wastes is consistent with the local health

*Prepared by the National Study Service of the National Social Welfare Assembly, Inc., with minor editing by committee staff.

codes. Road improvements are consistent with program needs. Structures are permanent and built to standards which maintain the esthetic qualities of the property. Regular maintenance procedures are carried out. Replacement cycle is normally 25 years.

Boys' Clubs of America

(a) The purposes of Boys' Clubs of America are to promote the health, social, educational, vocational, and character development of boys throughout the United States. These purposes are achieved through a building-centered program with professionally trained staff who work in a single building in a community or a central building and several branch buildings, depending on the size of the community, the areas to be served, and the number of boys to be served. Boys' Club buildings include a gymnasium, one or more games rooms, several shop rooms for woodworking, metalwork, and other crafts of various kinds, a library, several rooms for meetings of group clubs, administrative office, and in many instances a swimming pool with locker rooms, a health examination room, and a multipurpose use auditorium. Appropriate equipment is in each of these facilities. In addition, a large number of the clubs have playgrounds of varying sizes. Some 215 clubs conduct summer camps on which there are buildings or day-camp programs.

(b) Boys' Clubs are located for the most part in low-income residential areas and primarily serve boys from low-income families living in such areas.

(c) Club buildings are constructed to care for a membership of 500 up to 5,000 boys; the average facility for a membership of 1,000 to 1,500 boys.

(d) Qualitative standards for building maintenance, personnel, and work are required of the member clubs in Boys' Clubs of America. Much is done through the regional field staff to see that quality programs and facilities are maintained to provide quality service to the 700,000-boy members, most of whom come from low-income families.

Girl Scouts of the U.S.A.

(a) Local Girl Scout Councils own, lease, and borrow property and provide buildings and/or tent shelters and equipment including service vehicles, for activities, living, and operation, in order to offer camping.

(b) Camping is offered to the Council's girl membership, 7 to 17 years of age, by the day (5- to 6-day sessions); overnights by troops; and resident (generally in 2-week session).

(c) Standards of performance, for a camp housing 100 to 150 campers, include:

i. Several living units with 1 shelter each and containing 6 to 8 tents or cabins, 12 by 14 foot, housing 4 campers each;

ii. Sleeping area, 40 square feet per person, minimum 6 feet (resident camps) between heads of campers;

iii. Structures for administration are simple, and conform to building codes. A garage and utility shop are maintained. Also provided are a health center, office, living quarters for staff, director's cabin, shelter for staff recreation, central lodge, including dining hall and kitchen. Hot showers: one head for 8 campers. Toilets: 1 per 10 persons for resident camps, 1 to 20 for day camps:

iv. Water consumption is 50 gallons per person per day, if flush toilets are used, 30 gallons per person per day, if pit privy is used.

National Federation of Settlements and Neighborhood Centers

(a) The majority of buildings used by neighborhood centers are constructed of brick or concrete block. Most facilities are built to use two stories and basement. The spaces are designed for lobbies, offices, clubrooms, auditoriums, arts and crafts rooms, music, kitchens, gymnasiums, general multipurpose meeting rooms, health clinics, day-care facilities, playgrounds, day camps, resident camps. In a few facilities residence for staff is included.

(b) Multifunction social services are rendered to families living in low- and low-middle-income areas. Although generally located in the downtown areas of the city, in some instances facilities are in suburban areas. People of all ethnic groups receive service. The facilities, except camps, are located where the people who use them live.

(c) In general, space accommodations are:

Offices, for 1 or 2 persons at most.
Clubrooms, for 15 to 20 persons.
Auditoriums for 200 persons.
Multipurpose rooms, 75 to 100 persons.
Gymnasiums, standard high school size.
Arts and crafts rooms, 12 to 15 persons.
Music rooms, 15 persons.
Health clinics, 50 persons per period.
Day care, 45 to 60 children.
Resident camp, 60 to 100 children.

(d) The average life of the facility is 40 years.

National Jewish Welfare Board

(a) Facilities and equipment are provided for cultural, educational, social service, and health activities including, generally, clubrooms, meeting rooms, auditorium, arts and crafts rooms, gamerooms, lounge, gymnasium or gymnasium-auditorium, swimming pools, snack bar, and kitchen facilities.

(b) Leisure-time activities are conducted for members and participants in areas of Jewish and general culture, in education, social service, and health education.

(c) Facilities are designed to serve specific age groups and special interest needs of people to be served in their leisure time. The amount of space planned for different areas of structure is limited by total funds which can be obtained.

(d) Structures are "permanent" in character. Their frequency of repairs is minimal. The ordinary replacement cycle is from 30 to 35 years (due to mobility of clientele and, to a lesser degree, to obsolescence).

Young Men's Christian Associations of the United States of America

(a) The National Council of Young Men's Christian Associations of the United States of America is composed of 1,857 autonomous local YMCA's which are separately incorporated under the States in which

they exist. Approximately one-third of the YMCA's can be classed as nonequipment, or working out of offices.

(b) These YMCA's render service to residential, commercial, and industrial areas. They include armed services YMCA's, student YMCA's, city YMCA's, town and country YMCA's, where several small towns get together in a district, and transportation YMCA's. In 1965, local YMCA's also operated 406 residence camps and 782 day camps.

(c) In 1965 the number of YMCA members per 1,000 population ranged from 22 in cities over 500,000 to 43 in cities under 50,000—the ratio being 28 per 1,000 for the Nation as a whole.

(d) No information provided.

Young Women's Christian Association of the United States of America

(a) With respect to structures and equipment, the range is from small functional buildings for YWCA's in small communities or for decentralized program in larger cities to large multifunction central buildings in cities. The following types of properties are in use: Converted residential properties; converted small business buildings; buildings designed specifically for YWCA use; and buildings designed or converted for joint use with another agency. Characteristics of space provided, in order of complexity, beginning with basic areas in small facilities, are as follows:

i. Administrative and program offices; small meeting rooms; large meeting room ranging in size from 100 to 200 seating capacity; kitchen facilities primarily for serving catered meals or for light food service; and lounge and/or lobby.

ii. Item i, but with more offices and meeting rooms; large multipurpose room with 200 to 500 seating capacity, stage and storage; shower and locker complex for physical activities participants; and kitchen for serving maximum number in largest room and kitchenettes for light food service in other areas.

iii. Items i and ii plus swimming pool and additional physical activity space and shower and locker complex to serve both pool and other physical activity space.

iv. Items i, ii, and iii plus residence with sleeping rooms, lounges, kitchenettes, and laundry. These range in size from 50 beds or under to 250 beds. Some older buildings have residences but not pools. Some YWCA's have separate residence buildings.

v. Public food service. The number of these units is decreasing and is being retained or constructed only in large buildings, usually cafeteria style serving for general public and group food services in other meeting rooms as needed.

All buildings designed for YWCA use provide for a maximum amount of space for multipurpose use. Supporting areas vary in size and complexity, depending on the size and type of administrative and program areas.

(b) Services rendered include informal education and recreation including clubs for teenagers and young adults, interest groups and classes for all ages, social recreation activities for young people and families, and summer day camps or similar programs. Often resi-

dence service for young women, individual counseling, and food service are also provided. Many YWCA's also operate resident and trip camping programs, but these are not carried on in the facilities described in this outline. Program focuses on service to women and girls, although a number of men and boys are also served in coed and family activities. In medium sized cities, the primary facility is usually centrally located and serves the entire community, although additional program is usually carried in other facilities than the association's headquarters. In large metropolitan areas smaller branch buildings may be located in residential or subsidiary commercial areas. In small towns YWCA services are provided in other public facilities rather than YWCA owned buildings.

(c), (d) Information not available.

Summary of Section A–1

The facilities reported upon above by the eight cooperating national agencies include (*a*) urban centers where recreation, health and social services are provided, (*b*) camps, (*c*) residences, and (*d*) administrative and training headquarters. The services provided include opportunities for learning, recreation, physical improvement, social adjustment, constructive self-expression and growth, and in some instances residential care.

The urban neighborhood and community centers vary in the scope and adequacy of their equipment and provisions for the program. Usually they are housed in permanent (brick or stone) structures in low income neighborhoods. The typical center contains administrative offices, club rooms, recreation facilities, and perhaps a gymnasium and swimming pool. Boys' clubs, in addition to providing most of the above facilities, frequently have adjoining outdoor playgrounds. Attention is called to the space accommodations reported by the National Federation of Settlements and Neighborhood Centers as existing in general among its member houses. Attention is also called to the graded schedule of space provisions reported by the YWCA. The YMCA and YWCA usually provide residence space and frequently some accommodations for serving food. Many of the agencies whose programs are primarily urban, operate summer camps for children, youth, families, and for older people. A recent trend has been the extension of the centers' services to wider areas through use of school, church, and public housing facilities. Urban redevelopment, population mobility, and changing ethnic patterns within the community have caused some centers to shift their locations in order better to serve their clientele.

Camp facilities are extensively used by the Boy Scouts and Girl Scouts where they are a central element in the program. They are also used to some extent by the multiprogram urban agencies such as centers and settlements, the YMCA and YWCA. Camps require relatively large tracts of land which have been improved in the interests of safety and sanitation. Well constructed buildings are essential to serve the campers' needs for housing, food, and recreational activities, and to accommodate staff. Tents are used to a certain extent, according to program emphasis. Attention is called particularly to

the detailed reporting of camp standards found in the Girl Scout statement above.

Residences for selected clientele are provided by some of the agencies, the YWCA's primarily serving girls and women, the YMCA's boys and men. They are generally housed in urban structures of a more or less permanent character.

2. EXISTING CAPITAL PLANT IN THE UNITED STATES

(a) *As of mid-1965 (or 1962?) how many of these facilities or structures were in existence or operation?*
(b) *What was the distribution of such facilities or structures by States?*
(c) *What was the distribution of such facilities or structures by population size of city?*
(d) *What is the age distribution of such facilities or structures?*
(e) *Of these facilities and structures now in operation, what is the ownership pattern?*
(f) *What is the estimated current value (as of end of 1965) of these facilities and structures?*

Individual Agency Statements

Boy Scouts of America

(a) and (b) As of mid-1965, the following facilities were in operation:

Region	Number of camps	Number of offices
I	62	14
II	100	27
III	72	13
IV	56	13
V	46	15
VI	76	12
VII	153	29
VIII	62	5
IX	70	21
X	34	6
XI	53	13
XII	86	39
Total	870	[1] 207

[1] This does not include rented space.

(c) No information provided.

(d) The estimated age distribution of camps and offices is as follows:

	Percent
(1) Camps built before 1900	None
Offices built before 1900	None
(2) Camps during 1901–20	10
Offices during 1901–20	None
(3) Camps during 1921–40	35
Offices during 1921–40	4
(4) Camps during 1941–60	40
Offices during 1941–60	60
(5) Camps since 1960	15
Offices since 1960	36

(e) All of these facilities are owned by the Boy Scouts of America—a nonprofit organization.

(f) The estimated current value of these structures and facilities is approximately $140 million.

Boys' Clubs of America

(a) There are 687 boys' clubs and branch buildings in operation throughout the United States.

(b) The 687 clubs are located as follows:

Alabama	16	Missouri	10
Arizona	9	Nebraska	2
Arkansas	25	Nevada	1
California	72	New Hampshire	3
Colorado	5	New Jersey	23
Connecticut	20	New Mexico	11
Delaware	2	New York	73
District of Columbia	4	North Carolina	16
Florida	19	Ohio	19
Georgia	20	Oklahoma	8
Hawaii	1	Oregon	2
Idaho	2	Pennsylvania	35
Illinois	36	Rhode Island	13
Indiana	36	South Carolina	8
Iowa	2	South Dakota	3
Kansas	3	Tennessee	15
Kentucky	12	Texas	53
Louisiana	3	Utah	2
Maine	2	Vermont	1
Maryland	5	Virginia	10
Massachusetts	35	Washington	13
Michigan	24	Wisconsin	4
Minnesota	3	West Virginia	4
Mississippi	2		

(c) The distribution of the 687 facilities by size of city is as follows:

Size of city:	*Number of facilities*
500,000 and over	120
100,000 to 499,999	168
50,000 to 99,999	123
10,000 to 49,999	219
2,500 to 9,999	46
Under 2,500	11

(d) The age distribution of the buildings is as follows:

When built:	*Number of buildings*
Before 1900	40
1901 to 1920	60
1921 to 1940	74
1941 to 1960	350
Since 1961	163

(e) Boys' club buildings are owned by private nonprofit charitable organizations.

(f) As of 1965, the estimated current value of boys' club buildings and branches was $80,710,000. Value of camp buildings was $20,100,000.

Girl Scouts of the U.S.A.

(a) At the end of 1964 there were 548 resident camps, 3,517 day camps, and 44,393 overnight camps (by troops using or furnishing their own).

(b) The distribution of 462 of the facilities or structures, by States, was as follows:

Alabama	10	Montana	4
Arizona	5	Nebraska	1
Alaska	2	Nevada	1
Arkansas	6	New Hampshire	1
California	47	New Jersey	17
Colorado	6	New Mexico	3
Connecticut	14	New York	42
Delaware	1	North Carolina	14
District of Columbia	4	North Dakota	2
Florida	11	Ohio	24
Georgia	10	Oklahoma	4
Hawaii	2	Oregon	6
Idaho	3	Pennsylvania	30
Illinois	17	Rhode Island	1
Indiana	13	Puerto Rico	1
Iowa	10	South Carolina	3
Kansas	4	South Dakota	3
Kentucky	7	Tennessee	9
Louisiana	4	Texas	23
Maine	5	Utah	3
Maryland	5	Vermont	2
Massachusetts	20	Virginia	5
Michigan	12	Washington	8
Minnesota	13	Wisconsin	8
Mississippi	5	West Virginia	4
Missouri	8	Wyoming	1

(c) Figures as to distribution by population size of city are not available.

(d) Figures are not available as to age distribution of facilities and structures.

(e) Fifty-seven percent of the camp facilities and structures are owned by nonprofit organizations. Forty-three percent are leased or loaned (23 percent located on public property, 20 percent on private).

(f) The estimated current value of facilities and structures as of December 31, 1964, was $70 million.

National Federation of Settlements and Neighborhood Centers

(a) The National Federation of Settlements and Neighboorhood Centers has just under 300 local affiliates, with between 400 and 500 separate facilities in which they operate program (including camps). In addition there were some 500 other similar organizations in the United States prior to 1964. Since the OEO program, our organization knows of some 700 to 800 more such centers, either operating or in process of organizing. This report is limited, however, to agencies in the membership of National Federation of Settlements.

(b) NFS members are located in 31 of the 50 States. The organization is in touch with similar agencies in six additional States. The largest concentration of agencies is in the industrial sections.

(c) The distribution by population size of city (252 member agencies only) is as follows:

Size of city:	*Number of agencies*
500,000 or more	138
100,000 to 499,999	70
50,000 to 99,999	28
Less than 50,000	16

(d) The age distribution of the 252 buildings is as follows:

[In percent]

When built:	Distribution
Before 1900	15.3
During 1901–20	21.3
During 1921–40	16.4
During 1941–60	30.0
Since 1961	17.0

(e) The proportion owned by private, nonprofit organizations was 79 percent. The remainder are in low-rent public housing; some in National and State parks; and in a few instances, public schools are used.

(f) Information not provided.

National Jewish Welfare Board

(a) As of mid-1965, 262 of these facilities or structures were in existence.

(b) The distribution by States of these 262 facilities or structures was as follows:

Alabama	1	Minnesota	5
Arizona	2	Missouri	3
California	17	Nebraska	1
Colorado	2	New Hampshire	1
Connecticut	12	New Jersey	23
Delaware	1	New York	62
District of Columbia	3	Ohio	11
Florida	5	Oregon	2
Georgia	5	Pennsylvania	29
Illinois	10	Rhode Island	2
Indiana	1	South Carolina	3
Iowa	2	Tennessee	5
Kentucky	2	Texas	4
Louisiana	1	Utah	1
Maine	7	Virginia	4
Maryland	1	Washington	2
Massachusetts	25	Wisconsin	2
Michigan	5		

(c) The distribution of these 262 facilities by size of city was as follows:

Size of city:	Number of facilities
500,000 and over	63
100,000 to 499,999	56
50,000 to 99,999	35
10,000 to 49,999	31
2,500 to 9,999	25
Less than 2,500	52

(d) The age distribution of the 262 facilities was as follows:

When built:	Number of facilities
Before 1901	1
During 1901–20	8
During 1921–40	63
During 1941–60	147
During 1961–65	43

(e) All of these facilities and structures now in operation are owned by private nonprofit organizations and cooperatives.

(f) No information provided.

Young Men's Christian Associations of the United States of America

(a) As of mid-1965 there were 1,088 YMCA's in existence in the United States.

(b) The distribution of such facilities by States is not available without a special study and there is not time to make it.

(c) The distribution of such facilities is primarily in cities of 50,000 or over. It is estimated that only about 5 percent of the facilities are located in cities of from 10,000 to 50,000.

(d) The average distribution of such facilities indicates that 50 percent were built before 1920.

(e) All of the facilities are owned and operated by YMCA's.

(f) The present estimated value as of 1965 is $650,071,500.

Young Women's Christian Associations of the United States of America

(a) YWCA structures (exclusive of camp structures) in existence in 1965 numbered 670.

(b) The distribution of these 670 structures by States was as follows:

Alabama	6	New Hampshire	3
Arizona	5	New Jersey	22
Arkansas	8	New Mexico	1
California	63	New York	34
Colorado	6	North Carolina	17
Connecticut	15	North Dakota	3
Delaware	5	Ohio	56
District of Columbia	7	Oklahoma	9
Florida	17	Oregon	5
Georgia	11	Pennsylvania	58
Hawaii	8	Rhode Island	2
Louisiana	10	South Carolina	9
Maine	6	South Dakota	4
Maryland	11	Tennessee	11
Massachusetts	14	Texas	33
Michigan	21	Utah	2
Minnesota	9	Vermont	3
Mississippi	5	Virginia	16
Missouri	16	Washington	17
Montana	3	West Virginia	8
Nebraska	11	Wisconsin	13
Nevada	1	Wyoming	2

(c) Distribution of the 670 structures by population size of city was:

Size of city:	*Number of facilities*
500,000 and over	135
100,000 to 499,999	194
50,000 to 99,999	124
10,000 to 49,999	185
2,500 to 9,999	9
Under 2,500	1
Unknown	22

(d) Complete information is not available as to the distribution of structures. Forty-six new YWCA structures have been built or purchased since 1961.

(e) Ownership of facilities is as follows: Private, nonprofit organizations, 91 percent; cities, counties, towns, special districts, public authorities, or other local public bodies, approximately 3 percent; unknown, 6 percent.

(f) Information not available.

Summary of Section A–2

The above material shows that there were more than 8,564 facilities or structures in existence or operation in mid-1965 or thereabouts, not including overnight camps which made use of resident or day camp facilities. They were distributed by States pretty generally in accordance with the distribution of population. The urban facilities of the agencies reporting showed 1,833 of them distributed as follows with respect to size of the cities in which they are located:

500,000 and over	456
100,000 to 499,999	488
50,000 to 99,999	310
10,000 to 49,999	435
2,500 to 9,999	80
Under 2,500	64

Many of the structures and facilities had been in existence for some time, as the following table shows for 2,274 of them:

Built before 1900	78
Built during 1901–20	209
Built during 1921–40	490
Built during 1941–60	1,044
Built since 1961	453

Practically all of the structures were owned by private nonprofit-making organizations.

The estimated current value of the structures of four of the agencies was $960,881,500. No figures were available for the other four.

B. Costs and User Charges

1. CONSTRUCTION AND OPERATING COSTS

(a) *On the basis of some standard unit of measure indicate the current (as of 1965) range of typical construction costs for different size facilities or structures of longtime durability.*

(b) *On the same basis, indicate the current range of typical annual maintenance and operation expenses for different size facilities or structures.*

2. USER CHARGES

(a) *To what extent are user charges employed to pay for all or part of the services, occupancy, or use of the facilities or structures?*

(b) *To what extent are such user charges sufficient to cover annual maintenance and operation expenses plus annual debt service payments?*

(c) *To what extent are the costs of such facilities and structures met out of the general tax resources and general obligation borrowings of State and local government units?*

Individual Agency Statements

Boy Scouts of America

1. (a) On the basis of cost per square foot, the current typical construction costs for camp buildings varies from $10 to $15. Office building costs vary from $16 to $22 per square foot.

(b) The current range of typical annual maintenance expenses is approximately 5 percent. Operation expenses are not available.

2. (a) It is the responsibility of the local Boy Scout council to provide outdoor training facilities and central staff. Leaders of units (troops, posts) are volunteers who contribute their time without charge. Boys are required to pay for food and food preparation, medical care, transportation, and for expendable program equipment.

(b) See (a).

We do not incur indebtedness to finance capital costs. There are no instances where user charges exceed operating and capital costs.

(c) None.

Boys' Clubs of America

1. (a) It costs on an average between $15 and $24 per square foot to construct a boys' club building. Area of country is the basic determinant in this variation.

(b) The annual maintenance cost of an average size boys' club is $5,300 including janitor supplies. This average will have to increase in the years ahead.

2. (a) The main emphasis of boys' clubs is to keep club buildings free at all times for service to boys. However, during certain hours, in the mornings, they may make their facilities available to nonprofit community groups. As such groups come mainly from low-income areas and are usually of a community service nature, the charges made are absolutely minimum. The total is negligible in offsetting the cost of maintenance of facilities and services.

All charges to boy members, including dues, are minimal and are kept low enough so that the poorest boy will not be excluded from membership in the program. A number of items such as soap, swim and gym trunks, towels, craft materials are provided at no cost. Dues range from 75 cents to $4 per year. (Many youngsters from large families work them off.)

(b) As indicated in (a) charges for services or use of facilities are minimal. Generally not more than a maximum of 10 percent of the operating costs of a boys' club are absorbed by such charges. This amount will not be higher because of the nature of the work of boys' clubs and the clientele they serve.

(c) The costs of maintaining and operating boys' club buildings and camps are borne by contributions from individuals, corporations, and foundations, or from Community Chests and United Funds which contribute substantially.

Girl Scouts of the U.S.A.

1. (a) Camp construction costs range from $8 to $15 per square foot. In each of 548 resident camps, costs have ranged as follows:

Living unit structures (5 to 8 units per camp)	$18,000 to $24,000
Health center	$7,000 to $10,000
Office	$7,000 to $10,000
Administrative staff living quarters	$2,000 to $4,000
Cook house	$4,000 to $5,000
Director's cabin	$2,500 to $3,000
Shelter for staff recreation (multipurpose)	$7,000 to $10,000
Central lodge (including hall and kitchen)	$50,000 to $70,000
Central hot shower	$2,000 to $6,000
Caretaker's house	$9,000 to $17,000
Maintenance garage and utility shop	$4,000 to $5,000

Buildings of above structures are often combined for multipurpose service.

(b) Information not available.

2. (a) User-charges (camper fees) cover direct cost only. These include in-season cost of utilities, food, supplies, and program staff.

(b) United Funds are requested to provide Girl Scout councils with funds for year-round total administration and maintenance costs of camps. These range from 15 to 25 percent above income from camper fees.

(c) None.

National Federation of Settlements and Neighborhood Centers

1. (a) Construction costs since 1961 have ranged from $14 to $17 per square foot exclusive of land and equipment.

(b) Operating costs have represented 9.09 percent of total expenditures for services rendered.

2. (a) (b) (c) Occasional fees are charged if rooms are used for weddings, parties, or special meetings. Fees are set in relation to extra labor costs for the event, not in relation to maintenance or operating costs. This is viewed as a service of the agency.

National Jewish Welfare Board

1. (a) Construction costs vary with geographic location rather than in relation to size of facility. As of 1965 the general average cost per square foot was in the range from $16.50 to $20.

(b) Maintenance and administrative costs per square foot are more closely related to community-size than to building area. In 1964, the average cost per square foot was $1.04 for maintenance and $1.33 for administration.

2. (a) User charges are employed to pay for 61 percent of the services.

(b) Such user charges are sufficient to cover 39 percent of annual maintenance and operation expenses plus annual debt service payments. There are no situations where user charges exceed the sum of prorated operating and capital costs.

(c) Information not available.

Young Men's Christian Association of the United States of America

1. (a) The present construction cost varies from city to city. On an average it runs around $1.60 to $1.70 per cubic foot. Costs of furnishings run to 10 percent of the cost of building, excluding land.

(b) The current expenditure for property and maintenance for 1965 was $30,244,900.

2. (a) Participants provided 68 percent of the total operating costs, 3 percent came from invested income, and 7 percent from miscellaneous. Only 22 percent came from contributed support. Most of this subsidy and contributed support is in the program for youth.

(b) Information not available.

(c) Information not available.

Young Women's Christian Association of the United States of America

1. (a) Construction and operating costs will vary, depending on climate (kind and amount of heating equipment needed, and whether air conditioning is required), on materials used in construction, and on characteristics of sites used. The figures given below correspond to facilities listed by number in section A(1)(a) above.

i and ii. Range of $15 to $17 per square foot.

iii, iv, and v. Range of $18 to $23. Ranges will be somewhat higher in facilities for joint use which include standard gyms and other features requiring high-ceiling construction for large areas, health clubs, and other facilities requiring high-cost construction and equipment.

(b) Information as to annual maintenance and operation expenses not available by size of facility. Expenses reported range from zero to $91,000, the last figure representing a metropolitan association with seven branches with the large central building showing $46,000 of these costs. (Maintenance salaries are not included in these figures.)

2. (a) and (b) The percentage of self support varies, depending on the amount of space which is income-producing and on the sources of income other than user charges listed in this statement, such as dues of nonuser members, income from invested capital funds, and other sources. We have percentages on subsidy in relation to gross expense budgets, which range from 25 to 85 percent, with the higher percentages applying to YWCA's with limited activity space to bring in fees from users and without other significant income sources and the lower percentages applying to buildings with large recreational and institutional features. We have not isolated user charges except for specific activities and for direct costs. So far as possible, construction is limited to available funds to avoid interest on borrowed capital.

(c) None of the costs of facilities are met out of tax resources and obligation borrowings of State and local government units.

Summary of Section B

Construction costs of the above facilities range from $8 to $15 per square foot for camp structures to $14 to $24 per square foot for urban structures. Such information as is available on maintenance and operation (but not program) expenses indicates that they average less than $1 per square foot per year.

The extent to which user charges are employed to pay for all or part of the services varies with the agencies' program objectives. Those organizations serving youth in disadvantaged urban areas endeavor to keep user charges quite low. The Y's and the Scouting organizations, whose activities are available to a broader spectrum of citizens, more fully utilize memberships, campers fees, etc. as a legitimate source of income. The range is apparent in the contrasting statements of the Boy's Clubs and the YMCA in "2. User Charges" above.

Very little governmental subvention is reported for the meeting of construction and user costs.

C. Trend of Capital Outlays

1. What has been the trend of annual capital outlays for these facilities or structures during the 20-year period 1946–65?

(a) Explain the trend.

2. Of these annual capital outlays, how much or what proportions were accounted for by the ownership patterns indicated above?

3. What have been the sources of financing for these capital outlays?

Individual Agency Statements

Boy Scouts of America

1. Forty percent of camp construction occurred during the 1941–60 period; 15 percent during 1961–65. Acreage acquired during this period increased at a rate of approximately 10,000 acres per year. The valuation increased at a rate of approximately $4¼ million per year. Acreage and valuation increased at a generally steady rate.

2. All capital outlays were accounted for by a nonprofit organization.

3. The source of financing of all capital outlays is from gifts, bequests, donations, and fund-raising drives.

Boys' Clubs of America

1. During the period 1946–1965 the annual capital outlay for construction of Boys' Club units ran from an early low of $1,838,000 to a high in 1965 of $6,002,000. The annual number of units constructed ran from an early low of 10 to a high of 36 in 1965. During this period there has been great growth in the Boys' Club movement and a great stepping up in the construction of new buildings as new Boys' Clubs were organized. Also many of the older clubs have undertaken replacement programs for their obsolete facilities. In the next decade and beyond, this trend will continue at a heightened pace due to need for additional service to boys in less privileged areas and the population growth.

2. Building construction is paid for by the Boys' Club, a private, nonprofit charitable organization.

3. The funds have been contributed by gifts from foundations, individuals, corporations, through public fund drives, and from bequests.

Girl Scouts of the U.S.A.

1. Expenditures for structures and facilities during 1946–65 were:

	Million
1945–50	$4
1950–55	5
1955–60	7
1960–65	9

During this period, cost of labor and materials has increased out of proportion to cost of land for camping purposes.

Though the basic and very simple requirements for Girl Scout camps have remained the same, the trend is away from the purely rustic use of materials toward the economical use of modern materials and building methods.

Expansion of camping facilities has been consistent with the community's growing awareness that camping is an excellent way to accomplish three major objectives:

To stimulate enjoyment and appreciation of the out of doors through progressively adventurous experiences.

To provide training in citizenship through the give-and-take of community living in which each girl has a part in the planning and carrying out of the camping program.

To contribute to the physical, mental, and spiritual well-being of each camper and to help develop in her such qualities as resourcefulness, initiative, and self-reliance.

The Girl Scout organization strives to make camping available to all members. The girl membership grew from 906,885 in 1945 to 2,995,000 in 1965, tripling the responsibility.

2. Of these annual capital outlays, all were accounted for by private, nonprofit organizations.

3. The sources of financing for these capital outlays were gifts, bequests, donations, and fund-raising drives.

National Federation of Settlements and Neighborhood Centers

1. Nearly half of all units used have been built in the period 1946–65. This is to say that about 18 units are built annually. The cost of the 18 units is probably in the range of $5½ million per year. However, since 1961 the pace of building has just about doubled, and the capital expenditures accordingly.

2. In addition, it is likely that another $1 to $2 million annually has been invested by public housing in facilities operated by neighborhood centers.

3. Financing has been by capital fund drives, bequests, and foundation grants. Public housing and public schools sometimes have made space available.

National Jewish Welfare Board

1. There has not been any regular annual trend in capital outlays for the 20-year period 1946–65. The period of construction of new buildings started in 1948. From 1948 through 1953 the average annual expenditures for new buildings and additions was about $1,500,000. It spurted to about $6,500,000 for the following 2 years, declined to about $3,500,000 per year for the 3 years 1956–58, then increased to $6,500,000 annually for 1959 and 1960. In the latest 5 years, the expenditures have been fluctuating. The highest amount ($7 million) was for buildings completed in 1964, and the lowest ($2,900,000) for buildings completed in 1965.

2. Of these annual capital outlays, 100 percent was accounted for by private nonprofit organizations.

3. The sources of financing for these capital outlays have been gifts, bequests, donations, and fund-raising drives.

Young Men's Christian Associations of the United States of America

1. From 1955–62 a special study on new facilities constructed indicated the erection of 160 new buildings, 54 city associations, 89 neighborhood or suburban branches of metropolitan YMCA's, and 17 downtown or central branches.

2. The exact dollar value of these units is not available. However, the increase in capital assets in land, building, and equipment since 1950 has been $384,171,600 (from $265,900,000 in 1950 to $650,071,500 in 1965).

3. The sources of financing have been fund-raising drives.

Young Women's Christian Associations of the United States of America

1. The major capital outlays for new YWCA buildings have been made in the last 10 years, when buildings erected 40 to 50 years before that time reached about the same stage of obsolescence. A few were built between 1946 and 1955. There have been two phases of the trend. One has been replacement of old or inadequate buildings and the other has been erection of smaller branch or center buildings in expanding metropolitan areas.

An estimate would be that upward of $25 to $30 million has been spent on new YWCA buildings, including cost of construction of structures but not investment in sites, furnishings, and equipment not attached to the buildings. This also does not cover purchase and major remodeling of existing structures, nor joint YMCA–YWCA buildings.

2. The source of capital outlays is virtually 100-percent private nonprofit organizations. In 1965 one YWCA undertook operation of a Women's Job Corps Center which involved capital outlay from Federal Government funds.

3. The primary sources of financing capital outlays are gifts, bequests, donations, and fund-raising drives.

Summary of Section C

The trend of annual capital outlays for facilities and structures over the 20-year period 1945–65 has generally been sharply upward. The Boy Scouts of America report a 40-percent increase in camp facilities during this period. The Boys' Clubs of America report an increase in the annual role of construction from an early low of $1.8 million to a high of $6 million in 1965. The Girl Scouts show an increase from $4 million in 1945–50 to $9 million in 1960–65. The other agencies reporting show a similar trend in capital expenditures. The reasons given are an increase of program acceptance by the public, growth in population, extension of services through branches, necessity to replace obsolete structures, and high construction costs.

All capital outlays were accounted for by nonprofit organizations, using funds derived from gifts, bequests, donations, and fund-raising drives. Some program expansion, however, has occurred in space made available by public housing authorities, schools, and parks and playgrounds.

D. Needs and Prospective Capital Outlays

1. In terms of the "Great Society," what are the capital requirements (in millions of dollars) for these facilities or structures during the decade 1966–75?

(a) Describe the factors taken into account in making this projection.

(b) If possible, show these estimated capital needs on a per year basis.

(c) To the extent feasible, indicate the proportions of these estimated needs that you would ascribe to communities of various sizes.

(d) To the extent feasible, indicate the proportions of these estimated capital oulays that you would expect to be expended by the ownership patterns indicated above.

2. *What are the expected sources of financing for these prospective capital outlays?*

3. *If your estimated capital requirements exceed the amounts you estimate will be supplied by the above identified sources of funds, how would you bridge the gap?*

Individual Agency Statements

Boy Scouts of America

1. (a)-(b) The capital requirements projected for the decade 1966–75 are approximately 430,000 acres to meet the estimated needs. The capital requirements would be $157 million.

(d) All of the estimated capital outlays would be expended by nonprofit organization.

2. Expected sources of financing for the prospective capital outlays is entirely from gifts, bequests, donations, and fund-raising drives.

3. Capital requirements are fulfilled through gifts, bequests, and fund-raising campaigns only.

Boys' Clubs of America

1. We anticipate a total need for capital outlay of $97,500,000 by 1975. Of this, $60 million will be for the construction of some 400 new Boys' Clubs and branches averaged at $150,000 per unit that will have been organized during this period, and $37,500,000 for the replacement of existing obsolete Boys' Club buildings.

(a) Factors in making this projection are as follows. Two years ago a detailed study of the needs of Boys' Club service throughout the United States was made by Boys' Clubs of America and a 10-year blueprint for development of Boys' Clubs was laid out and is being followed today. As a result of the study, which was based on the needs of the number of boys primarily in low income areas in towns of 25,000 and over, it was determined that the 600 club units existing at that time should be brought up to a minimum of 1,000 and the number of boys served to 1 million. Population growth over the decade will undoubtedly increase this need. The anticipated outlays for replacement of obsolete existing facilities is conservatively estimated on our knowledge of existing facilities and their condition.

(b) We estimate approximately $9,750,000 or 10 percent of total needs will be spent annually on average over the next decade.

(c) We estimate that these construction needs would be taking place in an amount of $5,800,000 in cities of 50,000 or more and $2,700,000 in cities with a population of 25,000 to 50,000.

(d) Such capital outlays would be spent by Boys' Clubs, private, nonprofit charitable organizations.

2. The construction programs would be financed through gifts from individuals, corporations, foundations, fund-raising drives, and bequests.

3. Only that amount of construction would be undertaken for which funds would be available. Should insufficient funds be on hand, the construction of individual units would be postponed.

Girl Scouts of the United States of America

1. An estimate based on known value of owned land, structure, and equipment indicates that $36 million will be needed for capital requirements during the decade 1966–75.

(a) Factors taken into account in making projection of need are:

Increase in membership estimated on 49 percent increase in prior 10 year period:

1965	2,995,000
1975	4,400,000

Increased interest in camping program:	*Percent of membership*
1965, 1,647,305 campers	55
1975, 3,300,000 campers	75

Additional facilities required.

Replacement of obsolete facilities.

Development of presently owned, underdeveloped campsites.

(b) An estimate of needs on a per year basis, 1966–75, totals $23 million.

	Millions		*Millions*
1967	3	1972	2
1968	3	1973	2
1969	2½	1974	2
1970	2½	1975	2
1971	2		

(c) Facts are not available for population areas.

(d) All of these estimated capital outlays to be expended by private, nonprofit organizations and cooperatives.

2. Expected sources of financing for these prospective capital outlays are from gifts, bequests, donations, and fund-raising drives.

National Federation of Settlements and Neighborhood Centers

1. The capital requirements for the decade 1966–75 are estimated at from $100 to $120 million.

(a) Factors considered in this projection are: age of facilities, present overcrowding of many facilities, population growth, expanded public money for services and facilities, expanding services, mobility of persons from rural areas into cities, city rebuilding including highway program.

(b) The capital needs will probably be about $10 to $12 million per year. This includes replacements, major renovations, and new facilities.

(c) Cities with population of 50,000 or more will require 138 facilities; cities under 50,000, 8 facilities.

(d) These capital outlays will probably come from the following sources: One-third from funds on hand; one-third from capital fund drives; one-third from public funds, largely Federal (neighborhood facility program, sec. 703, Housing Act of 1965).

National Jewish Welfare Board

1. It is estimated that the capital requirements for these facilities or structures during the decade 1966–75 will be around $77,500,000.

(a) Of 72 new facilities projected for construction during the coming decade, 1 of every 2 will be replacements for existing structures which have become obsolete because facilities now being used are inadequate for providing service in terms of newer standards and concepts or because a significant segment of the clientele has moved away. Approximately one of every 10 of the projections will be additions to existing structures to provide more rounded services as well as to take care of a larger clientele.

The remaining fraction, around four-tenths of the projections, will represent new units of operations which will be either extension operations of some already in existence, or new operations in communities not previously served. They are being projected to take care of shifting population as well as of existing communities which have not been served.

(b) It is not possible to show these estimated capital needs on a per year basis.

(c) It is estimated that 77 percent of the needed facilities would be located in cities with populations of 50,000 or more; 14 percent in cities of 2,500 to 50,000; and 9 percent in cities of under 2,500 population.

(d) All of these estimated capital outlays would be made by private nonprofit organizations.

2. All funds would be derived from gifts, bequests, donations, and fund-raising drives.

3. Expenditures would be held within receipts.

Young Men's Christian Associations of the United States of America

1. In the next 10 years it is expected that capital outlays for facilitief and equipment will run to $256,114,000. It is expected that in this period 230 new buildings will be constructed, with an average os $25,600,000 per year. It is expected that 90 percent of the building will be in communities of 50,000 or more and 5 percent in cities under 50,000.

2. It is expected that these funds will be raised from capital fund campaigns. However, for short periods of time there will be a capital indebtedness, particularly from buildings that are self-supporting, such as residences. YMCA buildings include 566 residences with 58,884 beds.

Young Women's Christian Association of the United States of America

1. Estimated requirements for the decade 1966–75 are $35 to $40 million.

(a) These are based on obsolescence of central facilities, need for decentralized functional buildings in expanding metropolitan areas, need for replacement or additions to adapt to changing programs.

(b) Information not available.

(c) The major proportion in dollar costs and also in number of buildings will be in cities and towns of 50,000 or more. A few will be in cities and towns of 2,500 to 50,000, none in communities under 2,500 population.

(d) Practically 100 percent will be financed by private, nonprofit organizations.

2. Expected sources of financing.

(i) Limited amount will come from the Federal Government unless the YWCA has more Job Corps Centers.

(ii) Practically 100 percent will be derived from gifts, bequests, donations, and fund-raising drives.

3. A limited amount will be from mortgages although this will be discouraged.

Summary of Section D

In terms of the "Great Society" the capital requirements of the reporting agencies during the decade 1966–75 will reach nearly $800 million, as is apparent from the following recapitulation:

Boy Scouts	$157, 000, 000
Boys' Clubs	97, 500, 000
Girl Scouts	36, 000, 000
National Federation of Settlements and Neighborhood Centers	120, 000, 000
National Jewish Welfare Board	77, 500, 000
YMCA	256, 114, 000
YWCA	40, 000, 000
Total	784, 114, 000

The factors taken into account in making this projection are those suggested in the outline above.

It has not been found feasible to show these estimated needs on a per-year basis, or to indicate their distribution by size of city. Practically all of the estimated outlays would be by private nonprofit organizations.

CHAPTER 33

Arenas, Auditoriums, Exhibition Halls*

A. NATURE AND COMPOSITION OF FACILITIES

1. DESCRIPTION OF FACILITIES

Expansion in the field of public assembly buildings reached historic highs during the period 1946–65. This growth, however, is expected to be dwarfed during the next 10 years based on current (1966) indications.

The term "public assembly buildings" covers a number of different type structures. Specific descriptive names have been loosely applied to many. In general terms, those most used in the field, the buildings break down into the following categories:

1. *Auditorium-theaters.*—Theater-type structure generally with fixed seating and a stage. Seating ranges from a hundred or less to 5,000 and in some few cases more than this latter figure.

2. *Coliseums-arenas.*—Buildings with large seating capacities grouped around an open center area or arena. Most of the seats are fixed although temporary seating can usually be added to enlarge the capacity. These range in size from those with a few hundred seats to those with a capacity in the neighborhood of 20,000.

3. *Exhibition halls.*—Flat-floor structures of various sizes with no fixed or permanent seating capacity. These are used for public or trade exhibitions where manufacturers, dealers, etc., display their wares to potential buyers.

In actual practice, many buildings combine two or more of the above features and there has been a trend in recent years to all-purpose complexes that are flexible enough to be adapted to all three of the above outlined purposes.

Servicewise, these buildings play important roles in the communities and areas in which they are located.

The auditorium-theaters provide recreation in the forms of entertainment of professional and amateur types. The coliseum-arenas provide facilities for sports events, large meetings and conventions, pageants, and a wide variety of entertainment needing large areas in which to perform.

The exhibition halls are most commercial. They, when combined with large meeting facilities such as coliseums or auditoriums, are in actual practice, convention centers. Conventions are held with the meetings in the coliseum or auditorium and exhibits of products located in usually adjacent flat-floor exhibit halls. The convention business in the United States has grown to become "big business" and competi-

*Prepared by Charles R. Byrnes, executive director, International Association of Auditorium Managers, with minor editing by committee staff.

tion between cities has become stiff for the millions of dollars spent annually at these gatherings.

Millions of dollars are expended each year to keep these buildings in repair. There is no method of arriving at an average life of such buildings, but it generally is from 30 to 40 years.

2. EXISTING CAPITAL PLANT

As of mid-1965, some 1,200 of these buildings were in use throughout the United States.

Their location, as to States, was as follows:

Alabama	12	Missouri	24
Alaska	3	Montana	6
Arizona	6	Nebraska	17
Arkansas	12	Nevada	5
California	92	New Hampshire	29
Colorado	15	New Mexico	9
Connecticut	9	New York	61
Delaware	3	North Carolina	23
District of Columbia	7	North Dakota	29
Florida	34	Ohio	59
Georgia	30	Oklahoma	23
Hawaii	4	Oregon	14
Idaho	6	Pennsylvania	44
Illinois	56	Rhode Island	8
Indiana	37	South Carolina	12
Iowa	24	South Dakota	12
Kansas	20	Tennessee	19
Kentucky	16	Texas	63
Louisiana	18	Utah	11
Maine	14	Vermont	7
Maryland	7	Virginia	20
Massachusetts	27	Washington	15
Michigan	44	West Virginia	18
Minnesota	34	Wisconsin	24
Mississippi	14	Wyoming	5

By population, 13 percent were located in cities of 500,000 or more; 57 percent in those between 100,000 and 499,999; 21 percent in centers with 50,000 to 99,999; 8.7 percent in cities of 10,000 to 49,999 and few or none in those under 10,000 population.

Percentagewise, the buildings vary in age as follows: 1–5 years, 16 percent; 6–10, 14 percent; 11–15, 16 percent; 16–20, 18 percent; 21–25, 8 percent; 26–30, 9 percent; 31–35, 2 percent; 36–40, 13 percent; and over 40 years, 4 percent.

The majority of these buildings are owned by cities—approximately 72 percent. The State government or State agencies operate 4 percent with counties accounting for 6 percent and towns for 1 percent. The balance are privately owned by non-profit-making or profitmaking organizations.

Total value of these buildings is difficult to arrive at but, according to trade estimates, it was $2,505 million at the end of 1965.

B. Costs and User Charges

1. CAPITAL AND OPERATING COSTS

There is no rule of thumb available on the basis of some standard unit of measure in the construction of auditoriums, coliseums, and exhibition halls. This is due to a high variation in types and methods

of construction, the area in which it is built and labor and material costs. Some buildings are lavish in decor and equipment, others are simple and yet functional.

To keep these buildings in operation, an estimated $135 million is spent annually on repairs and remodeling.

2. USER CHARGES

Main income to these buildings is from rental fees. While there is a growing number who annually meet operating costs with their income, they are in the minority and only some 25 percent are able to accomplish this. Fewer are able to also contribute to capital costs.

Rental rates for auditorium-theaters and coliseum-arenas vary considerably from location to location. According to a recent survey, commercial rates range widely from $125 to $2,500 for an all-day rental. In many cases the building also received from 10 to 15 percent of the gross income of the event being held in the building. There is a "rule of thumb" for coliseum-arenas that is from 10 to 12 cents per seat. Religious, service, and nonprofit organizations usually get lower rates.

Exhibit hall rental rates range from 50 percent of the regular commercial rates to 100 percent. Some charge anywhere from 2 to 35 cents per square foot. To this, in most cases, is added extra charges for various equipment, labor, and services. In some cases, convention and exhibit halls are offered at no charge in order to bring certain conventions to the community.

C. Trend of Capital Outlays

Annual capital outlays for buildings is huge and is growing. It is estimated that buildings costing some $800 million will be opened to the public during 1966. This compares with $667 million in 1965; $498 million in 1964; $125 million in 1963; and $150 million in 1962. No figures are available prior to 1962.

Again, city governments account for most of this financing—72 percent. Counties are represented by 6 percent; State governments and State agencies by 4 percent; towns by 1 percent or less, with the balance divided among other public authorities, private capital, and nonprofit organizations.

Many buildings were constructed with help from Federal sources during the depression years. Works Progress Administration and Public Works Administration funds were allocated not only for construction but for modernization and repair. Today most buildings are financed by municipal bonds, either general obligation or revenue but there is an increase expected in participation of the Federal Government.

D. Needs and Prospective Capital Outlays

It is estimated that somewhat over $8 billion will be needed in the coming decade to provide the needed facilities. Basically, increased population will demand more buildings. Some of the present complexes, built during the depression years through WPA and PWA programs, will be replaced.

The vast expansion of entertainment, sports, and conventions will also demand bigger and more efficient facilities. Not to be overlooked is the growth in smaller cities and towns. People in these smaller communities have become more sophisticated, through television and travel, and want to see in person the best in entertainment and athletic events. As a result, and there are already indications of this trend, cities in the 100,000 and under class, will be planning buildings of many types. Commercial interests—hotels, motels, restaurants, retail stores, etc.—will also seek better facilities for meetings and conventions from which they benefit.

It is estimated that cities, counties, towns, special districts, public authorities, and other local public bodies will be instrumental in building 75 to 80 percent of the new buildings. Profitmaking organizations will probably account for 5 to 8 percent; State governments for less than 4 percent and nonprofit groups for less than 1 percent.

It is the opinion of observers that cities will provide about 55 percent of the financing; Federal Government, 20–30 percent; States, 8 percent; private capital, 3 percent; and gifts, bequests, donations, fundraising drives, 3 percent.

Chapter 34

Theaters and Community Arts Centers*

This chapter describes numbers of theaters, their seating capacities, methods of construction and financing, production costs, gross receipts, number of productions per year, and ticket prices in each of the following categories: Broadway, off-Broadway, national tour, regional and resident, summer and winter stock, musical, community and university theaters. It includes as much information as is available on community arts centers.

Where regional breakdowns are used, the *Northeast* includes 12 States and the District of Columbia with a total population of 51 million (Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, West Virginia); the *South* includes 13 States with a total population of 49 million (Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia); the *Midwest* includes 12 States with a total population of 43 million (Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin); the *West* includes 13 States with a total population of 28 million (Alaska, Arizona, Colorado, California, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming.) The population figures are based on the 1960 census.

Theaters

I. Broadway

In the 1965–66 season there were 35 Broadway theaters housing 67 productions which grossed a record $53.9 million, although according to *Variety* they were lit only 65.5 percent of the time. Today there are half as many theaters as there were 30 years ago. Production costs are estimated to have risen from $25,000 to as much as $150,000 for a dramatic play and from $60,000 to as much as $600,000 for a musical since 1940. The number of productions per year has steadily declined from a high of 264 in 1928 to 67 in the 1965–66 season. By 1959 average maximum ticket prices had increased 105 percent for dramatic shows and 77 percent for musicals over 1944 prices.

The following information was obtained from *Variety; Stubs;* the League of New York Theatres, Inc.; "The Broadway Producer," a background paper by Stuart Little prepared for the Rockefeller Brothers Fund Panel on the performing arts; "Crisis in the Free World Theater" by John F. Wharton; and material from the New York City Department of Commerce and Industrial Development:

*Prepared by the National Council on the Arts, with minor editing by committee staff.

Number of theaters.—There are currently 35 Broadway theaters in New York City, only a little more than half the number that existed 30 years ago.

Legitimate (commercial) theaters in New York City, 1931–66

	Number		Number
1931	66. 0	1951	31. 0
1935	56. 0	1955	31. 0
1938	48. 0	1958	32. 0
Average number per decade (1931–40)	54. 0	Average number per decade (1951–60)	31. 5
1941	43. 0	1961	33. 0
1945	36. 0	1963	36. 0
1948	35. 0	1965	36. 0
Average number per decade (1941–50)	37. 0	1966	35. 0

Source: 1931–60 figures from the League of New York Theatres, Inc., as they appear in "Crisis in the Free World Theatre" by John F. Wharton; 1961–66 figures from the New York City Department of Commerce and Industrial Development.

Seating capacity.—Broadway theaters seat from 781 to 1,788 persons. The average seating capacity is 1,211.

Construction and financing.—All Broadway theaters have been built and are maintained entirely with private capital. The last Broadway house was built in 1927. About 80 percent of the Broadway theaters have undergone major renovation within the past 5 years, all with private capital. The amount of capital involved in renovations is not available.

Production costs.—Production costs have risen steadily since 1940. Little estimates that the cost of mounting a dramatic play to have risen from $25,000 in 1940, to $60,000 in 1950, to $125,000 in 1960; and the cost of mounting a musical to have risen from $60,000 in 1940, to $200,000 in 1950, to $350,000 to $400,000 in 1960. Estimates run even higher according to the following information compiled by John F. Wharton:

Increase in capital requirements in the New York theater, 1939–60

Capitalization	Show (dramas)	Year
$25, 000	Life With Father	1939
20, 000	Voice of the Turtle	1943
40, 000	Deep Are the Roots	1945
100, 000	Mr. Roberts	1948
180, 000	Auntie Mame	1956
125, 000	Miracle Worker	1959
125, 000	Toys in the Attic	1960
144, 500	The Rape of the Belt	1960
150, 000	Advise and Consent	1960

Source: League of New York Theatres, Inc. Stuart Little, "The Broadway Producer," a background paper prepared for the Rockefeller Brothers Fund Panel on the performing arts.

Capitalization	Show (musicals)	Year
$225, 000	South Pacific	1949
160, 000	Gentlemen Prefer Blonds	1950
360, 000	Bells Are Ringing	1956
400, 000	My Fair Lady	1956
600, 000	Camelot	1960

Source: League of New York Theatres, Inc., as it appears in "Crisis in the Free World Theatre," by John F. Wharton.

Gross receipts.—The total gross for the 1965–66 season reached a record $53.8 million.

Broadway season total gross, 1947–66

Season	Total playing weeks	Total gross (thousands)	Season	Total playing weeks	Total gross (thousands)
1947–48	1,325	$28,827	1957–58	1,081	$37,515
1948–49	1,231	28,841	1958–59	1,157	40,151
1949–50	1,156	28,615	1959–60	1,156	45,666
1950–51	1,139	27,886	1960–61	1,210	43,830
1951–52	1,072	29,223	1961–62	1,166	44,251
1952–53	1,012	26,126	1962–63	1,134	43,525
1953–54	1,081	30,169	1963–64	1,112	39,149
1954–55	1,120	30,819	1964–65	1,250	50,463
1955–56	1,239	35,353	1965–66	1,295	53,862
1956–57	1,182	37,155			

Source: Variety, June 22, 1966.

Number of productions per year.—There were 67 Broadway productions in the 1965–66 season. There has been a steady decline in the number of productions each season since the record high of 264 in 1928. The annual average number of productions per decade has been 114 from 1901 to 1910; 138 from 1911 to 1920; 217 from 1921 to 1930; 142 from 1931 to 1940; 78 from 1941 to 1950; and 62 from 1951 to 1960. During the past 5 years annual productions were: 1961, 46; 1962, 53; 1963, 54; 1964, 63; and 1965, 67.[3]

Ticket prices.—Ticket prices for the 1965–66 season range from $2.20 to $7.50 for a dramatic play and from $2 to $12 for a musical. Earlier years were as follows:

Average maximum prices [1] of theater tickets, in New York City, 1944, 1953, 1955, and 1959

	1944 [2]	1953 [2]	1955	1959	Percent price increase, 1959 over 1953	Percent price increase, 1959 over 1944
Dramatic shows:						
Average maximum price	$3.49	$5.29	$5.49	$7.17	35.5	105.5
Admission taxes [3]	.58	.88	.72	.85		
Federal	.58	.88	.48	.53		
New York City			.24	.32		
Price less admissions taxes	2.91	4.41	4.77	6.32	43.3	117.0
Musicals:						
Average maximum price	4.84	6.90	6.97	8.57	24.2	77.1
Admissions taxes	.81	1.15	.91	1.03		
Federal	.81	1.15	.61	.65		
New York City			.30	.38		
Price less admissions taxes	4.03	5.75	6.06	7.54	31.1	87.1

[1] Average maximum price is the sum of the maximum ticket price of all dramatic shows and all musicals playing in January of each year, divided by the number of dramatic shows and musicals, respectively.
[2] The statistics in this chart for the years 1944 and 1953 differ somewhat from those reported for these years by the same source in 1953, but are more comprehensive.
[3] Admissions taxes: In 1944 and 1953, Federal, 20 percent of established price. In 1955, Federal, 10 percent of established price; New York City, 5 percent of established price. In 1959, Federal, 10 percent of established price less $1; New York City, 5 percent of established price.

Source: National Association of the Legitimate Theatre as it appears in "Crisis in the Free World Theatre" by John F. Wharton.

[3] 1901–60 figures from "Crisis in the Free World Theatre" by John F. Wharton; 1961–65 figures from the New York City Department of Commerce and Industrial Development.

II. OFF-BROADWAY

Professional theater productions in New York City performed in other than Broadway houses became known as "Off-Broadway Theater" about 15 years ago when Actors' Equity Association formally defined an off-Broadway house as one which seats no more than 300 persons. By 1966 there were 35 off-Broadway houses, production costs had soared from $8,000 to $25,000, ticket prices remained stable, and the number of productions declined from an estimated high of 120 in 1962 to 50 in the 1965–66 season.

The following information was obtained from the League of Off-Broadway Producers, the New York City Department of Commerce and Industrial Development, and "The American Theatre—Today and Tomorrow" by Norris Houghton, a background paper for the Rockefeller Brothers Fund Panel on the performing arts:

Number of theaters.—There are currently 35 off-Broadway theaters in New York City.

Seating capacity.—Off-Broadway theaters seat from 131 to 300 persons. Their average seating capacity is 200.

Construction and financing.—All off-Broadway theaters were built with private capital. Investments ranged from $10,000 to $50,000 and most involved the conversion of old ballrooms, movie theaters, and banquet rooms.

There were 24 off-Broadway theaters between 1956 and 1960; 29 in 1961 and 1962; 30 in 1963; a record high of 37 in 1964; 36 in 1965; and 35 in 1966.

Production costs.—In the early and middle 1950's an off-Broadway production could be mounted for $8,000.[4] Within 5 years the required capital expenditure had risen to $15,000 and as much as $25,000 is needed now to mount a current off-Broadway production.[5]

Number of productions per year.—There were 59 off-Broadway productions in 1958 and 1959, 85 in 1960 and 95 in 1961.[6] Approximately 120 productions were mounted in 1962. There has been a steady decline in the number of productions since 1962 and it has been estimated that only 50 productions were mounted in the 1965–66 season.[7]

Ticket prices.—Ticket prices for the 1965–66 season range from $2.25 to $5.50, not appreciably higher since the off-Broadway movement began.[8]

III. NATIONAL TOUR THEATERS

Professional theater tours booked out of New York are currently grossing more money, playing fewer weeks and have fewer theaters available to them. The number of theaters available for professional touring productions fell from 560 in 1921 to 193 in 1960.[9] The total number of playing weeks has decreased from 1,152 in the 1948–49 season to 699 in the 1965–66 season while gross receipts have risen from $23 million to $32 million over the same 18-year period.[10]

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[4] League of Off-Broadway Producers.
[5] Rockefeller Brothers Fund Panel Study *op. cit.*
[6] New York City Department of Commerce and Industrial Development.
[7] League of Off-Broadway Producers.
[8] *Ibid.*
[9] John F. Wharton *op. cit.*
[10] Variety.

The following information was obtained from Independent Booking Office. Inc., "Crisis in the Free World Theatre" by John F. Wharton, and *Variety.*

Number of theaters.—There were 155 theaters available in the 1965–66 season to Independent Booking Office, Inc. for national tours of productions which could be reached by plane or train (class A). New facilities are opening in every area of the country and are continually booked, according to Ernest M. Rawley.[11] Rawley submits that construction of new facilities is stimulating so many performances by local arts groups and such an influx of national opera, dance, and symphony tours, that time available for class A tours is extremely limited.

National Performing Arts, Inc., booked 860 performances into 171 cities in the 1964–65 season for tours traveling by bus or truck (class B).

Seating capacity.—Prime theaters in the United States seat from 798 to 9,297 persons. Most of these theaters seat approximately 1,700.

Construction and financing.—Five hundred and sixty theaters were available for professional touring productions in 1921. By 1953 there were 197 and by 1960 only 193. These theaters were constructed with funds from private, municipal, State or Federal sources.

Gross receipts.—The total gross for the 1965–66 season was $32.2 million.

Seasonal grosses of national tours (class A and class B), 1948–66

Season	Total playing weeks	Total gross	Season	Total playing weeks	Total gross
1948–49	1,152	$23,657,900	1957–58	728	$22,645,000
1949–50	1,019	20,401,300	1958–59	687	23,352,200
1950–51	913	20,330,600	1959–60	728	27,268,000
1951–52	829	18,827,900	1960–61	829	33,995,600
1952–53	1,036	23,417,600	1961–62	963	39,914,100
1953–54	794	17,623,200	1962–63	822	31,553,500
1954–55	879	21,122,000	1963–64	[1] 846	33,968,600
1955–56	864	22,853,500	1964–65	[2] 643	25,929,115
1956–57	772	19,826,300	1965–66	[3] 699	32,214,441

[1] An additional 119 weeks of split-week engagements were not reported.
[2] An additional 146 weeks of split-week engagements were not reported.
[3] An additional 55 weeks, mostly split-weeks, were unreported.

Source: *Variety*, June 22, 1966.

Regional breakdown.—Data supplied by the Independent Booking Office, Inc., indicates that the 155 theaters available to the organization for national tours in the 1965–66 season were fairly evenly distributed throughout the country, serving 123 cities with a total population of 39 million. In the 48 cases in which local theater managers estimated their potential audience, 63 million people were involved.

In the Northeast there were 37 theaters in 30 cities with a total population of 8.1 million. Twenty local theater managers estimated their potential audience at 34.6 million.

In the South there were 31 theaters in 31 cities with a total population of 9 million. Nine local theater managers estimated their potential audience at 5.9 million.

[11] Executive Director of Independent Booking Office, Inc.

In the Midwest there were 45 theaters in 32 cities with a total population of 13.2 million. Twelve local theater managers estimated their potential audience at 8 million.

In the West there were 42 theaters in 30 cities with a total population of 8.9 million. Seven local theater managers estimated their potential audience at 14.6 million.

IV. REGIONAL AND RESIDENT THEATERS

Of the 35 resident professional theaters in the United States, 26 have been formed since 1960. The Rockefeller Bros. Fund Panel report, *The Performing Arts—Problems and Prospects*, concluded:

> Of the nonprofit permanent professional theaters operating in the 1962–63 season, three—the Arena Stage in Washington, the Tyrone Guthrie Theater in Minneapolis, and the UCLA Theater Group in Los Angeles—reported operating surpluses. In 1963–64, only the Tyrone Guthrie Theater had a surplus. Other theaters reported losses ranging up to about $500,000. With the usual wide variations, their box office accomplishments were shaped by the facts that seasons varied from 10½ to 50 weeks; the number of seats from 215 to 2,263; ticket prices from zero (free admission) to a top of $6.50; and costs that would ordinarily have appeared on the ledger as operating expenses had been reduced in some cases by foundation grants and other contributions.
>
> There is reason to expect that more of the nonprofit permanent professional theaters, as they become better known and better established in their communities, will be able to make ends meet some years with box office receipts and still fulfill their special artistic obligations.

The following information was obtained from the Department To Extend the Professional Theatre of Actors' Equity Foundation, Inc., and *The Performing Arts—Problems and Prospects:*

Number of theaters.—There are currently 35 resident professional theaters in the United States, 2 existed before 1950, 7 were formed in the 1950's, and 26 have been formed since 1960.

Seating capacity.—Resident professional theaters seat from 140 to 2,300 persons.

Construction and financing.—Regional and resident theaters have received funds for programs and facilities from individuals, municipalities, foundations, universities, and the Federal Government.

The first Federal grants to assist the development of resident theaters since Federal assistance to the theater in the WPA projects during the 1930's were approved on a matching basis by the National Council on the Arts in June, 1966.

Ticket prices.—Ticket prices range from free admission to $6.50.

Regional breakdown.—The 35 resident professional theaters serve 30 cities with a total population of 23 million. Of these 35, more are located in the Northeast than in the other three regions combined.

> In the Northeast there are 20 resident professional theaters in 16 cities with a total population of 14 million (Hartford, New Haven, Stratford, Baltimore, Asbury Park, Moorestown, Morristown, Princeton, Buffalo, Philadelphia, Pittsburgh, Harrisburg, Providence, two in New York City and the District of Columbia and three in Boston).

In the South there are four resident professional theaters in four cities with a total population of 1.8 million (Louisville, Memphis, Houston, and Abingdon).

In the Midwest there are five resident professional theaters in four cities with a total population of 2.2 million (Ann Arbor, Milwaukee, Minneapolis, and two in Cleveland).

In the West there are six resident professional theaters in six cities with a total population of 4.9 million (Phoenix, Los Angeles, San Diego, San Francisco, Stanford, and Seattle).

V. SUMMER AND WINTER STOCK THEATERS

There are 150 professional summer stock theaters serving 126 cities with a total population of 18 million, and 56 professional winter stock theaters serving 48 cities with a total population of 15 million. The Rockefeller Panel report [12], indicates a "continuing postwar increase" in the number of professional summer stock companies from 130 in 1948 to 151 in 1964. There are 50 nonprofessional summer stock theaters serving 50 cities with a total population of 9 million.

The following information was obtained from Actors' Equity Association and "Summer Theaters," a directory published in 1966 by Leo Shull Publications:

Number of theaters.—There are currently 150 professional (operating with union contracts) and at least 50 nonprofessional (operating without union contracts) summer stock theaters and 56 professional winter stock theaters in the United States.

Seating capacity.—Professional summer stock theaters seat from 178 to 4,407 persons. Their average seating capacity is 450. Nonprofessional summer stock theaters seat from 100 to 750 persons. Their average seating capacity is 275.

Regional breakdown.—The Northeast has more summer stock theaters than the other three regions combined.

Professional summer stock.—The 150 professional summer stock theaters in the United States serve 126 cities with a total population of 18 million.

In the Northeast there were 83 theaters in 61 cities with a total population of 4.8 million.

In the South there were 14 theaters in 12 cities with a total population of 2.7 million.

In the Midwest there were 34 theaters in 30 cities with a total population of 4.7 million.

In the West there were 19 theaters in 17 cities with a total population of 5.7 million.

Nonprofessional summer stock.—The 50 nonprofessional summer stock theaters in the United States serve 50 cities with a total population of 9.3 million.

In the Northeast there are 27 theaters in 27 cities with a total population of 8 million.

In the South there are 5 theaters in 5 cities with a total population of 57,000.

In the Midwest there are 10 theaters in 10 cities with a total population of 650,000.

[12] Op cit.

In the West there are 8 theaters in 8 cities with a total population of 563,000.

Professional winter stock.—The 56 professional winter stock theaters in the United States serve 48 cities with a total population of 15 million.

In the Northeast there were 20 theaters in 18 cities with a total population of 6.4 million.

In the South there were 8 theaters in 8 cities with a total population of 2.8 million.

In the Midwest there were 12 theaters in 11 cities with a total population of 2.9 million.

In the West there were 16 theaters in 11 cities with a total population of 2.8 million.

VI. MUSICAL THEATERS

Only 30 of the 60 theaters in the country which have attempted over the past 19 years to devote themselves solely to the presentation of professional musicals have survived.[13] All 30 are economically sound and likely to remain so, despite a 50 percent increase in operating expenses and a 20 percent rise in ticket prices over the past 10 years.

Number of theaters.—There are currently 30 theaters in the United States which present only professional musicals.[14]

Seating capacity.—Musical theaters seat from 1,000 to 3,600 persons. The median seating capacity is approximately 2,100.

Construction and financing.—The first musical theater was built in Lambertville, N.J., in 1947.

All 30 theaters were all built with private capital. Presently 14 are tent theaters and 16 are housed in permanent facilities. Eight operate on a year-round basis and the remainder function summer or winter stock theaters.

Production costs.—Operating expenses have increased 50 percent in the past 10 years. Three theaters have become nonprofit organizations.

Ticket prices.—Ticket prices have risen 20 percent in the past 10 years.

Regional breakdown.—Of the 29 musical theaters, 16 are located in the Northeast, 2 in the South, 4 in the Midwest, and 8 in the West.

VII. COMMUNITY THEATERS

Community theaters are essentially nonprofit amateur operations staffed by volunteers, although in some cases directors, business managers and technical staff members are paid. There is no exact figure on the number of community theaters, but they are known to exist in every State. The Rockefeller Panel report states that "in 1964, there were approximately 5,000 formal amateur theater groups having some continuity of organization, while other groups, performing on varied schedules, were estimated at about 35,000. Performances vary enormously in quality, but some are good enough to compete vigorously with professional theater."

[13] Edward O. Lutz, executive director of the Musical Theaters Association.
[14] Ibid.

The following information was obtained from 626 complete or partial responses to questionnaires sent to 1,270 community theaters over the past 4 years by the American Community Theater Association (ACTA), a division of the American Educational Theater Association:

Number of theaters.—The ACTA has compiled a list of 1,270 community theaters in the United States. The Rockefeller Panel report indicates there may be as many as 40,000.

Construction and financing.—Two hundred and seventy-nine community theaters have their own facilities, and all are privately funded; 181 use local school facilities; and 161 use leased or rented civic auditoriums, private halls, or movie houses.

Number of productions.—The number of annual major productions by community theaters ranges from 1 to 12.

Audiences.—The average audience per production (average house times number of performances) in community theaters ranges from 150 to 3,900 persons.

Regional breakdown.—The Northeast has as many community theaters as the Midwest and the West combined, and more than twice as many as the South. The largest number of these theaters was formed between 1951 and 1960.

Community theater development

Region	When formed					
	Pre-1921	1921–30	1931–40	1941–50	1951–60	1961–66
Northeast (249 respondents out of 534 theaters)	17	21	42	39	71	28
South (111 respondents out of 213 theaters)	6	15	13	31	26	12
Midwest (196 respondents out of 382 theaters)	9	26	30	38	61	15
West (70 respondents out of 141 theaters)	4	7	13	16	17	10
Total	36	69	98	124	175	65

Source: American Community Theater Association.

VIII. COLLEGE AND UNIVERSITY THEATERS

There are 1,420 college and university theater groups listed in the *Directory of American College Theaters* published in 1960 by the American Educational Theater Association. Three hundred and seventy-three are in the Northeast, 427 in the South, 396 in the Midwest, and 224 in the West.

In a 1957–58 U.S. Office of Education survey of colleges and university facilities, only 227 institutions were listed as having campus theater buildings. Most student theater groups were operating in lecture halls and auditoriums.

Regional breakdown.—The 227 theater buildings pinpointed by the U.S. Office of Education were located in 39 States and were fairly evenly distributed throughout the four regions. Only 44 institutions indicated that their theater facilities had been rehabilitated since the date of establishment.

University theater construction and rehabilitation

Region	Number of theater buildings	Construction				
		Pre-1921	1921-30	1931-40	1941-50	1951-58
Northeast	58	20	8	8	10	11
South	56	13	10	6	11	15
Midwest	65	28	7	5	10	15
West	48	8	8	7	9	16
Total	227	69	33	26	40	57

Latest rehabilitation

Region	Pre-1940	1941-50	1951-58
Northeast	6	1	5
South	2	1	5
Midwest	7	4	4
West	3	5	1
Total	18	11	15

Community Arts Centers

The Rockefeller Panel report, *The Performing Arts—Problems and Prospects*, concludes that "* * * more than 100 'cultural centers' are being built or planned in communities throughout the country. Only about 30 of these are true arts centers, specifically designed to accommodate more than 1 performing art; many are merely sports arenas and convention halls that can house a cultural presentation only inadequately."

No real list of community arts centers has been compiled or maintained because various organizations have defined centers in many different ways.

A 1962 survey of community arts centers located only 40 centers by polling 600 chambers of commerce. The 40 centers were evenly distributed throughout the country and were built and supported with funds from individuals, foundations, and public and private organizations.[15]

Some of the arts centers and their costs:[16]

Lynchburg Fine Arts Center, Lynchburg, Va., $500,000. Includes theater, music rehearsal room, art gallery, and studios.

Lincoln Center, New York City, $142 million. Includes opera hall, symphony hall, operetta and dance hall, repertory theater, music school, and library-museum of performing arts.

Arts and Science Center, St. Paul, Minn., $2,500,000. Includes science museum, art gallery, classrooms, theater rehearsal space, and small auditorium.

Lakeview Center of Arts and Science, Peoria, Ill., $600,000. Includes museum, art gallery, theater assembly room, planetarium, classrooms, and library.

[15] Editor of Arts Management.

[16] "Arts Council—A New Approach to Cultural Leadership," an article by Arts Councils of America executive director Ralph Burgard appearing in the 1962-63 fall-winter issue of *Arts and Society*.

James G. Hanes Community Center, Winston-Salem, N.C., $1 million. Includes offices for chamber of commerce, health and welfare agencies, and arts council. Latter includes theater, classrooms, exhibition gallery, and music rehearsal room.

Other community arts centers which have been built or are under construction are:

Saratoga Performing Arts Center, Saratoga Springs, N.Y. (Cost: $4.1 million, of which $960,000 came from the State, and the remainder from private sources.)

The Loretto-Hilton Center for the Performing Arts, Webster College, Webster Groves, Mo. (Cost: $1.9 million, of which $1.5 million came from a private donor.)

The Memorial Cultural Center, Atlanta, Ga. (Cost: $12 million, of which $6.5 million came from an anonymous foundation and the remainder from private sources.)

The following are examples of cultural centers which have been or are being constructed with public funds:

The *New Jersey State Cultural Center* in Trenton, opened in 1965, consisting of a State library, auditorium, museum, and planetarium, constructed for $7,238,000.

The *Garden State Arts Center* in Holmdel Township, Monmouth County, presently under construction by the New Jersey Highway Authority to consist of an amphitheater, art museum, and theater. The amphitheater (phase 1) will cost $3,600,000 and open in 1967.

The *St. Paul Arts and Science Center* in St. Paul, opened in 1964, consisting of a science museum, art gallery, classrooms, theater rehearsal space, and small auditorium, constructed on city-owned land for $2,700,000 (of which $1 million came from private contributions and $1,700,000 from a bond issue; the city assumes maintenance costs, $160,000 in 1966).

The *Mobile Cultural Arts Center* in Mobile, opened in 1964, consisting of a theater, an auditorium, two galleries, a museum, and a restored fire station, constructed for $12 million, funded by a municipal bond issue.

The *Civic Arts Center* to be built in Huntsville, consists of an auditorium, theater, museum, galleries, and classroom, rehearsal, workshop, meeting, office and storage space; cost $7 million (of which $3 million will come from a civic liquor tax) and open in 1969.

The *Birmingham-Jefferson Civic Center Authority* to be built in Birmingham, consists of a coliseum, concert hall, theater, and exhibition hall; cost $25 million and open in 1971.

The *Arkansas Art Center* in Little Rock, opened in 1959, consisting of a theater, studios, exhibit galleries, and storage and office space, constructed for $931,745 (of which $275,000 came from the city in the form of property, $75,000 from a bond issue, and the remainder from private sources).

The *Pine Bluff Civic Center* to be built in Pine Bluff, Ark., consists of a theater, exhibit halls, galleries, and classrooms, cost $6,700,000 (of which $3 million will come from urban renewal funds, $3 million from regular municipal money, and $700,000 from a bond issue) and open in 1967.

The *Waterloo Recreation Center* in Waterloo, Iowa, opened in 1965, consisting of a theater, recital hall, art galleries, arts and crafts

workshops, and an outdoor band shell, constructed for $650,000 (of which $250,000 came from a bond issue, $50,000 from the regular municipal budget, and the remainder from private sources; $50,000 needed for additional work will come from municipal funds).

The *Cherokee Community Center* in Cherokee, Iowa, opened in 1965, consisting of a multiple-purpose theater plus workshop meeting room, and youth center facilities, constructed for $250,000 (of which $125,000 came from a bond issue and $125,000 from a private source).

Arts Councils of America, a private organization, estimates that there are currently 250 community arts councils, more than half of which were formed in the past 12 months.

Managing editor of Stanford Research Institute's Long Range Planning Service, Arthur Mitchell, estimated in 1962 that roughly 1,000 theaters and multipurpose art buildings will be constructed in the United States and Canada by 1972 at a cost of $4 billion.

CHAPTER 35

Museum Facilities*

A NATURE AND COMPOSITION

1. DESCRIPTION OF FACILITIES

(a) *Physical Characteristics*

A museum institution is a permanent establishment created to collect, preserve, exhibit, and interpret objects and specimens of cultural value, including artistic, historical, scientific, and technological collections.

At the present time museum facilities in the United States are undergoing rapid change and expansion to meet the growing public demand for their services, and to incorporate recent technological advances in environmental control which will aid in preserving the collections for use by future generations. The collections in American museums have been accumulated over the past 150 years; it is in the housing, and display of these objects and specimens that tremendous advances have been made in the last two decades.

Those buildings constructed in the last 20 years to serve the specific functions of a museum provide space not only for effective exhibition of the collections, but also for research and study related to the institution's field of specialization, and for educational and cultural activities. About 40 percent of the floor space is allocated to exhibit areas, 40 percent to *live* or readily accessible storage, and 20 percent to office and work space. Work areas include administrative offices, laboratories, classrooms, reference libraries, and studios for photographers, artisans, restorers, and preparators.

Permanent installations include extensive and flexible lighting arrangementss and systems to provide complete temperature and humidity control of the interior environment to aid in the preservation of the collections. Equipment includes exhibit cases, which may be wall or table cases, or built-in recessed cases; exhibition screens and panels; picture racks; storage shelving; and laboratory equipment varying in kind as the type of museum varies.

The museum buildings described above, those designed and built within the last 20 years, have set the standard for the proper physical plant in which to exhibit and care for museum collections. Those museum institutions which are housed in older buildings, and those whose physical plant was originally designed for another use have been faced with the need to do extensive remodeling in both the mechanical plant and the visitor areas of the building, or to plan for new construction which will meet these new standards. In the major-

*Prepared by Elena Van Meter of the American Association of Museums, with minor editing by committee staff.

ity of cases, remodeling and/or the construction of new wings has been the solution chosen for a variety of reasons, including the difficulty of acquiring a suitable building site, particularly if the present site is in a good location; historical value inherent in the existing structure; or, in many cases, the apparently lesser cost of remodeling as opposed to building.

Certain institutions fall under the definition of museum as recognized by the International Council of Museums and by the American Association of Museums, but by their nature have specific needs differing from those of art, history, and science museums. These are historic houses, preservation projects, zoos, botanical gardens, arboretums, planetariums, and aquariums.

The historic house and the preservation project (defined as restoration and/or reconstruction of a building complex to recreate a particular period of history) have their own special requirements. Equipment and furnishings must be of the period, or else especially designed to fit into the existing structure without changing its essential character. Work space requirements are often met by an additional building conforming in style to the historic structure.

Projection planetariums, which first came into being about 40 years ago, are generally associated with science and children's museums. Basic planetarium equipment consists of an auditorium and a projector.

Aquariums are usually, but not always, part of a science museum complex. Physical requirements include specially designed tanks and equipment for pumping, filtering, and treating water.

Zoological gardens have as many different physical requirements as they have types of animals on display. The current trend is toward providing more space per capita for the zoo's population, carefully controlled specific environments within the buildings, and toward creating larger and more natural display areas, such as flight cages and pastures for hoofed stock, rather than small individual enclosures.

Botanical gardens and arboretums have one major requirement of their buildings, absolute temperature and humidity control, necessitating complex and expensive heating and ventilating systems.

(b) *Services Rendered*

Services rendered by museums fall into two general areas: services to the general public, and specialized services to the scholarly fields with which the institution is concerned.

The museum's prime contribution to the general public is in the field of education, with the exhibits serving to reinforce "book-learning" for schoolchildren, and providing new knowledge and new insights for adults. The basic educational tool of the museum is the exhibition. Lighting, case design, and informative labeling contribute to its effectiveness. Visitor flow and crowd pressure in museum halls is now undergoing study. It has been discovered that areas of constant crowd flow should have terse, repetitive exhibits. The circulation of visitors must be planned to fit the logical order of the exhibition. This order is governed by chronology, and by the nature of the materials on display, in order to present a connected sequence of information.

The museum may also serve as a focal point for the constructive use of leisure time. The shortened workweek and consequent increase in leisure time may well explain the increase in museum attendance during the last decade, which exceeds both the rate of establishment of museums and the rise in national population. Current annual attendance is estimated to be over 300 million a year.

Museums are responding to public interest in a number of ways. Many museums, particularly in urban centers, are extending their open hours to accommodate visitors whose leisure time is in the evenings, on weekends, and on holdidays. They are also organizing and providing educational and cultural activities such as classes in subjects related to the work of the institution, lecture series, concert series, films, guided tours, and gallery talks, and in some case dramatic and dance presentations. In a survey of U.S. museums covering the year 1962, 80 percent of the respondents reported one or more such activities. Checkrooms, lounges, restaurants, information and sales desks are provided for the comfort and convenience of the visitor.

The museum's primary service to its specialized field is in preserving and documenting the materials in its collections for use by scholars in the field. The museum has the twofold responsibility of housing and maintaining research collections and of encouraging scholars to study the material. Museum research can be divided into two classes, technical research concerned with preserving and displaying the objects and artifacts, and subject field research, concerned with identifying, documenting, and interpreting the museum's collections. In addition, museums, particularly natural science and archaeology museums, send field trips to distant parts of the world to add to our knowledge of other areas and other people.

While intended primarily to add to the knowledge of the subject field, research sponsored by museum institutions may have immediate practical value as well. Archeological studies in the Middle East have been used by local governments to aid in planning irrigation systems; field studies of natural history museums have discovered plants of medicinal value; studies in invertebrate paleontology are important to the petroleum industry; the records preserved by the historical society may prove the citizen's right to a pension or solve a legal problem.

In a fully developed museum institution, the research function carried on behind the scenes is as important as the exhibit program apparent to all.

(c) *Standards of Performance*

Research on and exhibition of museum collections presumes the existence of such collections, which brings us to a third area of museum responsibility, that of maintaining adequate levels of protection against theft, fire and water damage, and deterioration from atmospheric exposure.

Security against theft and vandalism requires that secure locks and detection devices be placed on all exterior openings, and preferably that such entrances and exists be limited in number. High frequency sound or ultrasonic equipment is being used for area protection, and contactor devices and impact detectors protect the actual objects

involved. All such devices must of course continue to have the supervision of museum guards, although their numbers may be reduced.

Protection against fire involves responsibility to the museum's visitors as well as to its collections, and security measures must conform to the regulations governing public safety. Fire detection devices to give early warning of fire problems are often installed in air-conditioning and ventilating systems.

Also a factor in public safety is the flooring, generally of reinforced concrete in the newer fireproof construction. Floors and their supporting walls should be designed to carry a weight of at least a half ton per square yard, allowing for the weight of the largest foreseeable number of visitors and for the assembly of a number of heavy objects (as, for example, in a museum of industry and technology).

In new construction, security is planned for in advance, by the use of fireproof building materials, and built-in, concealed protection and warning devices against theft, fire, and breakdowns in mechanical equipment.

Museum collections must be protected against gradual deterioration as well as against theft and fire. In addition to temperature, humidity, and dust control in the exhibit and storage areas, museum laboratories are equipped to use the newest technical and scientific processes in the study and preservation of museum materials.

2. EXISTING MUSEUM FACILITIES

As of mid-1965, there were 4,595 museum institutions listed with the American Association of Museums, distributed by city population and State, as follows:

Distribution by city population

Population:	*Number*
Over 500,000	547
100,000 to 499,999	614
50,000 to 99,999	372
10,000 to 49,999	1,059
2,500 to 9,999	909
Under 2,500	1,094

Distribution by State

State	*Number*	*State*	*Number*	*State*	*Number*
New York	443	Maine	93	Oklahoma	43
Massachusetts	373	Indiana	91	Utah	43
California	337	Maryland	90	Louisiana	41
Pennsylvania	243	District of Columbia	73	New Mexico	40
Ohio	203	New Hampshire	73	Arkansas	38
Connecticut	153	Colorado	72	Montana	34
Texas	147	Tennessee	64	South Dakota	33
Illinois	131	Georgia	62	Mississippi	30
Michigan	125	Arizona	61	West Virginia	27
Virginia	118	Washington	60	Alabama	26
Florida	115	Oregon	59	Wyoming	21
Kansas	109	Rhode Island	59	Hawaii	18
Wisconsin	106	Kentucky	58	Idaho	18
Missouri	104	Vermont	58	North Dakota	17
North Carolina	104	South Carolina	48	Alaska	14
New Jersey	103	Nebraska	46	Delaware	14
Minnesota	101	Iowa	45	Nevada	11

Any discussion of the age distribution of buildings housing museum institutions must take into account the fact that for 30 percent of these buildings, historic houses and preservation projects, a part of their value exists because they are old. Of the remaining 70 percent, four-fifths, or 57 percent of the total number of museum institutions, are currently housed in buildings not originally planned for museum use, or share quarters with another institution which owns the physical plant. Of the museum institutions housed in physical plants designed specifically for their use, 49 have buildings constructed before 1900; 75 are in buildings completed during the period 1901–20; 223 institutional plants date from 1921 to 1940; 174 from 1941 to 1960; and 68 have been built since 1961.

Private, nonprofit organizations own the majority of all museum operations, 57 percent; followed by local public bodies with 19 percent; State governments, 12 percent; the Federal Government, 7 percent; and proprietary organizations, 5 percent.

The estimated value of the physical plant facilities of museum institutions as of the end of 1965 is in excess of $490 million.

B. Costs and User Charges

1. CAPITAL AND OPERATING COSTS

The average cost of construction for museums in 1965 was $1.41 per cubic foot, including electrical, heating, plumbing, air-conditioning, and elevator installations, but excluding the cost of the land, specific museum installations such as exhibit cases, and interior decoration. This average figure was found to hold true for both small museums such as park museums, specialized museums, and local historical museums, and for larger museusm of all types in small cities. Only in the very large museums, with total construction costs over $750,000, was there found to be a variation in this pattern, with the average cost rising to $1.89 per cubic foot.

Operational costs (guards, maintenance, repairs, and utilities) can be broken down as follows:

Small museum: $4,700 to $35,727.
Intermediate: $45,000 to $127,000.
Large: $165,000 to $1,500,000.

The great variation in cost within the size groupings can largely be assigned to the cost of guards in art museums. History and science museums of all sizes have operating costs ranging from a low of $4,700 to a high of $230,000, but in art museums the figure changes radically with several of them paying out over $1 million a year for maintenance and guards.

2. USER CHARGES

Approximately 19 percent of museum institutions (other than proprietary, which form 5 percent of the total 4,595) charge admissions, but only 3 percent have admissions which account for more than half of their operating income, and which might cover the cost of operating the institution. Specific museum taxes to cover the cost of operating a municipal or county museum are fairly rare, and an outside estimate

of the number of museums supported by a specific tax would be between 1 and 2 percent.

A fairly important source of income for museums with auditoriums is rental fees for use of the auditorium. However, these fees are usually set at a rate to cover the cost of operation of the auditorium, and do not go to general maintenance and operation of the institution.

Another source of income is class fees for classes organized by the institution, but again these fees are designed to assist in meeting the cost of the educational activities, and do not ordinarily go to the general operating budget.

Approximately 25 percent of the cost of maintaining and operating American museums is met out of the general tax resources of State and local governments.

C. Trend of Capital Outlays

Following World War II, new museum construction did not have any real impact until 1948 when seven new buildings were completed at a cost of $2.2 million. The following year saw a slight increase in construction put in place.

From 1950 to 1956 an average of eight new buildings and eight new units (wings or other building additions), were completed each year, with an average annual capital outlay of $7.5 million per year for construction purposes. The only significant variation in this period occurred in 1952, with construction slowed down due to manpower and material shortages stemming from the Korean war. This deficit was made up in the following year.

Beginning in 1957, a new period of capital construction was introduced, with more than twice as many new buildings being completed each year (average of 16.3 new buildings per year, 1957–1965). New units continued to be completed at about the same rate, averaging nine per year during the period. The average annual capital outlay tripled, amounting to $21.54 million per year during the 9-year period.

Prior to 1957, construction put in place tended to be simple replacement and extension of existing facilities, or, prior to 1954, completion of buildings planned or begun before World War II. Indeed, the last of the buildings designed during the 1930's was not completed until 1960.

The 100-percent increase in museum development since 1957 can be explained in terms of increased public interest in museums and of increasing recognition of the role of museums in public education. A museum is coming to be considered as necessary to the cultural life of a city or town as is a public library. This is borne out in statistics on museum attendance (122-percent increase in the decade between 1952 and 1962), and in the rate of establishment of new museums (one every 10 days, 1940–49; one every 5 days, 1950–59; one every 3 days since 1960).

The following table indicates the annual amount of capital construction funds expended by private, nonprofit organizations, local public bodies, State agencies, and the Federal Government during the years 1948–65.

Annual museum construction funds expended

[In millions of dollars]

Year [1]	Private institutions	Local government	State agencies	Federal Government	Total
1948	1.54	0.59		0.07	2.20
1949	2.72	.54		.10	3.30
1950	1.79	1.48	4.53		7.80
1951	5.97	.94	.22	.07	7.20
1952	2.73	.29		.16	3.175
1953	8.91	1.10	.99		11.00
1954	4.37	.72	2.01	.07	7.17
1955	5.32	1.69	1.35	.08	8.44
1956	4.22	.98	.27		5.47
1957	12.20	2.81	.66	.83	16.50
1958	11.32	.66	.79	.39	13.16
1959	5.34	2.42	3.39	.97	12.12
1960	12.03	2.44	.81	.98	16.26
1961	11.61		.75	.12	12.48
1962	12.51	7.91	2.64	9.89	32.95
1963	13.24	1.20	4.41	1.20	20.05
1964	19.66	5.51	17.30	36.18	78.65
1965	9.96	13.21	1.00	.75	24.92

[1] The year given is the year in which the construction was completed, and not necessarily the year in which the major part of the funds was expended.

The major source of financing for capital outlay has been gifts, bequests, donations, and fundraising drives, amounting to 63 percent of the total in the period 1950–56; and 70 percent of the total from 1957 to 1965. The next largest source is appropriations from tax resources, being 29 percent of the total from 1950–56; and 24.7 percent of the total from 1957–65. Federal Government grant assistance has put in a fairly recent appearance, and accounts for only 0.3 percent of the capital outlay in the period 1957–65, all under grants from the National Science Foundation. The remainder is accounted for by municipal bond issues, amounting to 8 percent of total financing from 1950–56, and 5 percent of the total outlay from 1957–65. No capital development funds have been obtained through State grants-in-aid for construction now in place, borrowing from the Federal Government, or capital flotations in security markets other than the municipal bonds mentioned above.

D. Needs and Prospective Capital Outlays

In estimating new construction needs for museum physical plants over the next 10 years, it is necessary to take into account a number of factors, including the rate of establishment of new museums, and the existing backlog of inadequate facilities.

New museum institutions are currently being established at the rate of 2 a week, or about 100 per year. A number of these institutions are historic houses, and will not require capital construction, and another large group will not develop sufficiently to support a new building designed especially for their use within the 10-year period. Therefore, we may assume that only one-fifth of these institutions will attempt to finance new construction for their use, making a total of 200 new buildings during the 10-year period.

Currently, 15 percent of the museum institutions listed with the association, or 689, are sharing quarters with other organizations. Again, assuming a 20 percent maturation rate, 138 of them will need new quarters during the period 1966–75.

There are now slightly over 1,000 (1,053) museum institutions housed in buildings which were not constructed for museum use. In most cases these are former residences, or public buildings originally designed for quite a different purpose. In the majority of cases, conversion to museum use could only be partially successful in terms of adequately meeting the standards set by new construction. Approximately 60 percent, or 630, of these institutions should undertake new construction within the next 10 years in order to house and display their collections adequately.

Assuming that the effective life of a public building is about 50 years, another 124 buildings will need either replacement or extensive remodeling by 1970.

A factor which will not be taken into account in the cost estimates, but is included here for consideration is the increasing inclusion by schools of visits to museum institutions as necessary parts of the school curriculum. If this trend continues to develop, many new museum institutions may be required to serve sparsely settled areas of the country where a trip to the nearest museum is now out of the question because of the great distances involved.

Assuming a cost of $0.87 million per unit or new building (based on actual average construction costs, 1957–65, plus allowance for increase in construction costs over the next 10 years), total capital outlay required during the period 1966–75 will be $950 million. This would amount to an average of $95 million per year, or about four times the current rate of expenditure.

Since no major changes are foreseen in museum ownership patterns, it is expected that future capital outlays will be expended by the Federal Government, State agencies, local public bodies, and private nonprofit organizations in roughly the same proportion as in the past. This would mean percentages of expenditure by governing authority as follows:

Private, nonprofit organizations, 65 percent.
Local public bodies, 16 percent.
State agencies, 12 percent.
Federal Government, 7 percent.

Recent trends in financing capital outlay, hardly yet reflected in construction put in place but evident in obligations for future construction, indicate that the "matching grant" from State or Federal Government may play a much larger role in museum construction in the future. Several States have authorized or appropriated funds under grant provisions, and others appear to be moving in that direction. The Federal Government has authorized such a grant to a municipality for museum construction under the Public Works Acceleration Act, and there are other possibilities, including urban renewal legislation. Taking this trend into account, it is estimated that approximately half of the financing for museum construction will come from the public sector and half from the private sector. Combining past precedents in the financing of museum construction with this emerg-

ing trend, sources for future capital for this purpose may be broken down as follows:

Gifts, bequests, donations, 50 percent.
Appropriations from tax resources, 25 percent.
Municipal bond issues, 10 percent.
State grants-in-aid, 7.5 percent.
Federal grants-in-aid, 7.5 percent.

Although the estimated capital requirements for the next decade greatly exceed past capital inputs for museum construction, the increasing public demand for museum services is expected to be reflected in increased willingness on the part of the public to pay for these services, both through direct giving and through indications to legislators at all levels of government that museum construction would be an appropriate use of public funds. We have already noted that the more than 100-percent rise in museum attendance from 1952 to 1962 was accompanied by a 100-percent rise in museum construction, and a 150-percent increase in funds expended for this construction. At present, we see no reason to expect a reversal of this trend.

NOTE.—The information in this report was taken from Laurence Vail Coleman's *Museum Buildings* (American Association of Museums, 1950), *Museum Report 1*, a survey of museum construction conducted in 1961, *Museum News*, 1948–65, and Annual Reports and other information on individual museums in the files of the American Association of Museums.

CHAPTER 36

Public Libraries*

A. NATURE AND COMPOSITION

1. DESCRIPTION OF FACILITIES

(a) *General Characteristics and Services Rendered*

The growing complexity of our modern world, rapidly changing occupational structure, and increased leisure in our affluent society have greatly increased the importance of our library resources as an integral part of our educational system. Public libraries of the United States provide knowledge and inspiration to all who use them. In 1966, it is estimated that total circulation from these libraries will approximate 1 billion books loaned to some 55 million citizens. In addition to these borrowers, millions use public libraries to study, do research, listen to music records, watch films, or simply for recreational reading. Public library users include businessmen, workers, researchers, professionals, housewives, children and teenagers, farmers, members of the Armed Forces—in fact, all segments of the population.

Public libraries have a number of common elements, including physical space, shelves with books, tables and chairs for readers, a circulation desk, and work areas and equipment for staff. However, the extent and variety of facilities and services depend in large part on the size of the community which the library serves. Thus, for a very small community, the library may be housed in a single room in a village hall or community center, which provides a couple dozen bookshelves with a few hundred books, four or five chairs, and possibly one table for readers. The library, probably staffed by an untrained librarian, may be open 4 to 6 hours per week.

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*This chapter prepared by Nathan M. Cohen, Chief, Reports Unit, Library Services and Construction Section, Library Services Branch, U.S. Office of Education, Department of Health, Education, and Welfare, with minor editing by committee staff.

A library in a community of 25,000 may have 11,000 square feet, with studying or reading space for 150 people, a meeting room for a group of approximately 100, shelving for 65,000 volumes, periodical racks, facilities for listening to records, pamphlet files, circulation desk with book charger and other equipment, a children's room, staff workroom with special equipment, and restrooms.

A library system serving 300,000 people probably will be based on a central library seating about 300. This central library may have a number of special departments, including science and technology, reference, fine arts, history and biography, and special collections and reading space for children and young adults. Other units in this library are: a technical processing area with special equipment, a separate record listening room, an audiovisual room and equipment, and auditorium and multipurpose room seating 200, staff and restrooms. The extension department will include about five branch libraries and one or more bookmobiles, each with a complement of shelves, books, and other facilities. Total floor area of the system will be about 120,000 square feet.

(b) *Standards for Public Library Construction*

A number of general standards or suggestions for public library buildings appear in the American Library Association's *Public Library Service . . .* and *Interim Standards for Small Public Libraries.*[1] Table 1 presents suggested specific criteria developed for the association for smaller communities of various sizes. Data in table 2, which are for a wider range of community size, are labeled "experience formulas" because these were developed by the authors on the basis of data collected from an actual sample of libraries.

In 1965, local public libraries occupied an estimated 55 million square feet of space and State library extension agencies about 1.5 million square feet. Local public libraries, however, reported needs for the addition of about 40 million square feet at an estimated cost of approximately $1 billion.

[1] American Library Association. *Public Library Service, A Guide to Evaluation, with Minimum Standards.* Chicago, The Association, 1956. *Interim Standards for Small Public Libraries: Guidelines Toward Achieving the Goals of Public Library Service.* Chicago, The Association, 1962.

TABLE 1.—*Guidelines for determining minimum library space requirements*

Population served	Shelving space [1]			Reader space	Staff work space	Estimated additional space needed [3] (square feet)	Total floor space
	Size of book collection	Linear feet of shelving [2]	Amount of floor space				
Under 2,499	10,000 volumes	1,300 linear feet	1,000 square feet	Minimum of 400 square feet for 13 seats, at 300 square feet per readers pace.	300 square feet	300	2,000 square feet.
2,500 to 4,999	10,000 volumes plus 3 books per capita for population over 3,500.	1,300 linear feet. Add 1 foot of shelving for every 8 books over 10,000.	1,000 square feet. Add 1 square foot for every 10 books over 10,000.	Minimum of 500 square feet for 16 seats. Add 5 seats per thousand over 3,500 population served, at 30 square feet per reader space.	300 square feet	700	2,500 square feet or 0.7 square foot per capita, whichever is greater.
5,000 to 9,999	15,000 volumes plus 2 books per capita for population over 5,000.	1,875 linear feet. Add 1 foot of shelving for every 8 books over 15,000.	1,500 square feet. Add 1 square foot for every 10 books over 15,000.	Minimum of 700 square feet for 23 seats. Add 4 seats per thousand over 5,000 population served. at 30 square feet per reader space.	500 square feet. Add 150 square feet for each full-time staff member over 3.	1,000	3,500 square feet or 0.7 square foot per capita, whichever is greater.
10,000 to 24,999	20,000 volumes plus 2 books per capita for population over 10,000.	2,500 linear feet. Add 1 foot of shelving for every 8 books over 20,000.	2,000 square feet. Add 1 square foot for every 10 books over 20,000.	Minimum of 1,200 square feet for 40 seats. Add 4 seats per thousand over 10,000 population served, at 30 square feet per reader space.	1,000 square feet. Add 150 square feet for each full-time staff member over 7.	1,800	7,000 square feet or 0.7 square foot per capita, whichever is greater.
25,000 to 49,999	50,000 volumes plus 2 books per capita for population over 25,000.	6,300 linear feet. Add 1 foot of shelving for every 8 books over 50,000.	5,000 square feet. Add 1 square foot for every 10 books over 50,000.	Minimum of 2,250 square feet for 75 seats. Add 3 seats per thousand over 25,000 population served, at 30 square feet per reader space.	1,500 square feet. Add 150 square feet for each full-time staff member over 13.	5,250	15,000 square feet or 0.6 square foot per capita. whichever is greater.

[1] Libraries in systems need only to provide shelving for basic collection plus number of books on loan from resource center at any one time.
[2] A standard library shelf equals 3 linear feet.
[3] Space for circulation desk, heating and cooling equipment, multipurpose room, stairways, janitors' supplies, toilets, etc., as required by community needs and the program of library services.

Source: American Library Association. *Interim Standards for Small Public Libraries: Guidelines Toward Achieving the Goals of "Public Library Service."* Chicago, the Association, 1962.

TABLE 2.—*Experience formulas for library size and costs*

Population size	Book stock, volumes per capita	No. of seats per 1,000 population	Circulation volumes per capita	Total square feet per capita	Desirable 1st floor square feet per capita	1961 fair estimated cost per capita [1]
Under 10,000	3½–5	10	10	0.7–0.8	0.5–0.7	$15
10,000 to 35,000	2¾–3	5	9.5	.6–.65	.4–.45	12
35,000 to 100,000	2½–2¾	3	9	.5–.6	.25–.3	10
100,000 to 200,000	1¾–2	2	8	.4–.5	.15–.2	9
200,000 to 500,000	1½	1¼	7	.35–.4	.1–.125	7
500,000 and up	1–1¼	1	6.5	.3	.06–.08	6

[1] Without furnishings (add 15 percent) or air conditioning (add 10 percent). These figures were originally based on 1940 conditions and have now been increased to reflect larger present book stocks. Floorspace has been reduced because of economies.

Source: Wheeler, Joseph L., and Herbert Goldhor. *Practical Administration of Public Libraries.* New York, Harper and Row, 1962, p. 554.

The data above and other data presented in this chapter are derived primarily from unpublished Office of Education sources. Data on public libraries for 1962, the latest year for which detailed State figures are available, are from a forthcoming Office of Education publication, *Public Library Statistics, 1962.* The total public library universe was surveyed for this study. Data for 1965 represent extrapolations and projections from a more recent survey by the U.S. Office of Education, to be published under the title, *Survey of Public Library Building Facilities, 1963–64.* From the latter survey, data have been analyzed for a library sample estimated to represent 61 percent of the population served by public libraries.

2. EXISTING CAPITAL PLANT OF PUBLIC LIBRARIES

In 1962, there were an estimated 7,257 community, county, regional, district or other local public library agencies in the United States. Of these, 6,264 responded to the survey which provides the most recent fully analyzed data available. Information on the number of library units is summarized in the first column of table 3, which also gives comparable information for selected earlier years. A State-by-State breakdown of the 1962 data, excluding bookmobiles, is shown in table 4.

TABLE 3.—*Number of public library units,[1] by type, 1945–62*

	1962	1956	1950	1945
Total	24,301	19,560	11,738	8,073
Central libraries	[2] 6,264	6,263	6,028	6,026
Branches and subbranches	5,725	5,285	5,107	2,047
Stations [3]	11,031	7,132	(4)	(4)
Bookmobiles	1,281	880	603	(4)

[1] Data are derived from reports submitted to U.S. Office of Education for various surveys. Since only reported units are included, data are not for entire universe.

[2] Change in status of hundreds of libraries from separate agencies to members of systems between 1956 and 1962 accounts for the lack of change in number of central libraries between the 2 periods.

[3] Stations are distribution points which may be located in a rural store, post office, or other community facility. They have no permanent book collections and no library staff.

[4] Data not reported for these years.

TABLE 4.—*Distribution of public library units (excluding bookmobiles), 1962*

	Total	Central libraries	Branches	Stations
Total	23,020	6,264	5,725	11,031
Alabama	528	75	89	364
Alaska	24	23		1
Arizona	121	35	11	75
Arkansas	355	53	130	172
California	1,419	179	627	613
Colorado	199	91	38	70
Connecticut	311	188	91	32
Delaware	25	18	3	4
District of Columbia	18	1	17	
Florida	214	115	84	15
Georgia	899	87	187	625
Hawaii	41	4	20	17
Idaho	75	66	3	6
Illinois	718	395	114	209
Indiana	551	239	128	184
Iowa	497	330	92	75
Kansas	225	192	22	11
Kentucky	588	73	76	439
Louisiana	381	55	292	34
Maine	196	177	7	12
Maryland	132	23	95	14
Massachusetts	937	351	228	358
Michigan	1,041	264	222	555
Minnesota	665	183	103	379
Mississippi	305	57	129	119
Missouri	863	147	126	590
Montana	111	47	36	28
Nebraska	219	184	24	11
Nevada	25	17	7	1
New Hampshire	240	202	22	16
New Jersey	614	296	122	196
New Mexico	39	35	4	
New York	1,078	95	879	104
North Carolina	1,039	97	203	739
North Dakota	62	48	8	6
Ohio	2,685	249	403	2,033
Oklahoma	93	63	15	15
Oregon	256	94	76	86
Pennsylvania	1,201	297	126	778
Rhode Island	84	60	11	13
South Carolina	547	50	102	395
South Dakota	119	79	12	28
Tennessee	1,276	22	189	1,065
Texas	426	205	137	84
Utah	89	50	36	3
Vermont	164	145	11	8
Virginia	135	64	47	24
Washington	334	93	169	72
West Virginia	280	37	26	217
Wisconsin	452	283	65	104
Wyoming	89	21	43	25
Canal Zone	11	1	3	7
Guam	1	1		
Puerto Rico	19	7	12	
Virgin Islands	4	1	3	

Source: Unpublished data in files of U.S. Office of Education for forthcoming publication, *Public Library Statistics, 1962*. Part 2. Data are for libraries reporting in this survey and not for entire universe.

It is noteworthy that, despite the recent steady growth in the number of public library units in the United States, the aggregate number of separate library agencies and library systems has remained relatively constant, as indicated by table 3. This is the result of a trend for small independent libraries to join library systems in order to broaden their tax base and improve service. Despite this trend toward consolidation, however, many small communities and library districts continue to operate independently. As a result, approximately one-half of the public library agencies in 1962 were located in places of less than 5,000 population. This is reflected in the data summarized in table 5. In this table a village library in a

single room counts as heavily as a city library system with a central library and many branches. Hence, the data provide only an indication of the distribution of library agencies (and not facilities) by size of community.

Based on extrapolations of data from the 1964 library survey,[2] the approximate distribution of publicly owned library buildings by date of construction is shown below:

Construction period:	*Proportion of all buildings (percent)*
Before 1905	16
1905 to 1924	22
1925 to 1960	48
1961 or later	14
	100

TABLE 5.—*Distribution of public library agencies by population of area served*

Population category:	*Number of libraries*
500,000 and over	36
100 to 499,999	228
50,000 to 99,999	333
10,000 to 49,999	1,575
5,000 to 9,999	910
Below 5,000	3,182
Total	6,264

Source: Unpublished data in files of U.S. Office of Education for forthcoming publication, *Statistics of Public Libraries, 1962*. Part 2. Data are for libraries reporting for this survey and not for entire universe.

The fact that so many libraries built during the "Carnegie era" are still in use and that some 38 percent of existing library buildings are more than 40 years old is evidence of a substantial backlog of needed construction for replacement. These needs, of course, must be added to needs for expansion of existing plant, which have been mentioned earlier.

Almost all of the public libraries are owned by public bodies. Of the estimated 56.5 million square feet of space occupied for public library purposes in 1965, approximately 49 million square feet (or 86.7 percent) were owned by cities, counties, towns, special districts, public authorities, or local public bodies. About 6 million square feet (or 10.6 percent) were leased from private owners for library uses. As already noted, approximately 1.5 million square feet (or 2.7 percent) were owned by State governments.

Estimated current replacement value of State and locally owned facilities and structures in 1965 is $1,262.5 million.[3] Estimated current replacement value of furniture and equipment in rented quarters is $22.5 million.

B. Costs and User Charges

1. COSTS

In 1965 new public library buildings cost about $25 per square foot. Additions to existing buildings cost about $20 per square foot, and remodeling and alterations about $8 per square foot.[3] Costs varied

[2] Unpublished data in files of U.S. Office of Education for publication, *Survey of Public Library Building Facilities, 1963–64*.

[3] These figures include costs of land, site development, architects' fees, construction, and initial equipment.

in different size communities. Table 6 gives some examples of recent construction project costs.

The 1963 operating budgets for three libraries are summarized in table 7. These budgets, believed to be typical, indicate that about 10 percent is spent for maintenance purposes. This includes janitorial service and salaries, building repairs and maintenance, repair and replacement of furniture and equipment, and utilities.

TABLE 6.—*Cost of 4 public library construction projects, 1965*

Name of project, location, and type	Population served	Cost of project	Square feet	Cost per square foot
DEER PARK PUBLIC LIBRARY, DEER PARK, N.Y.				
New central building serving the city	16,726	$271,300	11,600	$23.38
AKRON PUBLIC LIBRARY, AKRON, OHIO				
New central building serving the city of Akron and the remainder of Summit County not served by other libraries	513,569	4,651,863	144,000	32.30
HOUSTON MEMORIAL LIBRARY, DOTHAN, ALA.				
Remodeling of headquarters building for county library	50,718	128,784	26,425	4.87
YUMA CITY-COUNTY LIBRARY, YUMA, ARIZ.				
Addition to main library serving the city and county of Yuma	46,235	335,000	13,400	25.00

TABLE 7.—*Operating expenditures, 3 library systems, 1963*

	Total amount	Percent	Operating expenditures		Maintenance	
			Amount	Percent	Amount	Percent
Total	$2,066,449	100	$1,858,599	90	$207,850	10
1. City library serving 83,254 population in compact area near Los Angeles	415,178	100	365,079	88	50,099	12
2. County library serving 153,401 population in urban area	565,111	100	491,752	87	73,359	13
3. City library serving 300,000 in metropolitan area of 513,870 population in Midwest	1,086,160	100	1,001,768	92	84,392	8

Source: American Library Association. *Costs of Public Library Service, 1963.* A supplement to *Public Library Service, a Guide to Evaluation, With Minimum Standards.* Chicago, the Association, 1964, pp. 9, 11, 13.

2. USER CHARGES

Public libraries, by definition, do not have user charges. Fines for overdue books (or similar fees) are punitive measures designed to stimulate return of books so that others may borrow them. Fines and other fees are a very small percentage of library income; they are usually credited to the community general fund and not to the public library account.

C. TREND OF CAPITAL OUTLAYS AND SOURCES OF FUNDS

Capital outlay for public libraries has shown a huge increase in the past 20 years, rising from an estimated $1.8 million in 1946 to $103 million in 1965, as shown in table 8. This increase is accounted for by

the large increase in local funding from $1.6 to $70.9 million, and the introduction of $29.9 million in Federal funds for the first time in 1965.

Local funds have been the greatest source of support for public library construction in recent years. In 1946 about 88 percent of such support was local, while in 1965 the local portion was 69 percent. In 1965 the Federal Library Services and Construction Act contributed 29 percent of public library construction funds.

Endowments and other private sources amounted to about 12 percent in 1946 and 1.6 percent in 1965. State funds for local public library construction first became available in 1965 when Maryland and Rhode Island appropriated $275,000 and $100,000 respectively. It is estimated that State governments contributed about 0.4 percent of total funds for public library construction in 1965. State governments have appropriated funds for State library agency construction on occasion, but data on an annual basis are not available.

TABLE 8.—*Capital outlay, public libraries, by source, for selected years 1945–65*[1]

[In millions of dollars]

	Total[2]	Local-State			Federal	Endowment and other private source
		Total	Local	State		
1965	103.0	71.4	70.9	0.5	29.9	1.7
1964	61.3	60.1	60.1	----	----	1.2
1962	27.7	26.8	26.8	----	----	.9
1956	12.3	11.7	11.7	----	----	.6
1950	4.4	4.1	4.1	----	----	.3
1946	1.8	1.6	1.6	----	----	.2
1945	1.2	1.0	1.0	----	----	.2

[1] Data for local funds for 1945–62 are derived from reports of local libraries submitted to the U.S. Office of Education in various nationwide surveys of public libraries, with the exception of data for 1946 which are estimated. Data for 1964–65 local expenditures are based on extrapolations from partial returns from the Office of Education's *Survey of Public Library Facilities, 1963–64*. Data for endowment and other private soures are estimated except for 1965.

[2] Includes outlay for land, site development, architects' fees, construction and initial equipment.

Of the $70.9 million local funds for capital outlay in 1965, approximately $15.2 million (or 21 percent) was derived from bond issues passed in local elections. The balance of local funds came from other local bonds and local appropriations from tax sources. Federal funds of $29.9 million were expended as grants to local and State libraries under the Library Services and Construction Act.

Endowment and other private sources in the amount of $1.7 million in 1965 came from individuals and organizations. Estimated State funds of $0.5 million were mostly expended in the form of grants to local libraries.

D. NEEDS AND PROSPECTIVE CAPITAL OUTLAYS

(a) *Capital Requirements*

Capital outlay requirement for public library construction in the decade 1966–75 are estimated to total about $1.9 billion. This is the amount estimated as necessary to construct nearly 68 million gross square feet of library space, assuming a schedule of expenditures as shown in table 9.

Estimated needs may be accounted for as follows:

Backlog—39.8 million square feet.—This estimate reflects needs reported by public library officials in unpublished data from the U.S. Office of Education's Survey of Public Library Building Facilities, 1963–64. Reports are generally based on American Library Association standards and suggested criteria described earlier in this chapter.

Population growth—15.8 million square feet.—The estimate is based on an allowance of 0.5 square foot per capita and an assumed population increase of 1.5 percent per year.

Obsolescence—12 million square feet.—Because such a large proportion of existing library facilities were built before 1925 this is a conservative allowance, but in view of the large backlog of unmet needs, it seems prudent to assume that no larger proportion of the present buildings will be replaced during this decade.

TABLE 9.—*Capital outlay of public libraries estimated as required to meet needs during the decade 1966–75*

Fiscal year	Estimated construction cost per square foot [1]	Capital outlay (millions)	Estimated square feet to be built (millions)
1966	$25.50	$140	5.5
1967	26.00	145	5.6
1968	26.50	166	6.2
1969	27.05	177	6.5
1970	27.60	188	6.8
1971	28.15	200	7.1
1972	28.70	207	7.2
1973	29.30	220	7.5
1974	29.90	228	7.6
1975	30.50	236	7.7
Total		1,907	67.7

[1] Includes land, site preparation, architects fees, construction and initial equipment. The assumed annual increase in construction costs is 2 percent, which may be unduly optimistic based on recent general trends in the construction industry.

(b) *Distribution of Needs by Population Size of Community*

No reliable estimate of this distribution can be made.

(c) *Spending Agencies for Capital Outlays*

It is anticipated that the great majority of the projected capital outlays will be expended by cities, counties, towns, special library districts, etc. A small proportion, probably not exceeding 2 percent, is expected to be expended by State governments or State library agencies.

CHAPTER 37

Residential Group Care Facilities for Children*

This chapter deals with three types of facilities—detention homes, institutions for juvenile delinquents, and other child welfare facilities. Included in the last type are the following:

(i) Institutions for care of dependent and neglected children;

(ii) Residential treatment centers for emotionally disturbed children which are not part of a psychiatric hospital;

(iii) Maternity homes for provision of social and health services for unmarried mothers; and

(iv) Group homes owned or operated by a social agency for about 4 to 12 children, with house parents who are full-time employees of the agency.

A. Nature and Composition of Public Work or Facility

1. DESCRIPTION OF FACILITIES

(a) *General Physical Characteristics*

1. Detention for the juvenile court is the temporary care of children in physically restricted facilities pending court disposition or transfer to another jurisdiction or agency. Facilities used by the court for the detention of children generally are referred to as detention homes. Since they must offer a full program for meeting children's needs within secure custody, detention requires special planning in construction. They tend to be found in the more heavily populated areas of the United States, but they vary considerably in size (see table 1).

2. Institutions for delinquent children are defined in this report to include those specialized facilities which are designed primarily for the care and treatment of delinquent children committed to them by the courts. These institutions have the legal responsibility to provide food, clothing, shelter, education, ordinary medical care; and the duty to protect, to train, and to discipline the child. Typically, these institutions must include physical facilities such as cottages or dorms for housing, school buildings, chapels, dining and recreation halls, administrative buildings, etc. There is great variation in the number and number and size of the physical facility needs for these institutions. Two important factors related to these variations in need include the number of children to be served and the type of institutional treatment which is to be provided. Tables 2 and 3 show the ranges in size and type among these institutions.

3. The other facilities included under child welfare institutions serve populations from about 12 up to 900 children. The smallest institu-

*Prepared by Miss Hannah Adams, Dr. Leonard Hippchen, Mr. Martin Gula, under editorship of Mr. Bernard Greenblatt, all of the Children's Bureau, U.S. Department of Health, Education, and Welfare, with minor editing by committee staff.

tions and maternity homes may be housed in one congregate building with administrative offices, kitchen, dining room, and dormitory space. There may be one or more residential cottages housing from about 8 to 15 children. Playground space is included in the total "campus."

TABLE 1.—*Capacity of detention homes in the United States, 1964*

Capacity	Number	Percent
Total	200	100
Under 10	10	5
10 to 24	80	39
25 to 49	48	24
50 to 99	40	20
100 to 199	12	6
200 to 299	5	3
300 or more	5	3

Source: Children's Bureau, Welfare Administration, 1966. (Capacities of 81 detention homes unknown.)

TABLE 2.—*Capacity of public institutions for delinquent children, 1964*

Capacity	Number	Percent
Total	233	100
Less than 50 children	40	17
50 to 99	60	26
100 to 149	36	15
150 to 199	23	10
200 to 249	16	7
250 to 299	21	9
300 to 399	18	8
400 or more	19	8

Source: Children's Bureau, Welfare Administration, 1966. (Capacity for 43 institutions is unknown.)

TABLE 3.—*Public institutions serving delinquent children in the United States, by type, 1964*

Type of institution	Number	Percent
Total	274	100
Training schools	198	72
Forestry camps	63	23
Reception-diagnostic centers	13	5

Source: Children's Bureau, Welfare Administration, 1966. (Type for 2 institutions is unknown.)

The larger institutions serve several hundred children or more and include administrative buildings, school buildings, vocational training and shop buildings, farm buildings, hospital and nursing facilities, gymnasium, and individual residential cottages. A few of these institutions are large congregate-type structures with two or more levels which include a variety of the facilities usually housed in separate buildings.

(b) *Services Rendered*

1. Detention homes serve primarily juveniles referred to them by local juvenile courts, although some States include detention homes which are designed to serve a group of juvenile courts within a given region.

2. The majority (82 percent) of the 276 public institutions serving delinquent children are statewide in coverage and receive commitments from courts throughout the State;[1] a minority (18 percent) are locally operated institutions, and receive commitments from courts of only a single county or municipality. Private institutions more frequently serve wards received from a region rather than statewide.

3. The home addresses of children or adolescents accepted for care in the other child welfare institutions would generally reflect the general distribution of population nationally.

4. On this basis, it is estimated that about 70 percent [2] of the children come from urban and suburban areas; 30 percent from predominantly rural areas. More children in these welfare institutions come from low income sections of urban and rural communities.

(c) *Standards of Performance*

1. No quantitative standards of performance for detention homes appear to exist. However, it is known that in 1964, 686,000 juvenile delinquency cases, exclusive of traffic cases, were disposed of by juvenile courts in the United States.[3] These involved about 2 percent of the U.S. child population, ages 10 to 17. The exact number of children who were detained is not known, but it is estimated that possibly as many as 300,000 children from 7 to 17 inclusive are held in jails and jail-like places of detention each year.[4] They also state that many of these children did not need to be detained in a secure facility.

2. No quantitative standards of performance for institutions serving delinquent children have been established. However, these institutions in 1964 served an average of 172 per 100,000 child population (10 to 17 years of age) in the United States. Regionally, the rate ranged from 95 per 100,000 in the Middle Atlantic region to 296 per 100,000 in the Pacific region.[5]

3. There are no recognized standards for amount of child welfare residential facilities needed per given unit of child population. However in 1965 the rate for children being cared for in institutions for dependent and neglected children was 10 children per 10,000 child population under 21 years of age.[6]

(d) *Qualitative Standards of Performance*

1. Qualitative standards for detention homes recommended by juvenile delinquency specialists include: (1) Rate of detaining—it is recommended that no more than 10 percent of the total number of apprehended juveniles in any community need to be detained in a place of secure custody; (2) Detention homes should be made entirely secure; (3) All sleeping rooms should be individual rooms, approximately 8 feet by 10 feet in size when equipped with toilet and washbasins; (4) The capacity of a detention home should be not less than 20 nor more than 60 for greatest efficiency and program effectiveness; (5) The child-staff ratio should be 3:4 or 4:4; (6) The temporary stay

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[1] In this report, data referring to the two federally operated juvenile institutions in the United States will be included with the State data.

[2] U.S. Bureau of the Census, *Census of Population, 1960, U.S. Summary General Social and Economic Characteristic*, PC (1), 1 C, table 65.

[3] *Juvenile Court Statistics, 1964*, Children's Bureau Statistical Series No. 83, Department of Health, Education, and Welfare, 1965.

[4] Estimated by detention consultants, Children's Bureau.

[5] *Statistics on Public Institutions for Delinquent Children, 1964*, Children's Bureau Statistical Series No. 81, Department of Health, Education, and Welfare, 1965.

[6] Annual reports of State departments of public welfare to the Children's Bureau, 1965 and estimated population under 21 years of age, July 1, 1965, Bureau of the Census.

of a child in detention should be planned for from 10 days to 2 weeks; (7) In order to support an adequate detention home program, consultants recommend building detention facilities in areas of 250,000 or more population.

2. Qualitative standards[7] for juvenile delinquent institutions include such factors as: forestry camps should be built to accommodate no more than 50 children, training schools for no more than 150 children; institutions should be located near enough to a university or an urban center to make available the specialists who can provide the staff with consultation and stimulation as well as special services for children, such as hospitals; living units should be single-story cottages, including both single rooms and small dormitories, and dormitories should allow a minimum of 500 cubic feet of air space per child, with at least 3 feet between the sides of beds and a wall; separate housing should be provided for cottage personnel, rather than having them live with the children. Additional elements of performance, based upon reported data from institutions for 1964,[8] include: (a) Average length of stay, 9.3 months; (b) Occupancy rate, 40 percent of all institutions were housing more than their stated capacity; (c) Per capita operating expenditures, $3,020 annually per child; and (d) child-staff ratio, 2.2 children for every full-time staff member.

3. Qualitative standards for other child caring institutions have been developed in terms of such factors as: administration and organization; income needed for operation; board qualifications and responsibilities; location of institutional property; adequacy of physical space, facilities and staff; quality and adequacy of services to parent and child; nature of diagnosis, treatment, planning, and evaluation; etc. Such standards have been developed by most public State licensing agencies and by voluntary national organizations.[9]

Institutions are grouped on three levels of quality: (1) custodial, (2) casework oriented, and (3) clinically oriented. The custodial institutions provide basic shelter, food, clothing, recreation—but provide little if any educational, casework, psychological, or psychiatric services. A "mass" approach is generally used in providing this custodial care. Staff ratio in such institutions is usually one full-time staff member for three children in residence.

A smaller number of institutions and maternity homes have developed more individualized care for children and youth with the addition of some casework services, some remedial education, and some psychological and psychiatric consultation. These can be classified as casework oriented institutions. Staff-child ratio is one full-time staff member for two children in residence. The smallest number represents residential treatment centers which are clinically-oriented. These institutions have most highly individualized treatment programs for children, utilizing a full corps of casework, educational, psychological, and psychiatric services. Staff-child ratio is usually one full-time staff member for each child in residence.

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[7] *Institutions Serving Delinquent Children: Guides and Goals*, Children's Bureau publication No. 360, revised, 1962, Department of Health, Education, and Welfare.

[8] *Statistics on Public Institutions for Delinquent Children, 1964*, Children's Bureau Statistical Series No. 81, Department of Health, Education, and Welfare, 1965.

[9] *Standards for Services of Child Welfare Institutions* (Child Welfare League of America, 44 East 23d Street, New York, N.Y. 1963), and the Florence Crittenton Association of America: Standards for *Florence Crittenton Association Maternity Home Services* (Florence Crittenton Association Maternity Home Services, Florence Crittenton Association, 608 South Dearborn Street, Chicago, Ill., 1965).

2. EXISTING CAPITAL PLANT IN THE UNITED STATES

(a) *Number of Facilities.*

As of 1965:

1. There are an estimated number of 281 detention homes in the United States, its territories and possessions.

2. An estimated number of 400 institutions serving primarily juvenile delinquent children were in operation in the United States, its territories, and possessions (276 public, 103 voluntary, 21 proprietary).

TABLE 4.—*Distribution by State of detention homes (1965), public, voluntary, and proprietary juvenile delinquency institutions (1964), and public and voluntary child welfare institutions (1965)*

State	Detention homes [1]	Juvenile delinquency institutions			Public and voluntary child welfare institutions [3]
		Public [1]	Voluntary [2]	Proprietary [2]	
Total	281	[4] 276	103	21	1,580
Alabama	5	3	0	0	21
Alaska	3	1	0	0	19
Arizona	2	1	3	0	15
Arkansas	3	4	1	0	12
California	39	51	8	2	70
Colorado	2	3	2	0	23
Connecticut	3	2	2	0	16
Delaware	1	2	0	0	6
District of Columbia	1	1	0	0	12
Florida	14	7	0	0	27
Georgia	6	3	0	0	36
Guam	0	0	0	0	0
Hawaii	2	2	0	0	4
Idaho	0	1	0	0	4
Illinois	10	16	5	0	95
Indiana	6	4	3	0	50
Iowa	3	2	0	0	17
Kansas	6	2	2	0	18
Kentucky	4	5	4	0	50
Louisiana	4	4	1	0	40
Maine	0	2	0	0	15
Maryland	2	7	1	0	20
Massachusetts	4	11	0	0	32
Michigan	17	6	9	0	48
Minnesota	2	8	1	0	15
Mississippi	0	2	1	0	13
Missouri	4	9	1	0	50
Montana	1	2	1	0	9
Nebraska	2	2	1	0	17
Nevada	2	2	1	0	1
New Hampshire	0	2	0	0	10
New Jersey	10	6	3	0	44
New Mexico	1	3	0	0	6
New York	[5] 13	9	12	0	109
North Carolina	5	7	0	0	34
North Dakota	1	1	1	0	7
Ohio	23	1	6	0	109
Oklahoma	2	4	3	0	31
Oregon	4	4	4	0	9
Pennsylvania	22	11	16	0	134
Puerto Rico	2	4	0	1	14
Rhode Island	0	2	0	0	6
South Carolina	3	4	1	0	22
South Dakota	0	1	3	0	7
Tennessee	4	5	1	1	45
Texas	9	8	1	0	101
Utah	6	1	0	0	0
Vermont	0	1	0	0	8
Virgin Islands	0	1	0	0	2
Virginia	7	6	1	0	37
Washington	14	10	0	0	35
West Virginia	3	3	1	0	23
Wisconsin	4	4	3	18	28
Wyoming	0	2	0	0	4

[1] Children's Bureau, Welfare Administration, 1966 (unpublished).
[2] Project on physical facilities for group care of children, Report No. 1, Center for Urban Studies, University of Chicago, December 1965.
[3] Children's Bureau, Welfare Administration, 1965 (unpublished). Includes institutions for dependent and neglected children, residential treatment centers for emotionally disturbed children in a nonmedical setting, and maternity homes for unmarried mothers.
[4] Excludes 2 Federal institutions.
[5] Includes 5 detention homes under voluntary auspices.

3. There were in operation in the United States approximately 1,580 other child welfare institutions [10] under tax-supported or voluntary nonprofit auspices, *exclusive* of group homes (of which there are several hundred though the exact number is not known). These institutions *and* group homes as of March 31, 1965, were serving about 86,000 children.[11]

(b) *Geographic Distribution*

Distribution of such facilities or structures by State: State by State distributions of detention homes, of institutions for juvenile delinquents, and of other child welfare institutions are presented, respectively, in table 4. The data presented are those most recently available.

(c) *Distribution by City Size*

The distribution of detention homes, by population and size of city in which located, is shown in table 5. Ninety-three percent of all detention homes are located in areas of 50,000 population or more.

TABLE 5.—*Population of area in which detention homes are located in United States, 1965*

Population	Number	Percent
Total	281	100
500,000 or more	64	23
100,000 to 499,999	154	55
50,000 to 99,999	42	15
10,000 to 49,999	18	8
2,500 to 9,999	2	1
Under 2,500	1	(1)

[1] Less than 0.05 percent.

Source: Children's Bureau, Welfare Administration, 1966.

The distribution of public institutions for delinquent children by population size of city in which located, is shown in table 6. Half of all institutions are located in or near cities of 75,000 or more: 21 percent are in or near cities of 20,000 to 74,999; and 20 percent are in towns of less than 20,000 population or in rural areas.

TABLE 6.—*Distribution of public institutions for delinquent children, by population size of city, 1965.*

Urban-rural areas	Number	Percent
Total	276	100
In metropolitan area (more than 250,000)	35	13
Near metropolitan area (within 25 miles)	44	16
In metro-intermediate area (75,000 to 250,000)	28	10
Near metro-intermediate area (within 25 miles)	29	11
In or near small town (in or within 25 miles of town 20,000 to 74,999)	59	21
Rural (under 20,000)	81	29

Source: Children's Bureau, Welfare Administration, 1966.

Child welfare institutions are widely scattered through urban, suburban, and to some extent rural areas. In the census of institu-

[10] Unpublished list compiled by Children's Bureau from information furnished by State departments of public welfare.

[11] Annual reports of State departments of public welfare to the Children's Bureau, 1965.

tions conducted by the Bureau of the Census in 1960, 75 percent of the population of institutions for dependent and neglected children and homes for unmarried mothers was found in institutions located in standard metropolitan statistical areas of all sizes, and 52 percent of the population of these institutions was in institutions located in standard metropolitan statistical areas of 500,000 or more in population.[12]

(d) *Age Distribution*

(1) The distribution of detention homes in the United States by age is estimated by the detention consultants of the Children's Bureau as follows: 15 percent built prior to 1941; about 60 percent built between 1941–60; and about 25 percent were built since 1961.

(2) The distribution of public institutions for juvenile delinquents by age is shown in table 7. Twenty-two percent were built before 1900; 26 percent were built between 1901–40; and 52 percent were built since 1941.

TABLE 7.—*Distribution of age of public institutions for delinquent children, 1965*

When built	Number	Percent
Total	266	100
Before 1900	58	22
1901 to 1920	44	17
1921 to 1940	25	9
1941 to 1960	102	38
1961 or later	37	14

Source: Children's Bureau, Welfare Administration, 1966. (Age of 10 institutions is unknown.)

The following represent estimates of the age distribution of other child welfare institutions made by specialists in the Children's Bureau.

Original or new construction:	*Percent*
Before 1900	40
During 1901–20	40
1921–40	10
1941–60	8
1961-present	2

(e) *Ownership Patterns*

1. Auspices of the 281 detention homes is as follows: city-county, 268; State, 8; voluntary, 5 (all in New York); and proprietary, none.

2. The ownership distribution of the institutions for juvenile delinquents is: State, 49 percent; city-county, 20 percent; voluntary, 26 percent; proprietary, 5 percent.

3. Of the 1,580 other child welfare institutions now in operation, 1,422 or 90 percent are under the auspices of private nonprofit organizations, and 158 or 10 percent are operated by governmental agencies, of which an estimated four-fifths are county or city agencies and one-fifth are State agencies.[13] Although precise information is not available, the proportion of proprietary or profitmaking institutions is believed too slight to be significant.

[12] Derived from Bureau of the Census, *Inmates of Institutions*, 1960, tables 10, 31, and 42.

[13] Unpublished list compiled by Children's Bureau from information furnished by State departments of public welfare.

(f) *Estimated Current Value*

1. The estimated capacity of the 281 detention homes in 1964 is approximately 12,000 (based on data in table 1). Since the average replacement cost is estimated at $15,000 per bed,[14] the estimated total replacement value of these homes is $180 million.

2. In 1965, the 400 institutions primarily caring for juvenile delinquents had an estimated total bed capacity of 60,000 (table 2 projected). Based upon a replacement value of $15,000 per bed (the average construction cost in 1965 estimated by the National Council on Crime and Delinquency), these facilities and structures would have a current value of $1,050 million.

3. Based on an estimated average replacement cost per institution of $700,000, the current value of the 1,580 other child welfare facilities is estimated at $1,106 million. (The average replacement estimate is based on studies of plant evaluation of 43 institutions by the Duke Endowment.[15] This replacement estimate is similar to that obtained by the Child Welfare League of America in its study of 16 residential treatment centers.[16] The replacement value of these 16 facilities was calculated at $11.8 million, or an average of $750,000 per institution.)

B. Costs and User Charges

1. CONSTRUCTION AND OPERATING COSTS

(a) *Construction Costs*

1. The National Council on Crime and Delinquency has estimated that the current range of construction costs for detention homes is from $10,000 to $20,000 per bed of planned capacity.

2. Construction costs vary considerably depending upon such factors as size of institution, region of construction, and type of institution. The National Council on Crime and Delinquency has estimated the 1965 range of construction costs of institutions similar in nature to those for delinquent children are between $10,000 and $20,000 per bed of planned capacity.

3. Building costs per square foot (including equipment) vary geographically according to labor costs. The range for other child welfare institutions would be $15 to $25 per square foot, according to estimates of specialists in the Children's Bureau and the American Institute of Architects. These estimates include costs of built-in equipment, but the percentage of the total costs which equipment constitutes is not known. Excluded are costs of land acquisition, site development, movable equipment, and furnishings; the specialists estimate the costs per square foot would increase by 10 to 20 percent if these were included.

(b) *Operating Expenses*

(These estimates are for costs of all salaries and expenses, other than for capital improvements.)

1. Detention home consultants estimate that the operational and maintenance costs of child care in detention homes currently range between $7 to $35 per day per child ($5,475 average annually).

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[14] Estimate by the National Council on Crime and Delinquency.

[15] Duke Endowment: *Annual Reports of the Hospital and Orphan Sections*. New York: Duke Endowment, December 1963.

[16] Hylton, Lydia: *The Residential Treatment Center—Children, Programs, and Costs*. New York: Child Welfare League of America, 1964.

2. The average annual per capita operating and maintenance expense for all public institutions serving delinquent children in 1964 was $3,020 ($8.27 per day per child). The range of average per capita operating expenses was from $1,563 in the East South Central region to $4,808 in the Middle Atlantic region, and from $2,934 for training schools to $4,468 for reception-diagnostic centers. (See table 8.)

TABLE 8.—*Annual per capita operating expenditure of public institutions for delinquent children, by type of institution, and region, 1964*

Regions and type of institution:	*Annual per capita operating expenditures*
All institutions	$3,020
Regions:	
New England	3,606
Middle Atlantic	4,808
South Atlantic	2,237
East South Central	1,563
East North Central	3,380
West North Central	3,023
West South Central	1,965
Mountain	3,174
Pacific	3,994
Type of institutions:	
State training schools	2,934
Local training schools	3,184
Forestry camps	3,120
Reception and diagnostic centers	4,468

Source: *Statistics on Institutions for Delinquent Children*, Children's Bureau Statistical Series, No. 81 1965.

3. Available information on operating expenses of other child welfare facilities generally include minor repairs, replacements, salaries, and other expenses exclusive of capital improvements. However, there is currently no central source for data on the separate costs of annual maintenance which has been prepared in any standard way.

The best estimate of specialists in this area is that the total cost of operating institutions for dependent children range from $7 to about $15 per child day. The median cost is estimated at the low end of the range—perhaps as low as $7.50. At the high end of the range are clustered the institutions providing more comprehensive clinical services, that is, the residential treatment centers. Studies have indicated that as the number of children under care increases, the fixed costs decreases.[17] While this is generally true, there are many exceptions. High costs of maintenance reportedly are many times associated with age of building. In many of the antiquated buildings still being used, maintenance costs tend to be high.

2. USER CHARGES

(a) *User Charges*

1. Since detention homes principally are Government operated, user charges would be negligible.

2. User charges among public institutions serving delinquent children are negligible, estimated at less than 4 percent. A report of the United Community Funds and Councils of America, Inc.,[18] in

[17] Health and Welfare Council of Metropolitan St. Louis: *Costs and Income in Children's Institutions*. St. Louis: Health and Welfare Council, October 1962., *op. cit.*

[18] *Summary Report, Expenditures 1960*, United Community Funds and Councils of America, Inc., New York, p. 18.

1960, estimated that related types of institutions under voluntary auspices received about 22 percent of their operating revenues from public funds and about 50 percent from contributions or united funds. Of the remaining 28 percent revenue, it is estimated that user charges accounted for an average of approximately 10 percent with a range of from 2 to 35 percent.

Among the other child welfare institutions, the general pattern of fee charging nationally is to charge for the total service; therefore no special charges are recorded for occupancy or use of facilities or structures.

Fees received in institutions for dependent children in 23 cities in 1960 amounted to 6.5 percent of total receipts. Sources of all income for governmental and voluntary institutions is summarized below: [19]

	Percent
Public funds:	
Local	33.6
State	16.0
Federal	1.2
Contributions:	
United fund or chest	13.3
Other	19.9
Other receipts:	
Fees	6.5
Investments	7.4
Other	2.2

Payments from public funds make up the largest source of income. Governmental institutions were financed about 96 percent from public payments. Institutions under voluntary auspices received about 22 percent from public funds and about 50 percent from contributions or united funds.

(b) *Extent of User Charges*

1. User charges are too negligible to be considered as a source of funds for meeting current operational or planned capital needs for detention facilities.

2. User charges typically contribute only a small proportion of operational and maintenance charges for public and voluntary institutions serving delinquent children. There are no known instances of institutions which set aside operating income to finance capital costs; this is specifically excluded in most united fund agreements with voluntary institutions.

3. Also in regard to other child welfare facilities, there are no known instances of institutions which set aside operating income to finance capital costs. (Again, this is specifically excluded in most united fund agreements.)

There is a wide range in the extent to which public payments to voluntary institutions meet total operating costs. In some areas a flat grant is made which has little relationship to actual costs. In New York City, a complex formula pays up to 90 percent of costs.

(c) *Use of Tax Resources, Public Borrowing*

1. For the construction of large detention homes, government financing probably is supported by sale of bonds; smaller homes may be financed by the government from general tax funds.

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[19] *Ibid.*

2. The general pattern nationally in financing capital costs for these institutions for juveniles and related types of other child welfare institutions is for some kind of special funding.

Regarding the voluntary institutions, a capital fund drive is generally conducted whereas for the government, bonds are usually issued. There are reportedly only a few States or local governments which use the general fund for capital costs of public institutions.

C. Trend of Capital Outlays

1. TREND

Capital expenditure data for detention homes are not available on a national basis and consequently trends cannot be accurately determined. However, some indication of construction costs and capacities of detention homes built during 1949–56 can be gained from the selected data shown in table 9. This table shows the average cost of construction per bed during that period to be $8,153. Since it is estimated that about 85 percent of the 281 detention homes (total capacity 12,000) were built since 1941, then on the basis of the cost of construction of $8,153 per bed, it is roughly estimated that 239 detention homes (total capacity of 10,200) were built since 1941 at a total capital outlay of about $83.2 million or an average of $5.5 million yearly.

(The source documents for the cost data do not specify whether they include components of costs such as land acquisition, site development, built-in and movable equipment and furnishings.)

Table 9.—*Costs of construction for selected detention homes, 1949–56*

Location	Year of construction	Cost of construction	Capacity	Cost per bed
Los Angeles, Calif.[1]	1955	$4,850,000	585	$8,290
King County, Wash.[1]	1952	1,250,000	80	15,625
Dallas, Tex.[1]	1950	600,000	35	17,142
Dade County, Fla.[1]	1950	500,000	124	4,032
Passaic, N.J.[1]	1955	180,000	16	11,250
Stark County, Ohio[1]	1955	150,000	22	6,818
Norfolk, Va.[1]	1953	125,000	30	4,167
St. Joseph County, Ind.[1]	1953	185,000	14	13,214
Lehigh County, Pa.[1]	1950	50,000	10	5,000
El Paso, Tex.	1955	128,000	35	3,657
Wyandotte County, Kans.[1]	1954	170,000	33	5,152
Pima County, Ariz.[1]	1955	175,000	38	4,605
Utah County, Utah[1]	1952	125,000	16	7,813
Sonoma County, Calif.	1952	327,230	95	3,444
Kern County, Calif.	1951	466,000	60	7,766
Sacramento, Calif.	1947	250,000	41	6,098
Contra Costa County, Calif.	1950	659,000	84	7,845
Fresno County, Calif.	1956	450,000	55	8,182
Napa County, Calif.	1955	142,000	20	7,100
Placer County, Calif.	1955	100,000	15	6,667
San Diego County, Calif.	1954	1,250,000	160	7,812
San Francisco County, Calif.	1950	4,500,000	190	23,684
San Joaquin County, Calif.	1949	400,500	66	6,068
Santa Cruz County, Calif.	1949	53,000	10	5,300
Allen County, Ind.	1952	325,000	19	17,105
Average, 25 detention homes				8,153

[1] 12 States from various regions of the United States (1950–55) detention homes construction—average cost: $8,592 per bed.

Source: Children's Bureau, Welfare Administration, 1966.

Table 10 presents capital expenditure data for 6 selected years of the period 1953–64 for public institutions serving delinquent children who reported data to the Children's Bureau. It is estimated that institutions during the period had capital expenditures averaging $66,830 annually per institution. Based upon an average number of institutions for that period, the average annual capital outlay for these institutions is estimated to be $13,967,470; for the 1953–64 period, total capital outlays is estimated to be $167,609,640. It is estimated that the major proportion of these expenditures were for additions to existing structures, rather than for construction of entirely new and complete facilities. However, there has been a trend toward development of more diversified institutional approaches to the treatment of juvenile delinquents during the 1953–64 period. The newer facilities which have been built have tended to be more of the forestry camp and reception-diagnostic center type of institution, rather than the training school type. Training schools tended more to build additions to existing institutional complexes. Information concerning capital expenditures of voluntary institutions is not available.

TABLE 10.—*Annual expenditure, per capita operating*[1] *and capital expenditures of public institutions for delinquent children, 1953–64. (Selected years)*

Year	Total number of institutions	Number reporting institutions	All expenditures[2]	Operating-maintenance expenditures	Capital expenditures	Average daily population	Average per capita operating expenditures	Average per institution capital expenditure[3]
1953	129	107	$46,958,524	$36,565,690	$10,393,834	18,421	$1,985	$97,130
1956	175	139	59,150,000	51,460,500	7,689,500	27,184	1,893	55,320
1958	213	162	75,718,600	63,698,400	12,020,200	29,561	2,155	74,190
1962	230	226	119,083,472	101,629,074	17,454,398	38,722	2,625	77,230
1963	235	230	119,663,892	108,272,905	11,390,987	39,231	2,760	49,520
1964	274	245	128,633,130	117,566,659	11,066,471	38,924	3,020	47,610

[1] Per capita operating expenditure for each institution was computed by dividing the total of operating-maintenance expenditures by the average daily population.
[2] Based only on expenditures of reporting institutions for each year.
[3] 1953–64 average annual capital expenditure per institution is $66,830.

Source: *Statistics on Public Institutions Serving Delinquent Children*, Children's Bureau Statistical Series, 1953–64.

The only national data available on the extent of capital outlays for other child-caring institutions are preliminary estimates, prepared in advance of the report of a national survey, and, therefore, subject to subsequent revision.[20] These estimates pertain primarily to institutions for seven or more children in these categories: Maternity homes for unmarried girls; institutions for dependent and neglected children, institutions for (pre-)delinquents, including detention homes; and institutions for emotionally disturbed children. Data on which the estimates are based were reported by public, voluntary, and proprietary institutions.

Data on capital expenditures during the 1960's for new construction and for remodeling from a sample of 181 places were projected to the

[20] The survey is being conducted by the Center for Urban Studies, University of Chicago, *Project on Physical Facilities for Group Care of Children*. Indebtedness to Dr. Donnell M. Pappenfort, project director, for providing the advance estimates is hereby acknowledged.

national total of 1,972 institutions in the categories mentioned above. During the 1960's the national estimate of capital outlays for remoleding of such institutions is $71.5 million, and for new construction, $319.4 million. The estimated total of capital outlays, rounded off, is $390.8 million. (The survey data do not specify components of cost such as land acquisition, site development, built-in and movable equipment and furnishings.)

2. OWNERSHIP PATTERN OF CAPITAL OUTLAYS

(i) Auspices of capital expenditures for detention are estimated by detention consultants to have been as follows: 15 percent, State; 85 percent, city-county.

(ii) It is estimated [21] that about 90 percent of the capital expenditures for juvenile deliquents during the years 1953–64 were made by State governments and that about 10 percent were made by cities and/or counties. The proportionate amounts of capital expenditures by voluntary and proprietary institutions serving delinquent children are not available.

(iii) National statistics for the other child welfare institutions are not available. It is estimated by the Children's Bureau specialist that the largest proportion of capital outlays have been made by private nonprofit organizations. State and local governments have made a smaller outlay. Proprietary organizations have made the smallest capital outlay.

3. SOURCES OF FINANCING

(i) Large detention homes probably were financed by the issuance of bonds by local governmental bodies or States; small homes probably were financed from general tax sources.

(ii) The general pattern nationally in financing capital expenditures by States for institutions such as those for delinquent children is through the issuance of bonds. There are reportedly only a few States or local governments which use the general fund for capital costs of public institutions.

(iii) Statistics on other child welfare institutions are not available on sources for financing.

The largest sources of financing for voluntary institutions have been bequests, donations, and fundraising drives. The largest source of financing for public institutions has been bond issues, according to Children's Bureau information. There are no Federal grants or loans available for financing construction of these institutions.

D. Needs and Prospective Capital Outlays

1. DETENTION HOMES

(*a*) *Factors used in estimating and projecting detention home requirements.*—Unmet needs, need for rebuilding or remodeling existing homes, projection of number of juvenile court cases and child popula-

[21] Estimates based upon reported capital expenditures by institutions for 6 selected years for the period 1953–64.

tion, ages 10 to 17, in the United States, 1966–75, and increases in construction costs.

Factors considered in estimating current and projected needs for juvenile institutions include obsolescence, overcrowding, quantitative standards, experience factor of previous rate of capital expenditures, number of juvenile court cases, number of children, ages 10 to 17, in the U.S. population, and construction costs.

Benchmark data are not available at present for estimating capital requirements for other child welfare institutions.

According to the Children's Bureau specialists, the estimates of per unit cost and of projected needs are not sufficiently reliable for preparing estimates on a per-year basis.

(*b*) *Needs.*—Detention consultants of the Children's Bureau estimate that 15 detention homes now are needed in States where none exist. They recommend that homes be built in the range of capacity of 20 to 60, or an average capacity of 40. Fifteen detention homes, each with capacities of 40, would include a total of 600 beds; and at an average construction cost of $15,000 per bed would total $9 million.

Detention consultants of the Children's Bureau estimate that 60 detention facilities exist in the United States today which need to be rebuilt or expanded for a variety of reasons (that is, inadequacy, unsafe, nonfunctional, need to be consolidated, and so forth). Sixty detention homes, each with capacities of 40, would include 2,400 beds; and at an average construction cost of $15,000 per bed would total $36 million.

The data in table 11 show projections for the 1966–75 period for both the number of juvenile court cases (excluding traffic) and the U.S. child population, ages 10–17. Projections of the child population are estimates of the Census Bureau. The projections of juvenile court cases are based upon the assumption that the relationship of cases to child population (about 2 percent for the 1962–64 period) will remain constant for the 1966–75 period. Over the next 10 years, an increase of about 11 percent in both child population and number of juvenile court cases is expected. On the assumption that input to juvenile courts will increase by about 11 percent over the 1966–75 period, additional capital needs are estimated to be $4,950,000. Also, an estimated 1966–75 increase in construction costs (based on the Boeckh Construction Cost Index) would require an additional $4,995,000.

Total current and projected capital needs for detention homes, as a minimum estimate which accounts for only a few of the many factors involved, is estimated to be $54,945,000.

2. INSTITUTIONS FOR DELINQUENT CHILDREN

A summary of the estimated current and projected capital expenditure needs for public and private institutions for delinquent children appears in table 12. The estimated current and projected capital need of approximately $503 million represents a reasonable estimate of need made on the basis of available data. Many additional factors which might have been taken into account could not be included

because of the unavailability of information. Also, projections assume certain constancies for the factors which are used as the basis for the projections.

(a) *Obsolescence.*—Table 9 shows that 58 of the total of 276 public institutions for delinquent children were built before 1900. On the assumption that these institutions be declared obsolete and new institutions with capacities of 150 each be built in 1965, a total of 8,700 new beds would need to be provided. Multiplying 8,700 beds by the average construction costs of $15,000 per bed gives a total of $130,500,000 which would be needed.

(b) *Overcrowding.*—In 1964, about 40 percent of the 276 public institutions reported that they were overcrowded (average populations exceeded capacity); this represents 180 institutions which were overcrowded. The degree of overcrowding in these 108 institutions was calculated to average 15 percent, which affected an estimated 2,600 children. To build 2,600 new beds at an average construction cost of $15,000 per bed would cost $39 million.

(c) *Qualitative standard.*—A standard recommended by the Children's Bureau is that institutions serving delinquent children should be built to accommodate not more than 150 children. In order to meet this standard, a minimum of 294 institutions would be needed to house the estimated 44,100 children who were in public institutions for delinquent children in 1964. This is 20 institutions more than were in operation. Twenty institutions, each with capacities of 150, would include a total of 3,000 beds; and 3,000 beds at an average construction cost of $15,000 would cost $45 million.

(d) *Projection of capital expenditures.*—From the data in table 12 the 1953–64 average annual capital expenditures for institutions reporting to the Children's Bureau is computed to be $66,830. Assuming that this average expenditure is appropriate for the 276 operating public institutions for delinquent children in 1965, an annual capital need for $18,445,080 would exist for the 10-year period 1966–75. Total capital needs for these institutions, assuming no change in number of institutions, would be $184,450,800. If the 103 private institutions were to have capital needs estimated at $33,415 each annually (50 percent of public needs), the total annual capital needs of private institutions would be $3,441,745; the 1966–75 total need would be $34,417,450.

The data in table 11 show projections for the 1966–75 period for both the number of juvenile court cases (excluding traffic) and the U.S. child population, ages 10–17. The projections of child population in the table are based upon Bureau of Census reports, and the projections of juvenile court cases are based upon the assumption that the relationship of cases to child population (about 2 percent for the 1962–64 period) will remain constant. During the 1966–75 period, an increase of about 11 percent both in child population and in number of juvenile court cases is expected. On the assumption that input to institutions will be increased by about 11 percent over the 1966–75 period, additional capital needs are estimated to be $20,289,588 for public institutions, and $3,785,920 for private institu-

tions. Finally, an estimated $45,744,376 will be needed during the period for increased construction costs. (Boeckh Construction Cost Index.)

3. NEEDS: BY SIZE OF COMMUNITY

(i) All of the estimated needs for detention homes pertain to cities in excess of 50,000 population. (Consultants recommend that detention homes be built in areas of 250,000 population or more.)

(ii) The Children's Bureau has recommended that institutions for delinquent children be built near cities large enough to supply the medical, personnel, and other types of needs deemed necessary for effective operation of the institution. To the extent that these standards are followed, capital needs will be greatest in cities with populations of 50,000 or more.

4. NEEDS: ACCORDING TO OWNERSHIP PATTERN

(i) Although the past trend has been for city-county governmental units to build detention homes, there is a new and increasing trend toward State planning and development of statewide regional detention facilities. During the next 10 years, therefore, we would expect a large proportion of the capital expenditures for these institutions to be by State governments.

(ii) Proportions of estimated capital need for juvenile delinquency institutions by auspices, are: State, 50 percent; city-county, 20 percent; voluntary, 25 percent; and proprietary, 5 percent.

TABLE 11.—*Projection of juvenile court cases and child population (10 to 17 years of age), 1965–75*

Year	Juvenile court cases [1] (excluding traffic)	U.S. child population [2] (ages 10 to 17)	Percent case of population
1957	440,000	22,351,000	0.0197
1958	433,000	23,496,000	.0201
1959	483,000	24,531,000	.0197
1960	510,000	25,364,000	.0201
1961	503,000	26,023,000	.0193
1962	555,000	26,936,000	.0206
1963	601,000	27,983,000	.0214
1964	686,000	29,119,000	.0236
1965	643,225	29,371,000	[3].0219
1966	655,379	29,926,000	.0219
1967	667,534	30,481,000	.0219
1968	679,688	31,036,000	.0219
1969	691,843	31,591,000	.0219
1970	704,019	32,147,000	.0219
1971	708,925	32,371,000	.0219
1972	713,831	32,595,000	.0219
1973	718,736	32,819,000	.0219
1974	723,642	33,043,000	.0219
1975	728,504	33,265,000	.0219

[1] *Juvenile Court Statistics—1964*, Children's Bureau Statistical Series No. 79, Department of Health, Education, and Welfare, 1965.

[2] *Population Estimates, Current Population Reports*, series P-25, Nos. 286, 326, Bureau of Census, U.S. Department of Commerce.

[3] 1962–64 average, projected to 1965–75.

TABLE 12.—*Summary of estimated capital needs for public and private institutions for delinquent children*

Public institutions:	
Current needs (1965):	
1. To rebuild because of obsolescence	$130, 500, 00
2. To relieve overcrowding	39, 000, 000
3. To meet capacity standard	45, 000, 000
Total for current needs	214, 500, 000
Projected needs (1966–75):	
1. Based on 1953–64 capital expenditures	184, 450, 080
2. Based on expected increased input	20, 289, 588
Total projected needs	204, 740, 388
Total public capital needs	419, 240, 388
Private institutions:	
Current needs (1965)	(1)
Projected needs (1966–75):	
1. Based on estimated prior capital expenditures	34, 417, 450
2. Based on expected increased input	3, 785, 920
Total projected needs	38, 203, 370
Total private capital needs	38, 203, 370
Total of public and private capital needs	457, 443, 758
Additional allowance of 10 percent for estimated average increase in construction costs	45, 744, 376
Grand total	503, 188, 134

[1] Unknown.

CHAPTER 38

Armories*

A. NATURE AND COMPOSITION OF ARMORIES

1. DESCRIPTION OF FACILITIES

Armories are described in following terms:

(a) *General Physical Characteristics*

An "armory" is a primary structure that houses one or more units and equipment of the Reserve components and is used for training and administration of such units. It includes a structure that is appurtenant to such primary facility and houses equipment used for the training and administration of the units assigned. It is restricted to a facility designed for home station training. These facilities are called "armories" by common usage when used by the Army National Guard. A similar-type structure is used by the U.S. Army Reserve and is referred to as a "Reserve center." An armory facility normally includes the following essential functional areas under existing criteria: (1) assembly hall, (2) rifle range, (3) classrooms, (4) training aid storage room, (5) library and classroom, (6) unit storage, (7) arms vault, (8) locker room, (9) administrative offices, (10) kitchen, (11) toilet and showers, (12) maintenance and custodial, (13) mechanical equipment room, (14) minimal parking facilities for military and civilian parking.

(b) *Services*

An armory structure is often used for many varied functions and activities other than the normal training of the Army National Guard units stationed therein. Armories are managed and controlled by the State military authorities. Under such rules and regulations as prescribed by such authorities, the armories may be utilized as community buildings for athletic events, social functions, civic use, and assembly areas in support of civil authorities in event of national disaster. The primary service these buildings provide the communities in which they are located is to house and train the Reserve component units and provide a means by which the young men of military age may fulfill their military obligations at home.

(c) *Standard of Performance by Capacity and Quantity*

Prior to the enactment of the National Defense Facilities Act of 1950, the States provided armory facilities at their own cost and

*Prepared by Control Branch, Installations Division, National Guard Bureau, Lt. Col. Morris E. Foist, Chief, NG–ARIC, Department of the Army, Department of Defense, with minor editing by committee staff.

used their individual criteria for armory construction. Federal funds have been available for construction of armories since 1952. The Federal space criteria and construction standards for construction of armory facilities for the Army National Guard have been modified several times since the program was initiated. In January 1956, the Department of Defense approved new revised space criteria for Army National Guard armories. These criteria indicate the maximum space allowances for specific functional areas for which Federal contributions may be made in the support of new armory construction. Federal funds may be contributed to a State toward construction of Army National Guard armories in amounts up to 75 percent of the cost of construction, calculated according to approved Federal space criteria and construction standards. The space requirements for functional areas within an armory and the total armory space to be allowed for Federal contributions are based upon the type and composition of the unit and/or units to be supported in the facility. Armory criteria as approved by Department of Defense are determined primarily on a unit rather than a per capita basis.

(d) *Qualitative Standards of Performance*

Armories are designed to have a degree of structural adequacy, durability, and serviceability to assure a useful life of 25 years or more under low maintenance and expenditures. New armory facilities provided under Federal criteria will be of permanent-type construction. Standardized plans, specifications, space criteria and construction standards in accordance with Federal regulations shall be devised and used to the maximum extent practicable in the acquisition of such facilities with Federal funds.

Each armory project toward which a contribution is granted by the Federal Government shall be covered by an appropriate agreement between the United States and the State. The State and Federal agreement for each armory constructed covers a period of 25 years. This use agreement provides that the State must maintain and preserve the facility for the life of the agreement, and likewise provides specific protective use and disposition of the facility for the needs of the Federal Government as dictated by training needs of Reserve components, national emergency, or any other use deemed a requirement by the Federal Government.

In order to qualify for construction, the State must provide the land and the required matching funds equal to 25 percent of the federally supported items for proposed construction. Each armory or facility has a prescribed authorized strength and actual construction will not be started until the actual strength is a minimum of 75 percent of authorized strength or design capacity of the proposed armory. Likewise, armories will not be provided at Federal expense at a location which has a unilateral actual strength of less than 55, or a combined (joint) actual strength of less than 100.

A time frame for a proposed ordinary replacement cycle is not appropriate for armory construction as the federally supported program has not been in existence for a sufficient number of years to provide data upon which to base an appropriate comment.

2. EXISTING CAPITAL PLANT IN THE UNITED STATES

(a) *Number of Facilities*

As of February 28, 1966, the Army National Guard (ARNG) had a total of 2,786 armory facilities in existence or operation throughout the 50 States, Puerto Rico, and District of Columbia.

(b) *Distribution by States*

A distribution of all Armory (ARNG) facilities for the 50 States, Puerto Rico, and District of Columbia is shown below:

State and number

Alabama	139	Louisiana	46	Ohio	99
Alaska	73	Maine	25	Oklahoma	81
Arizona	23	Maryland	39	Oregon	42
Arkansas	76	Massachusetts	74	Pennsylvania	107
California	128	Michigan	55	Puerto Rico	25
Colorado	24	Minnesota	68	Rhode Island	13
Connecticut	33	Mississippi	106	South Carolina	77
Delaware	14	Missouri	58	South Dakota	43
District of Columbia	2	Montana	25	Tennessee	75
Florida	51	Nebraska	30	Texas	152
Georgia	70	Nevada	10	Utah	28
Hawaii	22	New Hampshire	22	Vermont	27
Idaho	32	New Jersey	51	Virginia	48
Illinois	48	New Mexico	28	Washington	31
Indiana	72	New York	87	West Virginia	30
Iowa	56	North Carolina	98	Wisconsin	72
Kansas	64	North Dakota	29	Wyoming	21
Kentucky	37				

(c) *Distribution by Size of City*

The distribution of armory facilities by population size of city follows:

500,000 or more	80
100,000–499,999	186
50,000–99,999	157
10,000–49,999	836
2,500–9,999	1,067
Under 2,500	460
Total	2,786

(d) *Age of Facilities*

The age distribution of armory facilities is identified below:

Built before 1900	57
During 1901–20	237
During 1921–40	553
During 1941–60	1,419
Since 1961	420
Age unknown	100
Total	2,786

(e) *Ownership*

Of the 2,786 armory facilities in operation by the Army National Guard the ownership is shown by following categories:

(1) State governments or State agencies	2, 584
(2) Cities, counties, towns, special districts, public authorities, or other local public bodies	[1]
(3) Private, nonprofit organizations and cooperatives	[1]
(4) Proprietary or profitmaking organizations	143
(5) Federal Government (licensed facilities)	59
Total	[2] 2, 786

[1] Not applicable.
[2] Armory facilities are normally classified by ownership or source as follows:

(1) Public Law 783 (State-owned structures—contracted under provisions of title 10, United States Code)	1, 392
(2) State owned	1, 192
(3) Leased	143
(4) Licensed	59
Total	2, 786

(f) *Current Value*

The estimated current value of these facilities and structures is not available.

B. Costs and User Charges

1. CONSTRUCTION AND OPERATING COSTS

(a) *Construction Costs*

Experience of construction costs for the Army National Guard Armory Complex, based on gross square footage, of projects contracted during fiscal years 1963, 1964, and 1965 are as shown:

Size of armory:	*Gross square footag cost range*
1-unit armory	$7 to $20.
2-unit armory	$9 to $16.
3-unit armory and larger	$8 to $17.

(b) *Operating Costs*

The current range per net square foot of typical annual maintenance and operation expenses for Army National Guard (ARNG) armory facilities is shown below:

Low	$0. 14
High	1. 20
Average	0. 47

2. USER CHARGES

(a) The extent to which user charges are employed to support the use of occupancy of these facilities is impossible to determine because of the many diverse methods employed in this respect.

(b) Information is not available due to the many diversified methods of accounting employed by the various States and individual armory boards throughout the Nation. It is extremely unlikely that any user charges would be used to cover payment on the indebtedness incurred to finance the capital costs of the facilities or structures as the States must certify that adequate State "matching funds" are available to support construction prior to programing of new facilities.

(c) Costs of construction, operation, and maintenance of armory facilities are normally provided under specific appropriations by the

State legislature and revenue is normally obtained from general tax resources. An exception to this rule may incur in a few isolated instances but detailed information is not available.

C. Trend of Capital Outlays

1. ANNUAL CAPITAL EXPENDITURES

The trend of annual capital outlays in terms of contract awards for State controlled armory complexes during the 20-year period 1946–65 in terms of numbers of units and dollar value (in millions of dollars) indicates extreme lows in the first 2 years (1946–47) with only one start in 1946 at $400,000 and no starts in 1947, and a return to an extreme low at the end of the 20-year period in fiscal year 1965 by having only three armory starts at a total cost of $1.3 million. There was a gradual increase during the first 5 years (1946–51) both in numbers of projects and in dollars. The project starts increased from 1 project in 1946 to 32 in 1950 and 31 in 1951. The cost of all projects placed under contract increased from the low of $400,000 in 1946 to a high of $4.5 million in 1951. There was a dip in construction in 1952 to only 14 projects with a total cost of $2.3 million. All armory projects constructed during the period 1946 through 1952 were constructed at 100 percent State cost with the exception of one facility purchased at Sitka, Alaska, in 1952 with $9,000 Federal and $3,000 State funds.

The period of greatest progress in providing new facilities for the Army National Guard began in 1953 and extended into fiscal year 1957. The number of new starts increased from 73 in 1953 to a peak of 252 in 1956 which slipped to 199 in 1957. The cost of new starts for armory construction jumped from $11.5 million in fiscal year 1953 to a peak of $39.1 million in fiscal year 1957.

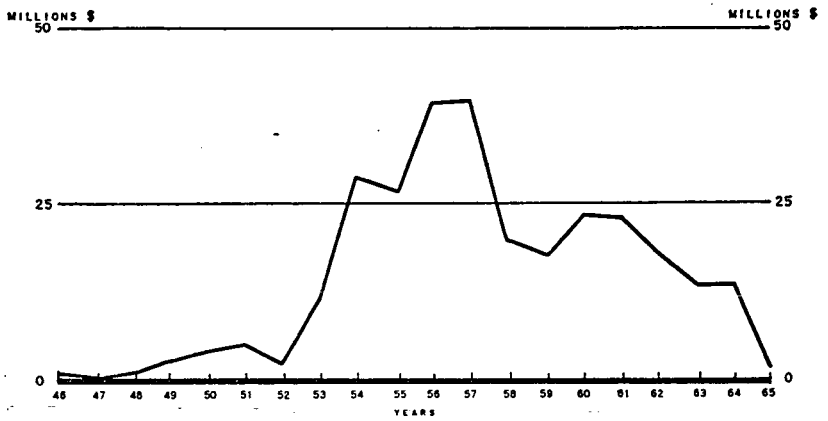
The years 1958–65 show a continual decline in providing new facilities. In fiscal years 1958–59, there was a sharp reduction in new armory starts to a 1959 low of 74 projects and $17.1 million. There was a slight increase in 1960 to a level of $23 million for both fiscal years 1960 and 1961. A drop of approximately $5 million per year for next 2 years (1962 and 1963) and a leveling off for 1964 with a drop to a low of $1.3 million in fiscal year 1965.

(*a*) The gradual increase in providing new armory facilities with State funding has been shown for the years 1948 through 1951, which was followed by a drop in construction for 1952. The decline in 1952 was a result of initiating the new federally financed program that was to get underway in 1953. The new Federal program that provides 75 percent of the qualifying financing for armory construction began in 1953 and this caused an increase in projects and dollars for the armory program. The program was extremely active during the first 5 years, 1953 through 1957, and each year had shown an increase in dollars and projects being placed into the armory assets throughout the Nation. The program reached its peak in fiscal year 1957 and has declined continuously since then to a deferral of all construction in 1966.

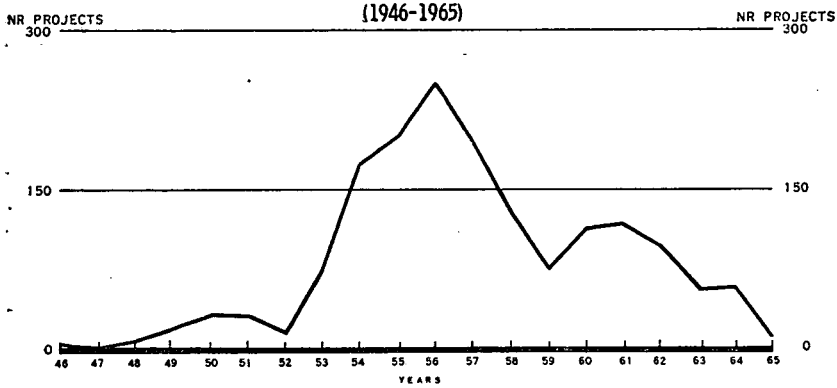
The increase of construction from 1953 to 1957 was a result of congressional authorizations and appropriations being provided to

ARMY NATIONAL GUARD

TREND of ANNUAL CAPITOL OUTLAYS
for
ARMORY CONTRACT AWARDS by DOLLAR VALUE
(1946-1965)
(in millions of dollars)



TREND of ARMORY CONSTRUCTION
BY NUMBERS of PROJECTS
(1946-1965)



assist in the construction programs of the various States. The decrease in the program from 1957 through 1965 was a result of a reduction of congressional appropriations and authorizations being provided for this purpose.

2. DISTRIBUTION BY SPENDING UNITS

Of the total annual capital outlays for contract awards for State controlled Armory Complexes during the 20-year period 1946–65, the following proportions of capital outlays were accounted for as shown below:

(*a*) State governments or State agencies: 33 percent.

(1) The State governments provided 100 percent of the cost of armory construction from 1946 through 1952 except for the purchase

of an armory at Sitka, Alaska, in 1952 at $9,000 Federal and $3,000 State cost.

(2) From 1952 through 1965 the State governments have provided 33 percent of the capital outlay for armory construction.

(*b*) Cities, counties, towns, special districts, public authorities, or other public bodies: Unknown. Detailed information on amounts of funds provided for armory construction by these agencies is not available. In general, these public bodies contribute land for construction of armory facilities and do not normally provide funds for actual construction. In a few isolated instances, exact number not available, the cities have contributed to the State a portion of the construction cost.

(*c*) Private, nonprofit organizations and cooperatives: Unknown.

(1) These groups do provide funds for furnishing dayrooms and library facilities within the armory structures. Normally, funds for construction are provided by the State legislature and not by private subscription.

(2) Information on those isolated cases where funds may have been contributed for construction purposes is not available.

(*d*) Federal Government: 67 percent. The Federal Government has contributed approximately 67 percent of the capital outlays for armory construction from 1952 through 1965. This percentage is an average participation by the Federal Government in all new armory starts since the beginning of the construction program in 1952. For individual armory construction, the Federal funding support may vary from a maximum of 75 percent to less than 50 percent in those cases where the State may have constructed in excess of the space or standards provided for under Federal regulations.

3. SOURCES OF FINANCING

The sources of financing for capital outlays are identified as follows:

(*a*) Appropriations from State tax resources (average): 33 percent.

(*b*) Gifts, bequests, donations, fund-raising drives: Percent unknown.

(1) Funds from these sources are occasionally obtained for possible purchasing of land and used in purchasing recreational items and furnishings for the new armory buildings.

(2) Such funds are normally not considered as being made available for cost of construction.

(*c*) Federal Government grant assistance (average): 67 percent.

(1) The National Defense Facilities Act of 1950 (Public Law 783, 81st Cong.), provides that the Secretary of Defense may contribute 100 percent (75 percent in the case of an armory constructed pursuant to certain regulations) of the cost of constructing, expanding or rehabilitating a facility for the Reserve components. In situations where Federal contribution is limited to 75 percent, funds in support of the remaining costs are the responsibility of the State. Under this program of contribution, the facility is located on State-owned or State-controlled land; thus the title to the facility is vested in the

State. Prior to the contribution of any Federal funds, an agreement delineating the conditions under which the contribution is made, is entered into between the Federal Government and the State.

(2) The 67 percent capital outlay shown is the average amount actually contributed by the Federal Government in the overall cost of armories provided under this program. Many items are often included in State construction contracts that are not provided by Federal criteria and are paid for at 100 percent State cost. A few States are continually providing armories at 100 percent State cost. Many States construct facilities in the proportions of 25 percent State and 75 percent Federal funds as provided for under the law.

(*d*) Tax-exempt municipal bond market (for public bodies): Percent unknown.

(1) As a general rule, the States provide funds for construction from State tax revenue and therefore the tax exempt municipal bond market would not apply. The States certify that State "matching funds" are available to support construction prior to the programing of new construction.

(2) In special cases State armories may be provided from funds made available from such sources but such data is not a matter of record and is not available.

D. Needs and Prospective Capital Outlays

1. CAPITAL REQUIREMENTS

The capital requirements (in millions of dollars) for these armory facilities or structures during the decade 1965–75 would amount to $144.5 million, which based upon planned application of normal yearly authorized programs would require $108.4 million Federal funds. (75 percent) and $36.1 million State "matching funds" (25 percent).

(*a*) Based upon a total foreseeable requirement study of armory facilities as of June 30, 1964, the Federal cost of providing new armory facilities was estimated at $148.7 million. In consideration of the States' providing "matching funds" (25 percent) in the amount of $49.6 million, the total capital requirement would be $198.3 million. This construction program contemplated the need for the construction of a total of 996 armory projects to include 745 new armories, and 251 alterations, expansions, additions, rehabilitation and conversion projects. Approximately 36 percent of the units are now housed in facilities that are substandard or will become substandard in the foreseeable future due to the anticipated deterioration and obsolescence of existing facilities. At the anticipated level of budgeting, as shown in the yearly increments below, it will require approximately 13 years to complete the armory program based upon the above specified requirements. This projection of capital requirements for the decade 1965–75 is based on anticipation of authorizations and appropriations to be provided by congressional authorities.

(*b*) The capital requirements (in millions of dollars) that are anticipated to be provided for armory construction on a per year basis during the decade 1966–75 are shown below:

[In millions of dollars]

Year	Federal cost	State cost	Total
1966	11.5	3.8	15.3
1967	5.7	1.9	7.6
1968	11.4	3.8	15.2
1969	11.4	3.8	15.2
1970	11 4	3.8	15.2
1971	11.4	3.8	15.2
1972	11.4	3.8	15.2
1973	11.4	3.8	15.2
1974	11.4	3.8	15.2
1975	11.4	3.8	15.2
Total	108.4	36.1	144.5
Percentage	75	25	100

(*c*) The percentage or proportion of these estimated needs may be ascribed to the following population categories:

(1) Cities with population of 50,000 or more: 14 percent.

(2) Cities and towns with population 2,500 to 49,999: 71 percent.

(3) Agricultural rural areas, cities, and towns with population under 2,500: 15 percent.

(*d*) The proportions of the estimated capital outlays expected to be expended by source are as shown:

(1) State governments or State agencies: 25 percent.

(2) Federal Government: 75 percent.

2. EXPECTED SOURCES OF FINANCING

The expected sources of financing for these prospective capital outlays by percentage distribution based upon projected trends and emerging developments are indicated below:

(a) Federal Government grant assistance (new program): 75 percent.

(*b*) Appropriations from tax resources: 25 percent.

The total foreseeable armory requirements amount to $198.3 million and the projected armory requirements for the decade 1966–75 amount to $144.5 million. This would produce a shortfall in the entire program of approximately $40 million, which would require the extension of the program for a 3-to-4-year period at the same level as the projected decade. Under an extension of the program for an additional number of years, the funds would be supplied on the same basis as the projected program which allowed for 75 percent Federal and 25 percent State funding.

In consideration that the capital requirements for the decade 1966–75 exceed the funds provided for such purpose, then such shortfalls or gaps would be bridged by increasing Federal appropriations in the year or years following the shortfall. In the event Federal appropriations and authorizations are not available to bridge the gap or shortfall then the older, dilapidated, obsolete, inadequate facilities would be continued in use.

CHAPTER 39

Jails and Prisons*

PART I. JAILS

INTRODUCTION

There are few reports of any kind on a statewide basis prepared on jails. The lack of information in this area is due in large part to the difficulty in collecting it. There are only 13 States which have a State jail inspection service, a large percentage of these providing service in name only. In some States even the number and location of jails is unknown. With the exception of one Bureau of the Census report providing an age, sex, and race breakdown on jail inmates on April 1, 1960, there are little or no data available on the numbers or kinds of people confined in jails. Accurate statistical data can be tabulated for the most part only on an institution by institution basis and there are almost no resources available to accomplish this. If these difficulties were not enough, the tremendous variations in administration between jails makes it impossible to develop much data with valid comparability from jail to jail or State to State.

Because of the general limitations listed above, this study is based on questionnaires submitted by the Federal jail inspectors of the Federal Bureau of Prisons who are each responsible for geographic areas from 4 to 11 States, and from the few pieces of State-published data which was made available to us.

A. NATURE AND COMPOSITION OF JAILS

Jails are facilities for housing prisoners serving short sentences of usually less than a year, prisoners awaiting trial, hearing or grand jury action, and convicted offenders awaiting transfer to State correctional institutions. According to the 1960 census report mentioned above, there were on April 1, 1960, 119,992 inmates of local jails and workhouses. Of this total, 7,805 were female. With regard to age, approximately 600 were under 15 years old; about 12,500 were age 15 through 19; 21,000 were age 20 to 24; almost 17,000 were 25 through 29; over 42,000 were 30 through 44; and 26,000 were over 45 years old. As to racial breakdown, 74,000 were white and 46,000 nonwhite.

On an average day there are 3,000 to 3,500 pretrial Federal offenders held in local jails in the United States.

In one Midwestern State for which figures were available, almost 40 percent of those persons held in jails were for minor offenses such as vagrancy, drunkenness, disturbing the peace, and traffic offenses. In some cities in this State 96 percent of those held were for these

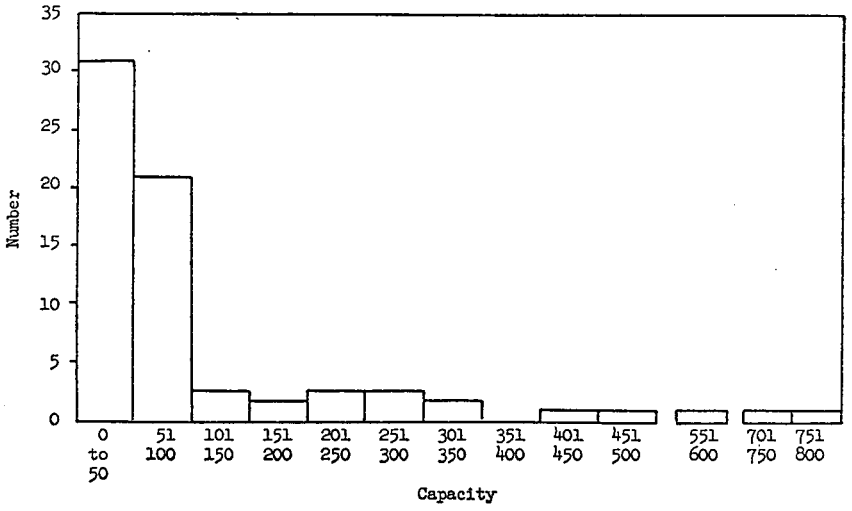
*Prepared by Federal Bureau of Prisons, Research and Statistics Branch, Department of Justice, with minor editing by committee staff.

offenses. The largest single-offense group in the jails of this State was being held for drunkenness. Average time served in jail on any particular admission is estimated as 5 to 60 days and will vary this much from jurisdiction to jurisdiction.

1. CHARACTERISTICS OF JAIL FACILITIES

Jails range in size from 1-cell units to a 4,000-man institution in Log Angeles, Calif. A variety of living arrangements are possible, depending primarily on security requirements. The extremes range from single-man cells providing the closest possible security for potentially dangerous inmates to open dormitories housing 40 to 80 men serving short sentences for misdemeanors. The Federal jail inspector survey of jail construction, which provided data on 73 new jails built during the past 5 years, showed that they range in size from small institutions constructed to handle as few as 2 men, to institutions as large as 3,300. The average capacity of these institutions is 56 (see fig. 1 for a graphic presentation of this distribution). Most jails with a capacity of over 25 have both close security quarters arrangements and multiman quarters of lesser security.

FIGURE 1 - CAPACITY DISTRIBUTION OF 73 JAILS CONSTRUCTED 1961-1965



Almost all jails have kitchen facilities. In very small jails the wife of the sheriff may prepare meals in her own kitchen, whereas a very few small jails may receive food from local restaurants.

Virtually all jails have modern toilet facilities, usually located in the living quarters; however, in some older jails they are located outside the quarters themselves. Although shower facilities are usually available in jails, not infrequently these facilities are very inadequate to the demands made on them. Federal standards require 1 shower head for 14 men; most jails fail to meet this standard. In

addition, very few jails provide infirmaries, chapels, recreation or educational facilities.

FIGURE 2.—*Percentage of jails constructed during various periods for geographical area reported*

Region or State	Number of jails	Period of construction				
		Percent before 1900	Percent 1901–20	Percent 1921–40	Percent 1941–60	Percent since 1961
All	622	23.1	19.1	22.3	22.3	13.0
North Carolina, Ohio, Michigan, Virginia	108	12.0	15.7	24.0	32.4	15.7
Arkansas, Texas, Oklahoma	98	6.1	25.5	33.6	23.4	11.2
Missouri, Kentucky, Indiana, Illinois	94	18.0	27.6	27.6	20.2	6.3
Wisconsin	71	11.2	14.0	18.3	33.8	22.5
Pennsylvania	70	74.2	7.1	5.7	5.7	7.1
California, Nevada, Utah	69	2.8	21.7	20.2	31.8	23.1
New York	32	3.1	25.0	37.5	15.6	18.7
New Jersey	16	18.7	25.0	25.0	18.7	12.5
Maryland	14	57.1	7.1	7.1	21.4	7.1
Massachusetts	14	78.5	7.1	14.2	----	----
Connecticut	9	88.8	----	----	11.1	----
New Hampshire	8	37.5	50.0	12.5	----	----
Vermont	8	50.0	25.0	12.5	----	----
Maine	7	85.7	----	----	----	14.2
Delaware	3	----	33.3	66.7	----	----
Rhode Island	1	100.0	----	----	----	----

The Federal jail inspectors report covering 622 institutions in 27 States showed that 23 percent of these jails were built before 1900; 19 percent were built between 1901 and 1920; 22 percent were built between 1921 and 1940 and another 22 percent between 1941 and 1960. Thirteen percent of these 622 jails have been built during the past 5 years.

2. EXISTING JAILS

There are approximately 3,050 county jails owned and operated by the county government. The county sheriff ordinarily is in charge of these jails. They are frequently a part of the courthouse structure—often occupying the top floor. There are also 20 to 25 city jails that are part of a civic center and are operated under a metropolitan system of government; examples of these would include Los Angeles, Miami, and Nashville. In a few States, legislatures have authorized regional jails operated jointly by two or more counties. The Minnesota Legislature recently authorized this type of system. Connecticut and Alaska have State-owned and operated jail systems.

Jails offer limited work opportunities for their inmates. For the most part, work is limited to janitorial and maintenance service provided to the jail and courthouse.

There are no data available on staffing patterns of jails but it is well known that jails are generally understaffed and that jail personnel receive very low salaries. Many small jails may be staffed only by the sheriff with some assistance from his wife who does the cooking.

Current Value.—Because some jails are actually a small part of the sheriff's residence at one extreme and at the other extreme a part of a multi-million-dollar civic center, and because almost all jails

everywhere are a part of a structure used for other purposes, there is no adequate way to estimate their dollar value. What price can you place on a 30-man jail in New England built over 150 years ago or any of the other 20 to 25 percent of jails built before 1900? Replacement costs on a per bed basis would give one crude estimate of value.

B. Costs and User Charges

1. CAPITAL COSTS

The costs of new jails vary greatly with size, location, custody requirements and on the basis of its being a free-standing structure or part of a government complex (i.e., civic center, courthouse or sheriff's office). We were told by one company specializing in jail construction that it is possible to build a jail for as little as $1,000 a bed. Federal jail inspectors were able to secure cost figures for 37 jails in 10 States. The average per bed cost of these 37 institutions was $8,930. Per bed costs ranged from $888 for a 250-man addition to the county jail in Oklahoma City to $17,000 for a 38-man jail in Manitowoc County, Wis. (see fig. 3 for cost distribution by capacity). In some instances these cost figures included the total cost of the structure which served other government functions in addition to the jail. Although this greatly limits the quality of these cost figures, it is estimated by the only experts in this area—the Federal jail inspectors—that real per bed construction costs for jails probably average from $6,000 to $9,000.

FIGURE 3.—*Average per bed cost for 37 jails of varying capacity built 1961–65*

Capacity	Number of jails	Average cost per bed
Total	37	$8,931
0 to 50	19	9,793
51 to 100	6	8,842
101 to 150	2	6,541
151 to 200	2	13,381
201 to 250	2	2,118
251 to 300	1	6,836
301 to 350	2	8,698
551 to 600	1	6,696
751 to 800	1	8,312
1,200 to 1,250	1	8,000

2. USER CHARGES

During fiscal year 1965, the Federal Government paid an overall daily rate of $3.80 for the care of U.S. prisoners confined in jails and other non-Federal institutions. U.S. prisoners were held in jails in every State in the Union, Guam, Puerto Rico, Virgin Islands, and the District of Columbia during 1965. A total of 1,207,024 days of care was provided at a cost to the Federal Government of $4,582,812. Housing and subsistence alone amounted to $4,208,722, or $3.48 per man-day. For medical, dental, and hospital expenses incurred by U.S. prisoners, $374,090 was spent. The per day rates the Federal Government pays for U.S. prisoners confined in jails and other non-Federal institutions are determined by negotiation between the Government and the jail authorities involved. The operating costs

of the jail in large measure determine the rates the Government pays and are therefore a fairly good index of the operating and maintenance costs. A better index is not available because jail operation and maintenance is usually not separated out in county budgets. It is apparent that maintenance costs run very low because wages are low and the inmates perform many of the maintenance functions.

C. Trend of Capital Outlays

There are indications that expenditures for jail construction are increasing at an accelerating rate. Of the 622 jails on which the Federal jail inspectors reported the year constructed, 13 percent were erected in the past 5 years. The Federal Jail Inspection Service of the Bureau of Prisons provides a consultation service to communities planning new jail construction. The numbers of requests for this service have gone up significantly during the past 3 years. In 1963, there were 92 such requests; in 1964 there were 184; and in 1965 there were 250. Although no specific inferences can be drawn from the increased use of this consultation service, it is seen by the Jail Inspection Service as support for their belief that jails are being built in increasing numbers at this time.

Most jails are built by county governments which use tax-exempt municipal bonds as the usual source of financing jail construction. Appropriations from tax resources finance jail construction only in a very few instances.

D. Needs and Prospective Capital Outlays

The need for new jail construction is great. It is indicated that approximately half of the jails in the United States are over 50 years old; 25 to 50 years is the usual lifespan of a jail. The Federal Jail Inspection Service conservatively estimates that one-third of the jails in the United States do not meet the minimum standards set by this service for housing Federal prisoners. The Jail Inspection Service sets nine basic standards in this area including: (1) adequate diet (minimum 2,100 calories); (2) adequate medical service; (3) facilities for separating felons, juveniles, misdemeanants and females; (4) adequate sanitation; (5) control and discipline; and (6) management.

As the majority of jails are obsolete, longstanding unmet needs in the area of jail construction are the most important factors in the capital outlays now required to provide these facilities. In some instances new programs much similar to the Huber Law in Wisconsin, which permits certain jail inmates to work in civilian jobs in the community by day and return to jail at night, have required new and different types of facilities than have been traditionally available in jails. Finally, population growth is seen as a factor accounting for the capital requirements in this area.

Since jails in metropolitan areas are most overcrowded, the need for new facilities in almost every high-population area is critical. Even where localities have attempted to meet their needs for jail construction, they have found their new facilities overcrowded as soon as they have begun operation. Because jails in rural and low population areas usually have little problem with overcrowding, little pressure is felt in these areas to replace old and obsolete facilities.

If we assume that 622 jails on which we know the period of construction, are representive of all jails and that the percentages of facilities built during a given period would equal the percentage of the total bed spaces provided, then we can compute the probable capital outlay at $6,000 per bed for the past 5 years as approximately $100 million or $20 million a year.

On the same basis, we can say that if one-half of all jails are obsolete that 60,000 beds are now needed and these would cost $360 million at $6,000 per bed.

If approximately $20 million a year was spent in each of the past 5 years for new jail construction, and jails are being built at an accelerated rate, more than $200 million would probably be spent in this area in the next 10 years.

Jails are being built at an increasing rate which will probably continue as the backlog of unmet needs and the growth of population are putting tremendous pressure on communities to update and expand their jail facilities. This is particularly true in high population areas. Tax-exempt municipal bonds are the usual source of financing jail construction and will probably continue to be the primary source of revenue for building such facilities.

PART II. ADULT FELONY INSTITUTIONS

The second part of this chapter deals exclusively with State adult felony institutions. The information for this report was obtained from the responses to questionnaires sent to the departments of correction in all 50 States and in the District of Columbia. Responses were received from all States with the following exceptions: Alaska, Arkansas, Kansas, Massachusetts, Rhode Island, Utah, and West Virginia; therefore, these States have been excluded from the study.

A. Nature and Composition

1. DESCRIPTION OF FACILITIES

The institutions covered in this study are categorized in terms of the type of security provided. Three general levels of security are used: minimum, medium, and maximum. Minimum custody institutions usually have no fences, walls or towers; they are, in other words, open institutions. Forestry camps, farm camps, and some youth facilities are examples of minimum custody institutions. This type of institution is relatively small, housing 60 to about 300 inmates in dormitories, and at times in individual rooms, as opposed to cells. First offenders, young offenders, and relatively minor offenders with short sentences are confined in minimum custody institutions.

Medium custody institutions usually have a capacity of 300 to 800. They provide a variety of housing arrangements, consisting of dormitories and one- or two-man cells. These institutions are surrounded by fences, and have guard towers placed at strategic points to maintain security. Reformatories and houses of correction are examples of medium security institutions. This type of institution serves a heterogeneous group of inmates with prior records, varying sentence lengths and kinds of offenses.

Differing from the other institutional types in the intensity of its security, the maximum custody institutions are double fenced or walled facilities, with guard towers that provide full coverage of the perimeter, providing very tight internal and external security. Cells of varying sizes are the typical housing arrangements in close custody institutions. The institutions are usually large, with capacities ranging from 500 to 3,000. They are designed for long-term, serious offenders with extensive prior records, considered dangerous to society. Individuals requiring maximum control who are over 25 years old and have a history of assaultive behavior or an escape record in institutions of lesser security are placed in this type of institution.

For the purposes of this study, the data on States have been grouped in the following manner: by estimated civilian population, by prisoners confined in State institutions and by geographical region—Northeastern, North Central, Southern and Western. The Northeastern region consists of: Maine, New Hampshire, Vermont, Connecticut, New York, New Jersey, and Pennsylvania. Included in the North Central region are: Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, and Nebraska. Making up the Southern region are: Delaware, Maryland, the District of Columbia, Virginia, North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Alabama, Mississippi, Louisiana, Oklahoma, and Texas. Finally, the Western region consists of: Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Nevada, Washington, Oregon, California, and Hawaii. As mentioned earlier, Massachusetts, Rhode Island, Kansas, Arkansas, West Virginia, Utah, and Alaska were excluded from the study due to the fact that they did not respond to the questionnaire.

We have combined the data by State into two population groups, that of estimated civilian population and confined prison population, and have obtained the rate of prisoners confined per 100,000 of the estimated civilian population. The estimated civilian population is that reported by the Census Bureau as of July 1, 1964, while the confined prisoner population is that reported by the national prisoner statistics program as of December 31, 1964. As seen in table 1, the States with a larger civilian population, in general, have larger confined prisoner rates than do the States with a smaller civilian population. For the States with populations of 10 million or more, the confined prisoner rate is 108.9 per 100,000; those States in the 4 million to 10 million group have a 105.3 rate. For the States having a civilian population of 2 to 3 million, 500,000 to 1 million, and under 500,000, the rates were 90.1, 89.4 and 83.4 respectively. The only exception to this trend was the population group with 1 to 2 million, which had a confined prisoner rate of 112.7. In addition to the foregoing, there were other exceptions within the civilian population groups. For example, among the States with larger populations, Pennsylvania had a confined prisoner rate of 67.0; New Jersey had one of only 69.6; Wisconsin had one of 69.3; and Minnesota had one of 53.0. Among the smaller States—3 million and under—Oklahoma had a confined prisoner rate of 115.5; Colorado had one of 138.4; and Nevada had one of 112.5. Although the District of Columbia had the highest rate with 208.2 prisoners confined per 100,000 population, this figure may not be

equitable with those of other States since the District is entirely urban, whereas the States have both rural and urban elements making up the population.

With regard to region, the West had the highest confined prisoner rate—131.9, followed by the South, North Central and Northeast regions with rates of 119.1, 90.3 and 80.7 respectively.

2. EXISTING CORRECTIONAL INSTITUTIONS

Excluding nonrespondent States, the number of State adult felony institutions in existence as of 1965 was 279. As seen in table 2, the States with larger civilian populations have the largest number of correctional institutions. One hundred ninety-five, or almost 70 percent of these institutions have been built by States with a civilian population of 4 million or more. This must be qualified, however, by noting that North Carolina has built 75, or 57.7 percent of the 130 institutions in the 4 to 10 million population group. As for the regional breakdown, the South, with 147 or 52.7 percent of the total has built the greatest number, although it must be mentioned once again that North Carolina built 75 of these.

Most of these institutions were found to be 25 years of age or older. Table 2 shows that of the 279 institutions, 187 or 67 percent were built prior to 1941. This trend is seen in all State population groups with the exception of the one in the 2 to 3 million range, which shows that 8 of their 23 institutions were built since 1961. Regionally, the institutions in the States comprising the Northeast, North Central, South and the West have tended to be over 25 years old.

The States with large confined prisoner populations have tended to build the greatest proportion of institutions. The States with confined prisoner populations of 3,000 or more have built 215 or 77.1 percent of the 279 institutions.

B. Cost

Because the States reporting presented their operating costs during the period 1963–1965 in various ways on the questionnaire used in this study, it is not possible to present a comprehensive picture of this aspect of their operations. Data are given here only for those States that provided separate figures for each of the last three years.

California's cost figure for 1963, 1964 and 1965 was $5,842,184, $6,380,907 and $7,526,475 respectively. Pennsylvania's appropriation was $16,551,943, $16,716,009 and $17,267,369 for the years 1963–1965 respectively; New Jersey's cost was $8,603,199, $9,504,358 and $9,810,893 for the three year period. Among the smaller States for which we have data for the three year period, Arizona appropriated, for fiscal years 1964–1966, $2,418,735, $3,272,611 and $3,213,847 respectively; Montana, for the years 1963–1965, appropriated $1,451,951, $1,486,784 and $1,525,686 respectively; and South Carolina, for fiscal years 1964–1966 appropriated $1,710,377, $1,871,877 and $1,848,795. The data indicate that States with large civilian populations appropriate more money than do small States; this is natural since larger States have more institutions with a greater confined population than do smaller States and would, therefore,

have greater operational costs. It can also be seen that operational costs have increased for each of these States from 1963 to 1965.

C. Trend of Capital Outlays

Data were obtained on adult correctional institutions constructed over the last 20 years by type of institution, design capacity and capital outlay. Completed data were obtained on only 62 adult correctional institutions built during the last 20 years—i.e., number, capacity, total cost, average cost per bed. Forty of these were minimum-type institutions with a total capacity of 23,170, a cost of $162,091,000 and an average cost per bed of $6,996. Eleven were medium-type institutions with a capacity of 6,945, a total cost of $57,212,000 and an average cost per bed of $8,238. Eight were maximum institutions with a capacity of 8,162, a cost of $32,364,000 and an average cost per bed of $3,965. This figure is undoubtedly atypical of construction costs for maximum security institutions. Considering the States in which these institutions were built—Texas, Florida, North Carolina, South Carolina, and New Mexico—it should be pointed out that in some cases these States used a broader definition of the term "maximum" than is generally accepted; some States used prison labor, lowering construction costs; and some of the institutions were exceedingly small. The foregoing accounts for the apparent disparity in cost figures for this group of institutions as opposed to minimum and medium institutions. Two were medical institutions—one built by California and one by Florida with a combined capacity of 2,872, at a cost of $21,439,000 and an average cost per bed of $7,465. There was one prerelease guidance center constructed in Colorado with a designed capacity of 70, at cost of $250,000 at an average cost per bed of $3,571.

By geographic region, the South has built the most institutions, 27 out of the total of 62; followed by the West with 19, the North Central with 10 and the Northeast with 6. The average cost per bed ranged from a low of $907 for a minimum custody institution in Alabama housing 300 inmates to a high of $22,487 for a youth center housing 300 inmates built in Washington, D.C. Most of the institutions constructed during the last 20 years have been built by States with larger civilian and confined prisoner populations. States with larger populations have, in addition, spent more per bed than have States with smaller populations. A complete breakdown by individual States can be seen by looking at table 3.

In addition to the 62 institutions represented in table 3, there were 4 other institutions constructed during the past 20 years—1 minimum custody institution in Florida, 1 medium custody in Indiana and 2 institutions in Connecticut, 1 minimum and 1 medium, for which no cost figures were available.

Part II of this report is concerned entirely with State owned and operated institutions. These governments appropriated the funds for construction of the institutions built during the last 20 years from tax revenues in all States except the following: California, Illinois, Missouri, and New Mexico, which used bond issues and Maryland which used a general construction loan.

Among the factors cited by the respondents as most important in the last 20 years for the construction of new institutions were growth

in population, obsolete facilities, upsurge in crime, a desire to improve the correctional system, improved economic situation, better segregation of prisoners, implementation of narcotic offender treatment laws, and expanded agricultural programs.

D. Prospective Needs and Capital Outlays

In order to arrive at a prospective capital outlay for 1966–75, two figures were obtained. The States supplied a total estimated outlay without regard to particular institutional needs and, in addition, supplied an institution-by-institution breakdown giving an approximation of the funds needed for each planned new institution, as well as an estimation of the institutional capacity and the expected completion date. The former figure gives a general overview of needs which might arise in the field of corrections during the next decade while the latter shows specific requirements by listing the particular types of institutions planned during the next 10 years.

During the next decade, there is the likelihood that 76 new institutions will be constructed. We have complete data on 72 of these institutions. The institutions not included in this analysis are a minimum institution in Tennessee (prospective cost unknown), two institutions in Oklahoma—one a maximum security institution and the other a reception center (both costs unknown) and one institution in Wyoming, cost $250,000, but capacity unknown.

Of the 72 institutions for which there is complete data, 24 will be minimum custody institutions at a total cost of $95,190,000; 18 will be medium custody institutions at a total cost of $159,425,000; 8 will be maximum custody institutions at a total cost of $144 million; 5 will be medical institutions at a combined cost of $66,800,000; 11 will be prerelease guidance centers (or halfway houses) at a cost of $1,500,000; and 6 will be reception and diagnostic centers at a cost of $32,800,000. In summary, the total estimated capital outlay for 72 new institutions likely to be constructed over the next 10 years is $499,715,000. Of the expected 11 prerelease guidance centers, 4 are to be built in Iowa at a cost of $200,000 and 7 are to be built in Oregon at a cost of $1,300,000.

In contrast to the past 20 years, when most new institutions were built by States with the largest civilian or confined populations, smaller States will account for an increasing amount of construction in the next 10 years. Iowa is expected to construct 10 new institutions and Oregon is planning to build 8 new institutions. Although smaller States are building numbers of institutions on a level comparable with that of larger States, the larger States' expenditures will continue to be much greater. Out of a total of $95,190,000 expected to be spent on minimum custody institutions, States with a population of 4 million or more are planning to spend $60,250,000; out of a total planned expenditure of $159,425,000 for medium custody institutions, these

same States account for $109,050,000; and $130 million of the $144 million total expenditure on maximum custody institutions is to be spent by these States.

With regard to region, the West is planning to build the most institutions—26 followed by the South with 19, the North Central with 18 and the Northeast with 9. Of the prospective expenditures on minimum institutions and medical centers, the West is planning to spend the largest amount of the four geographic regions—$[illegible]0,000 and $37 million respectively; the Northeast is planning the greatest expenditure for medium, maximum, and diagnostic institutions—$72,500,000, $64 million, and $17,500,000 respectively. A complete delineation of planned expenditures by State, for the years 1966–75, can be seen on table 4.

The estimated overall capital outlay figure for correctional needs during the next 10 years without regard to specific institutional construction is $721,038,260. This is an approximation since data were not obtained from Illinois, Connecticut, Oklahoma, and the District of Columbia. The obtained figure is much greater than the $499,715,000 projected for specific construction, since the figure $721,038,260 includes needs for which no specific plans are now available. It is indicated on table 5 that States having a population of 4 million or more are projecting a total capital outlay of $546,669,650. It may be noted that States with a confined prison population of 10,000 inmates or more are projecting a sum of $343,250,000 over the next 10 years. Those with a confined population of 5,000 to 10,000 are projecting a sum of $96,750,000.

All of the funds for the capital outlay are expected to come from State appropriations or general tax revenues with the following exceptions: Missouri, New Jersey, Washington which will use bond issues, and Maryland which will use a general construction loan. This funding applies only to the capital outlay for institutions in the planning stage at the present time.

It should be pointed out here that much of the data are approximations and, therefore, inconsistencies may exist. Data on capital outlay have been obtained insofar as possible; however, certain States such as Illinois, Connecticut, Oklahoma, and the District of Columbia were not able to supply data on projected capital outlay and, therefore, the totals which are supplied on the attached tables are not in actuality as high as the totals should be.

Table 6 offers a complete breakdown, by State, on a per year basis of the capital outlay, devoted to institutions for which there is the probability of construction during the next 10 years.

Among the reasons given for the prospective capital outlay were: population growth, replacement of obsolete facilities, expansion of rehabilitative programs, current backlog of unmet needs, and better segregation of prisoners, including the need to provide special facilities for the inmates with psychiatric problems.

TABLE 1.—*Estimated civilian population: July 1, 1964, confined prisoners in State institutions Dec. 31, 1964, for selected States*

State and region	Estimated civilian population	Confined prisoners in State prisons	Rate of prisoners confined per 100,000 of the estimated civilian population
Population 10,000,000-plus:			
Total	77,812,000	84,700	108.9
New York	17,870,000	17,658	98.8
California	17,749,000	26,483	149.2
Pennsylvania	11,442,000	7,667	67.0
Illinois	10,443,000	8,753	83.8
Texas	10,227,000	12,278	120.1
Ohio	10,081,000	11,861	117.7
4,000,000 under 10,000,000:			
Total	46,782,000	47,607	101.8
Michigan	8,075,000	8,028	99.4
New Jersey	6,629,000	4,614	69.6
Florida	5,607,000	6,725	119.9
Indiana	4,816,000	4,797	99.6
North Carolina	4,761,000	4,888	102.7
Missouri	4,374,000	3,529	80.7
Virginia	4,221,000	4,873	115.4
Georgia	4,197,000	7,309	174.1
Wisconsin	4,102,000	2,844	69.3
3,000,000 under 4,000,000:			
Total	20,594,000	21,683	105.3
Tennessee	3,770,000	3,187	84.5
Minnesota	3,516,000	1,863	53.0
Louisiana	3,433,000	3,564	103.8
Alabama	3,384,000	4,586	135.5
Maryland	3,378,000	5,453	161.4
Kentucky	3,113,000	3,030	97.3
2,000,000 under 2,000,000:			
Total	15,649,000	14,102	90.1
Washington	2,930,000	2,960	101.0
Iowa	2,755,000	2,256	81.9
Connecticut	2,752,000	1,716	62.4
South Carolina	2,490,000	2,306	92.6
Oklahoma	2,432,000	2,808	115.5
Mississippi	2,290,000	2,056	90.0
1,000,000 under 2,000,000			
Total	6,813,000	7,672	112.7
Colorado	1,926,000	2,666	138.4
Oregon	1,865,000	2,056	110.2
Arizona	1,561,000	1,627	104.2
Nebraska	1,461,000	1,323	90.6
500,000 under 1,000,000			
Total	6,763,000	6,044	89.4
New Mexico	987,000	987	100.0
Maine	971,000	719	74.0
District of Columbia	794,000	1,653	208.2
South Dakota	708,000	525	74.2
Montana	695,000	742	106.8
Idaho	686,000	476	69.4
New Hampshire	647,000	198	30.6
Hawaii	641,000	504	78.6
North Dakota	634,000	240	37.9
Under 500,000			
Total	1,628,000	1,360	83.4
Delaware	482,000	281	58.3
Vermont	408,000	290	71.1
Nevada	400,000	450	112.5
Wyoming	338,000	339	100.3
Total	176,041,000	183,168	104.0
South	54,579,000	64,997	119.1
North Central	50,965,000	46,019	90.3
West	29,778,000	39,290	131.9
Northeast	40,719,000	32,862	80.7

TABLE 2.—*Number of institutions by year built, State and region, by estimated civilan population, for selected States*

State and region	Total	Year built				
		Before 1900	1901–20	1921–40	1941–60	Since 1961
Total	279	54	30	103	51	41
Population 10,000,000+:						
Total	65	18	5	19	13	10
New York	19	7	2	5	3	2
California	13	2		1	6	4
Pennsylvania	8	3	2	2	1	
Illinois	6	3		2		1
Texas	13	1		8	1	3
Ohio	6	2	1	1	2	
4,000,000 under 10,000,000:						
Total	130	11	10	68	26	15
Michigan	8	2		3	2	1
New Jersey	14	1	3	2	3	5
Florida	8		1		5	2
Indiana	4	2	1	1		
North Carolina	75	1	3	55	13	3
Missouri	8	1		3	1	3
Virginia	5	2	1	2		
Georgia	3			1	2	
Wisconsin	5	2	1	1		1
3,000,000 under 4,000,000:						
Total	28	7	3	7	6	5
Tennessee	4	3		1		
Minnesota	3	1	2			
Louisiana	2		1		1	
Alabama	7			3	3	1
Maryland	9	2		1	2	4
Kentucky	3	1		2		
2,000,000 under 3,000,000:						
Total	23	5	4	3	3	8
Washington	7	1	1		2	3
Iowa	3	2	1			
Connecticut	2				1	1
South Carolina	7	2		2		3
Oklahoma	3		1	1		1
Mississippi	1		1			
1,000,000 under 2,000,000:						
Total	7	4	2		1	
Colorado	2	2				
Oregon	2	1			1	
Arizona	1		1			
Nebraska	2	1	1			
500,000 under 1,000,000:						
Total	16	6	5	2	2	1
New Mexico	1				1	
Maine	3	1	2			
District of Columbia	3		2			1
South Dakota	1	1				
Montana	1	1				
Idaho	1	1				
New Hampshire	1	1				
Hawaii	3		1	2		
North Dakota	2	1			1	
Under 500,000:						
Total	10	3	1	4		2
Delaware	4		1	3		
Vermont	2	1		1		
Nevada	3	1				2
Wyoming	1	1				
Northeast	49	14	9	10	8	8
North Central	48	18	7	11	6	6
South	[1] 147	12	11	[2] 79	27	18
West	35	10	3	3	10	9

[1] North Carolina accounted for 75.
[2] North Carolina accounted for 55.

TABLE 3.—*Adult correctional institutions constructed over the last 20 years by State, region, estimated civilian population, and type of institution*

Estimated civilian population by State and region	Total institutions	Type of institution							
		Minimum				Medium			
		Number	Capacity	Cost in thousands	Average cost per bed	Number	Capacity	Cost in thousands	Average cost per bed
Total	62	40	23,170	$162,091	$6,996	11	6,945	$57,212	$8,238
Population 10,000,000 plus: Total	21	15	17,532	123,434	7,040	2	2,900	23,500	8,103
New York	4	4	360	1,672	4,644				
California	8	7	13,136	85,485	6,508				
Pennsylvania	1	1	1,200	15,000	12,500				
Illinois	1	1	1,200	15,000	12,500				
Texas	5	2	1,636	6,277	3,837				
Ohio	2					2	2,900	23,500	8,103
4,000,000 under 10,000,000: Total	17	8	2,848	22,048	7,742	5	2,764	16,635	6,018
Michigan	1					1	600	12,000	20,000
New Jersey									
Florida	[1] 7	2	1,232	1,883	1,528	3	1,664	3,885	2,335
Indiana	[2]								
North Carolina	4	1	100	230	2,300	1	500	750	1,500
Missouri	4	4	940	10,935	11,633				
Virginia									
Georgia									
Wisconsin	1	1	576	9,000	15,625				
3,000,000 under 4,000,000: Total	7	6	1,120	5,450	4,866	1	600	12,000	20,000
Tennessee									
Minnesota									
Louisiana	1	1	400	3,250	8,125				
Alabama	1	1	104	150	1,442				
Maryland	5	4	616	2,050	3,328	1	600	12,000	20,000
Kentucky									

2,000,000 under 3,000,000:									
Total	9	6	665	1,608	2,418	2	402	2,577	6,410
Washington	4	4	285	825	2,895				
Iowa	1	1	80	340	4,250				
Connecticut	1					1	102	777	7,618
South Carolina	2					1	300	1,800	6,000
Oklahoma	1	1	300	443	1,477				
Mississippi									
1,000,000 under 2,000,000:									
Total	4	2	400	472	1,180	1	279	2,500	8,961
Colorado	2	1	100	200	2,000				
Oregon	1					1	279	2,500	8,961
Arizona	1	1	300	272	907				
Nebraska									
500,000 under 1,000,000:									
Total	2	1	300	6,746	22,487				
New Mexico	1								
Maine									
District of Columbia	1	1	300	6,746	22,487				
South Dakota									
Montana									
Idaho									
New Hampshire									
Hawaii									
North Dakota									
Under 500,000:									
Total	2	2	305	2,332	7,646				
Delaware									
Vermont									
Nevada	2	2	305	2,332	7,646				
Wyoming									
Total	62	40	23,170	162,091	6,996	11	6,945		8,238
Northeast	6	5	1,560	16,672	10,687	1	102		7,618
North Central	10	7	2,796	35,275	12,616	3	3,500		10,143
South	27	13	4,688	[illegible]	4,486	6	3,064		6,017
West	19	15	14,126	[illegible]	6,309	1	279		8,961

See footnotes at end of table, p. 667.

TABLE 3.—*Adult correctional institutions constructed over the last [illegible] by State, region, estimated civilian population, and type of institution—*nued

Estimated civilian population by State and region	Type of institution											
	Maximum				[illegible] 1,02[illegible] 9,115	Medical			Prerelease centers			
	Number	Capacity	Cost in thousands	Average cost per bed	[illegible]	Capacity	Cost in thousands	Average cost per bed	Number	Capacity	Cost in thousands	Average cost per bed
Total	8	8,162	$32,364	$3,965		2,872	$21,439	$7,465	1	70	$250	$3,571
Population 10,000,000 plus: Total	3	4,360	11,349	2,603		2,035	19,410	9,538				
New York						2,035	19,410	9,538				
California												
Pennsylvania												
Illinois												
Texas	3	4,360	11,349	2,603								
Ohio												
4,000,000 under 10,000,000: Total	3	1,580	8,365	5,294	1	837	2,029	2,424				
Michigan												
New Jersey												
Florida	1	1,200	7,500	6,250	1	837	2,029	2,424				
Indiana												
North Carolina	2	380	865	2,276								
Missouri												
Virginia												
Georgia												
Wisconsin												
3,000,000 under 4,000,000: Total												
Tennessee												
Minnesota												
Louisiana												
Alabama												
Maryland												
Kentucky												

2,000,000 under 3,000,000: Total	1	1,200	5,000	4,167								
Washington												
Iowa												
Connecticut												
South Carolina	1	1,200	5,000	4,167								
Oklahoma												
Mississippi												
1,000,000 under 2,000,000: Total									1	70	250	3,571
Colorado									1	70	250	3,571
Oregon												
Arizona												
Nebraska												
500,000 under 1,000,000: Total	1	1,022	7,650	7,485								
New Mexico	1	1,022	7,650	7,485								
Maine												
District of Columbia												
South Dakota												
Montana												
Idaho												
New Hampshire												
Hawaii												
North Dakota												
Under 500,000: Total												
Delaware												
Vermont												
Nevada												
Wyoming												
Total	8	8,162	32,364	3,965	2	2,872	21,439	7,465	1	70	250	3,571
Northeast												
North Central												
South	7	7,140	24,714	3,461	1	837	2,029	2,424				
West	1	1,022	7,650	7,485	1	2,035	19,410	9,538	1	70	250	3,571

[1] Does not include 1 camp, capacity 50, because cost unknown.
[2] Does not include 1 medium custody institution, capacity 600, because cost unknown.
[3] Does not include 1 medium, capacity 1,056, and 1 minimum, capacity 400, because cost unknown.

TABLE 4.—*Projected expenditures for prison construction by type of institution, and estimated civilian population by State, 1966–75*

Estimated civilian population by State and region	Total institutions	Type of institution											
		Minimum				Medium				Maximum			
		Number	Capacity	Cost in thousands	Average cost per bed	Number	Capacity	Cost in thousands	Average cost per bed	Number	Cpacity	Cost in thousands	Average cost per bed
Total	72	24	12,320	$95,190	$7,726	18	12,990	$159,425	$12,273	8	11,4000	$144,000	$12,632
Population 10,000,000-plus:													
Total	15	4	5,600	50,750	9,063	5	6,800	70,850	10,419	4	7,400	104,000	14,054
New York	4					2	3,000	40,000	13,333	2	4,000	64,000	16,000
California	6	3	3,600	42,000	11,667	1	1,200	16,000	13,333	1	1,400	22,000	15,714
Pennsylvania	1												
Illinois	(1)												
Texas	2	1	2,000	8,750	4,375	1	1,100	2,850	2,591				
Ohio	2					1	1,500	12,000	8,000	1	2,000	18,000	9,000
4,000,000 under 10,000,000:													
Total	11	3	1,700	9,500	5,588	4	2,000	38,200	19,100	2	2,600	26,000	10,000
Michigan	1												
New Jersey	2					2	1,400	29,000	20,714				
Florida													
Indiana													
North Carolina													
Missouri	2	1	1,200	4,500	3,750					1	1,200	16,000	13,333
Virginia	1	1	300	4,250	14,167								
Georgia	2	1	200	750	3,750					1	1,400	10,000	7,143
Wisconsin	3					2	600	9,200	15,333				
3,000,000 under 4,000,000:													
Total	8	2	1,800	11,000	6,111	3	1,900	29,000	15,263	2	1,400	14,000	10,000
Tennessee	1	1	600	6,000	10,000								
Minnesota													
Louisiana	1	1	1,200	5,000	4,167								
Alabama	2									1	600	2,000	3,333
Maryland	2					2	1,400	23,000	16,429				
Kentucky	2					1	500	6,000	12,000	1	800	12,000	15,000

2,000,000 under 3,000,000:													
Total	17	8	1,400	9,316	6,654	3	665	7,375	11,090				
Washington	3	2	400	2,786	6,965	1	240	750	3,125				
Iowa	10	4	200	230	1,150	2	425	6,625	15,588				
Connecticut	(1)												
South Carolina	3	1	600	6,000	10,000								
Oklahoma	(1)												
Mississippi	1	1	200	300	1,500								
1,000,000 under 2,000,000:													
Total	13	3	300	800	2,667	1	1,000	5,000	5,000				
Colorado	5	3	300	800	2,667	1	1,000	5,000	5,000				
Oregon	8												
Arizona													
Nebraska													
500,000 under 1,000,000:													
Total	5	3	1,420	12,824	9,031								
New Mexico													
Maine	1												
District of Columbia	(1)												
South Dakota													
Montana	1	1	50	324	6,480								
Idaho	1	1	1,250	12,000	9,600								
New Hampshire													
Hawaii	2	1	120	500	4,166								
North Dakota													
Under 500,000:													
Total	3	1	100	1,000	10,000	2	625	9,000	14,400				
Delaware	2	1	100	1,000	10,000	1	445	5,500	12,360				
Vermont	1					1	180	3,500	19,444				
Nevada													
Wyoming	(4)												
Total	72	24	12,320	95,190	7,726	18	12,990	159,415	12,273	8	11,400	144,000	12,632
Northeast	9					5	4,580	72,500	15,830	2	4,000	64,000	16,000
North Central	18	5	1,400	4,730	3,379	5	2,525	27,825	11,020	2	3,200	34,000	10,625
South	19	8	5,200	32,050	6,163	5	3,445	37,350	10,842	3	2,800	24,000	8,571
West	26	11	5,720	58,410	10,212	3	2,440	21,750	8,914	1	1,400	22,000	15,714
Total		5	3,900	66,800	17,128	11	430	1,500	3,488	6	2,650	32,800	12,377

See footnotes at end of table, p. 671.

TABLE 4.—*Projected expenditures for prison construction by type of institution, and estimated civilian population by State, 1966–75*—Con.

Estimated civilian population by State and region	Type of institution											
	Medical				Prerelease centers				Reception, diagnostic, and classification centers			
	Number	Capacity	Cost in thousands	Average cost per bed	Number	Capacity	Cost in thousands	Average cost per bed	Number	Capacity	Cost in thousands	Average cost per bed
Population 10,000,000-plus: Total	1	1,600	$24,000	$15,000					1	1,000	$15,000	$15,000
New York												
California	1	1,600	24,000	15,000								
Pennsylvania									1	1,000	15,000	15,000
Illinois												
Texas												
Ohio												
4,000,000 under 10,000,000: Total	1	800	25,000	31,250					1	800	10,800	13,500
Michigan	1	800	25,000	31,250								
New Jersey												
Florida												
Indiana												
North Carolina												
Missouri												
Virginia												
Georgia												
Wisconsin									1	800	10,800	18,500
3,000,000 under 4,000,000: Total									1	300	1,000	3,333
Tennessee												
Minnesota												
Louisiana									1	300	1,000	3,333
Alabama												
Maryland												
Kentucky												

2,000,000 under 3,000,000:												
Total	1	400	4,800	12,000	4	80	$200	$2,500	1	150	2,500	16,667
Washington												
Iowa					4	80	200	2,500				
Connecticut												
South Carolina	1	400	4,800	12,000					1	150	2,500	16,6..
Oklahoma												
Mississippi												
1,000,000 under 2,000,000:												
Total	1	500	6,000	12,000	7	350	1,300	3,714	1	200	1,000	5,000
Colorado	1	500	6,000	12,000								
Oregon					7	350	1,300	3,714	1	200	1,000	5,000
Arizona												
Nebraska												
500,000 under 1,000,000:												
Total	1	600	7,000	11,667					1	200	2,500	25,000
New Mexico												
Maine									1	200	2,500	25,000
District of Columbia												
South Dakota												
Montana												
Idaho												
New Hampshire												
Hawaii	1	600	7,000	11,667								
North Dakota												
Under 500,000:												
Total												
Delaware												
Vermont												
Nevada												
Wyoming												
Total	5	3,900	66,800	17,128	11	430	1,500	3,488	6	2,650	32,800	12,377
Northeast									2	1,200	17,500	14,583
North Central	1	800	25,000	31,250	4	80	200	2,500	1	800	10,500	13,500
South	1	400	4,800	12,000					2	450	3,500	7,778
West	3	2,700	37,000	13,704	7	350	1,300	3,714	1	200	1,000	5,000

[1] Not available.
[2] Does not include 1 minimum custody institution, capacity 100, because cost unknown.
[3] Does not include 1 maximum custody institution, capacity 800, because cost unknown. Does not include 1 reception center because capacity and cost unknown.
[4] Does not include 1 medium custody institution because capacity unknown.

TABLE 5.—*Estimated capital outlay, by State and region, 1966–75, for selected States, by estimated civilian population*

State and region	*Estimated capital outlay*
Total	$721,038,260
Population 10,000,000 plus:	
Total	378,750,000
New York	104,000,000
California	190,000,000
Pennsylvania	35,500,000
Illinois	(1)
Texas	12,000,000
Ohio	35,000,000–40,000,000
Median	(37,500,000)
4,000,000 under 10,000,000:	
Total	167,919,650
Michigan	25,000,000
New Jersey	33,500,000
Florida	2,500,000
Indiana	9,000,000
North Carolina	40,000,000
Missouri	21,000,000
Virginia	6,169,650
Georgia	10,750,000
Wisconsin	20,000,000
3,000,000 under 4,000,000:	
Total	750,000,000
Tennessee	12,000,000
Minnesota	10,000,000
Louisiana	6,000,000
Alabama	6,000,000
Maryland	23,000,000
Kentucky	18,000,000
2,000,000 under 3,000,000:	
Total	22,136,000
Washington	3,536,000
Iowa	8,000,000
Connecticut	(1)
South Carolina	10,000,000
Oklahoma	(1)
Mississippi	600,000
1,000,000 under 2,000,000:	
Total	28,002,060
Colorado	10,000,000
Oregon	6,000,000
Arizona	5,000,000
Nebraska	7,002,060
500,000 under 1,000,000:	
Total	27,730,550
New Mexico	----------
Maine	2,500,000
District of Columbia	(1)
South Dakota	----------
Montana	1,330,550
Idaho	12,000,000
New Hampshire	150,000
Hawaii	10,000,000
North Dakota	1,750,000

1 Unknown

TABLE 5.—*Estimated capital outlay, by State and region, 1966–75, for selected States, by estimated civilian population*—Continued

State and region	*Estimated capital outlay*
Under 500,000:	
Total	$21, 500, 000
Delaware	5, 500, 000
Vermont	3, 500, 000
Nevada	8, 000, 000–15, 000, 000
Median	(11, 500, 000)
Wyoming	1, 000, 000
Regions:	
Total	721, 038, 260
Northeast	179, 150, 000
North Central	139, 002, 060
South	152, 519, 650
West	250, 366, 550

TABLE 6.—*Projected expenditures for institutional construction by State and year, 1966–75*

[Cost in thousands of dollars]

State	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
Total	136, 960	16, 875	7, 000	230	111, 370	57, 500	37, 000	44, 750	10, 000	71, 600
Alabama	3, 000									
Arizona										
California					22, 000	24, 000	16, 000	16, 000	10, 000	16, 000
Colorado		250	250		5, 300		6, 000			
Connecticut [1]										
Delaware		6, 500								
District of Columbia [1]										
Florida										
Georgia					17, 000					
Hawaii					7, 500					
Idaho	12, 000									
Illinois [1]										
Indiana										
Iowa		5, 125	200	230	1, 500					
Kentucky					6, 000		12, 000			
Louisiana		5, 000								
Maine	2, 500									
Maryland							3, 000	20, 000		
Michigan	25, 000									
Minnesota										
Mississippi	300									
Missouri					20, 500					
Montana	324									
Nebraska										
Nevada										
New Hampshire										
New Jersey	29, 000									
New Mexico										
New York					20, 000	32, 000				52, 000
North Carolina										
North Dakota										
Ohio	30, 000									
Oklahoma [1]										
Oregon			2, 300							
Pennsylvania	15, 000									
South Carolina	13, 300									
South Dakota										
Tennessee [2]										
Texas								8, 750		2, 850
Vermont	3, 500									
Virginia			4, 250							
Washington	2, 786									750
Wisconsin					11, 570	1, 500				
Wyoming	250									

[1] Information not available for these States.

[2] Tennessee will appropriate funds for 2 institutions—1 a minimum institution, expected completion date in 1966—cost unknown and 1 a $6,000,000 minimum institution, expected completion date unknown.

CHAPTER 40

Fire Stations and Related Building Facilities*

A. NATURE AND COMPOSITION OF FACILITIES

1. DESCRIPTION OF FACILITIES

The United States of American receives fire protection at the local government level from an estimated 23,000 fire departments. As can be ascertained from table 1, page 676, 22,426 can be identified in the various States. The discrepancy is due to faulty information in some States and the lack of uniform accounting between the various reporting agencies. None of these figures include military, GSA or industrial fire departments.

These fire departments, hereafter referred to as "the fire service," are maintained by cities, villages, boroughs, towns, and tax districts generally referred to as "fire districts." Some counties or parishes provide fire protection to the communities within their boundaries, but the number is small and for the purpose of this report are included in the total figures covering local communities.

Another form of fire department found in the United States is the "membership corporation" which owns its apparatus and equipment as well as buildings, and contracts service to what may be termed "fire protection districts" or "contract districts." Since these districts are taxing districts, the departments serving them are included in the totals without distinction.

Finally, there are a handful of "commercial contract" departments which offer their services to subscribers on a profit basis. Because the effect on the total is negligible their presence is ignored and not otherwise identified.

The fire service is distributed as follows:

1. An estimated 1,600 fully paid departments protect communities from 10,000 population and up.

2. An estimated 4,400 predominantly volunteer membership departments protect communities of 2,500 to 9,999 population. In this category some paid firefighters may be employed, and many of the so-called "volunteers" may be more accurately identified as "paid-on-call" firefighters.

3. In those communities below 2,500 population approximately 17,000 fire departments are maintained, for the most part, staffed with wholly volunteer personnel.

Present estimates of manpower employed by the fire service are 250,000 paid or full-time professional firefighters and 1,500,000 volunteers, including paid-on-call men.

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*Prepared by Donald M. O'Brien, general manager, International Association of Fire Chiefs, with minor editing by committee staff.

2. EXISTING CAPITAL PLANT

(a) *Number of Facilities*

(*1*) *Buildings.*—The fire service operates 110,000 vehicles of all types with the major apparatus consisting of 60,000 pumper trucks and 8,000 aerial ladder trucks. Housing these motor vehicles is the primary reason for fire department buildings.

In those cities maintaining paid departments or part-paid departments the fire stations also serve as living quarters for the on-duty men.

In the volunteer service the buildings are equipped as meeting rooms for the members and may also serve as community social centers.

The paid fire service building facilities are generally more complex than those found in volunteer departments. For example, a large city commonly has a headquarters station, which may or may not house apparatus, a number of company stations strategically located within the community, a large maintenance shop, training center, communications or fire alarm center, and so forth. A modern trend in the larger cities is to combine administrative, maintenance, training, and communications functions in a complex of buildings within the community limits.

(*2*) *Fire stations.*—A survey conducted in mid-1965 disclosed that the fire service maintains 2,760 headquarters buildings. Many of these serve as central stations where apparatus and manpower are housed in addition to the administrative and specialist offices.

The same survey disclosed that 25,600 fire stations were in existence at the time. It should be noted that the overwhelming majority of the 17,000 departments serving communities of less than 2,500 population maintain only a single station housing 1 to 3 motor vehicles.

(*3*) *Shops.*—A total of 1,200 maintenance shops is provided. Most small departments, paid and volunteer, have no special shop facilities. In a few cases, in larger departments, the fire department maintenance work is carried on in central garages in conjunction with other city departments, such as street, police, parks, etc.

(*4*) *Training centers.*—Most paid fire departments provide some type of training facilities, and a total of 1,560 centers is maintained. Some of these are multibuilding facilities but are not further identified.

A number of counties now provide a central training facility for joint use by all volunteer departments within the county limits. In addition, some States provide fire training centers at colleges or universities as a part of their adult education extension service. The totals of the above are not large and have been included in the above figures.

(*5*) *Fire alarm centers.*—A total of 450 separate communications centers is operated. These include facilities for reception of public alarms by means of telephone or telegraph. Dispatching services all include the use of radio for communicating with mobile vehicles.

In all other departments similar forms of alarm reception and dispatching equipment are maintained but the center is located within a building which provides for other functions as well.

(b) *Distribution by States*

Fire departments are distributed as shown in table 1 below: (Fire stations may be estimated in a given State by reckoning the number

of communities, populationwise, and multiplying by the following factors: Over 500,000, 53.6; 250,000 to 499,999, 23; 100,000 to 249,999, 11.4; 50,000 to 99,999, 5.6; 25,000 to 49,999, 3.5; 10,000 to 24,999, 1.8; 5,000 to 9,999, 1.5; 2,500 to 4,999, 1.2; 1,000 to 2,499, 1.1; less than 1,000, 1).

TABLE 1

State	Number of departments
Alabama	225
Alaska	60
Arizona	100
Arkansas	235
California	760
Colorado	210
Connecticut	420
Delaware	60
District of Columbia	1
Florida	350
Georgia	340
Hawaii	5
Idaho	150
Illinois	1,100
Indiana	755
Iowa	965
Kansas	510
Kentucky	350
Louisiana	255
Maine	410
Maryland	295
Massachusetts	375
Michigan	850
Minnesota	770
Mississippi	155
Missouri	430
Montana	205
Nebraska	490
Nevada	55
New Hampshire	260
New Jersey	450
New Mexico	140
New York	1,840
North Carolina	550
North Dakota	415
Ohio	1,155
Oklahoma	270
Oregon	405
Pennsylvania	2,250
Rhode Island	100
South Carolina	170
South Dakota	330
Tennessee	175
Texas	600
Utah	100
Vermont	195
Virginia	365
Washington	645
West Virginia	275
Wisconsin	750
Wyoming	100
Total	22,426

Distribution populationwise in mid-1965 for the country as a whole is shown in table 2 below.

TABLE 2

Population group	Number in the United States	Headquarters	Stations	Shops	Training centers	Fire alarm
500,000 and over	28	28	1,500	26	28	21
100,000 to 499,999	109	109	1,590	92	100	55
50,000 to 99,999	217	217	1,215	210	72	72
10,000 to 49,999	1,731	1,731	3,911	862	390	294
2,500 to 9,999	4,187	----------	5,517	----------	970	----------
Under 2,500	16,232	----------	17,855	----------	----------	----------
Total	22,504	2,085	31,588	1,190	1,560	442

(c) *Historical Data*

Perhaps 2 percent of fire stations built prior to 1900 are still in use. (Within the next 4 years these most likely will be abandoned or razed.) However, about 10 percent of fire station structures still in use were

built in the 1901–20 period. Approximately 20 percent still in service were built in the period 1920–40. Very few were built during the war years of 1941–45.

However, nearly 60 percent of all stations have been built between 1945–60 and perhaps 8 percent since 1961.

The years 1945–60 were periods of great expansion for the fire service in this country. Nearly 45 percent of all existing fire departments were formed during this time, the majority in the smaller communities which accounts for the fire station construction boom during that period.

This was also a period of heavy replacement of structures in the larger departments (delayed by World War II) as well as growth of the larger communities by annexation with the resulting need for new facilities in the annexed portions.

(d) *Ownership and Valuation*

It is believed 95 percent of all fire department buildings are owned by the local government, including tax districts. An estimated 4½ percent are owned by membership corporations, and one-half of 1 percent are county or State owned. The estimated valuation of present buildings is $3 billion.

B. Costs and User Charges

1. CONSTRUCTION AND COSTS

The fire service is expected to spend up to $191 million during 1966 on building construction. An additional $8,500,000 will be expended to equip these units with furniture, etc.

In the smaller volunteer departments many of these buildings will be of simple construction such as slab foundation and cinder block walls. The cost [1] will approximate $18 per square foot.

A station intended to house two to four motor vehicles incorporating excellent design will cost approximately $25 per square foot. Larger stations of the same design will cost approximately $20 per square foot.

A 1965 survey of random cities and towns showed the following construction budgets:

Table 3

Population group	Number reporting	Dollars budgeted	Average per department
Over 500,000	15	8,390,000	$560,000
100,000 to 499,999	30	7,700,000	335,000
50,000 to 99,999	25	4,560,000	182,500
10,000 to 49,999	74	6,072,000	83,000
2,500 to 9,999	24	737,000	31,000
Less than 2,500	37	350,000	9,000

[1] Variations in cost per square foot can be expected across the country depending on labor rates. The above figures are based on skilled construction worker rates in the New York City area.

As closely as can be determined the funds for these buildings were obtained as follows:

TABLE 4

[In percent]

Population group	Operating budget (taxes)	Capital budget (taxes)	Bond issue (municipal)	Urban renewal	Fund-raising activities, carnivals, etc.
Over 500,000	----------	52	48	----------	----------
100,000 to 499,999	----------	48	46	6	----------
50,000 to 99,999	5	44	49	2	----------
10,000 to 49,999	13	40	35	2	10
2,500 to 9,999	27	20	22	2	29
Under 2,500	32	8	13	4	43

Based on the survey material a simple projection of fire service building for the year 1966 is as follows:

TABLE 5

Population group	Building starts	Estimated cost
Over 500,000	80	$52, 000, 000
250,000 to 499,999	48	18, 000, 000
100,000 to 249,999	82	16, 000, 000
50,000 to 99,999	114	22, 000, 000
25,000 to 49,999	284	25, 000, 000
10,000 to 24,999	298	28, 000, 000
5,000 to 9,999	122	5, 000, 000
2,500 to 4,999	315	14, 000, 000
1,000 to 2,499	440	8, 000, 000
Under 1,000	438	3, 000, 000
Total	2, 213	191, 000, 000

2. OPERATION EXPENSE

Maintenance and operation expenses are estimated according to population groups as follows:

Average of $2,900 per department for the 6,000 departments in communities of 2,500 population and over for a total of $17,640,000 during the year 1965.

Average of $116 per department for the 17,000 departments serving communities of less than 2,500 population for a total of $1,972,000 in 1965.

Payment of costs.—Charges to pay for these buildings are based on local taxation. In fire districts these are specific taxes. In those areas where membership corporations provide service the building and maintenance costs are supported by contract fees, donations, and fund-raising activities, such as carnivals, bingo, etc.

Generally, the costs are held to budgeted figures and seldom exceeded (as is typical where local tax moneys are involved).

C. Future Needs

During the period 1966–75 it can be anticipated that 20,000 new fire stations will be constructed by the fire service. These can be expected to be divided as follows:

Table 6

Population groups	Buildings	Estimated cost
Over 50,000	2,000	$720,000,000
2,500 to 50,000	10,000	576,000,000
Under 2,500	8,000	75,000,000
Total	20,000	1,371,000,000

These buildings will be needed to replace obsolete structures now in use, new stations required to meet expansion of communities, and the creation of entirely new fire departments.

The above projection takes into account the absorption of some small departments into larger ones by annexation as well as the consolidation of stations in departments where changing fire protection requirements indicate this desirability.

It is expected that financing of these buildings will proceed in a parallel manner to that shown in table 4. In this respect it can be anticipated that greater use be made of urban renewal funds in the larger communities. This should result due to forced demolition and relocation of fire stations as the renewal projects proceed.

CHAPTER 41

Public Office and Court Buildings*

A. NATURE AND COMPOSITION OF FACILITIES

1. DESCRIPTION OF FACILITIES

(a) *Physical Characteristics*

At the State level, the functions of government are divided between the legislature and the courts, executive and administrative agencies. The legislative space needs include those buildings necessary to carry on the business of lawmaking, thus are generally located in the State capital. However, there is a growing trend among State legislators to have space in public buildings in their home districts or rent such space commercially to provide a place to contact their constituents. The State judicial function is more decentralized. Its space needs include courts of various levels; supreme courts, intermediate courts of appeal in 14 States,[1] general trial courts and, in some cases, specialized courts and minor courts. These courts, other than the supreme courts, are distributed throughout the State. The other functions of State government are administered by the Governor, his administrative departments, and various independent agencies and commissions. These administrative offices are generally located in the capital city but with local or district offices usually located in other parts of the State.

At the county level of government (there are over 3,000 counties in the United States), organization is complicated and quite varied. However, there are some broad general patterns: (1) a governing body (commissioners, supervisors, etc.) controls the county's fiscal affairs, enacts legislation, may perform some administrative functions and usually exercises some degree of supervisory authority over county affairs in general, and (2) a considerable variety of officers, boards, and commissions charged with more specific tasks such as sheriff, coroner, clerk, treasurer, recorder, superintendent of schools and county engineer.

For the less populous counties, governmental needs are generally served by one multipurpose structure. For counties of over 100,000 population special purpose buildings are more common, serving specific functions such as jails, health centers, welfare departments, etc.

The organization of municipal government generally falls into one of three categories: (1) mayor-council, (2) commission, (3) council-manager. Department heads are responsible for such functions of government as police and fire protection, public works, finance, and

*Prepared by American Public Works Association, by Mr. Andrew Kinane, staff planner, with minor editing by committee staff.

[1] As of 1962.

public health. In larger cities other functions such as urban renewal, public housing, and welfare are also provided for.

In the larger communities, special purpose buildings are constructed to serve specific functions, such as police protection, public health and welfare, fire protection, etc. In smaller cities, generally those of less than 10,000 population, these functions are implemented by a single multipurpose building. Schools, not included in this chapter, are a specific exception to this rule. In this chapter, only the space needs for city halls, city and county courts, and multipurpose public administration functions are considered. Other local public buildings such as police and fire stations, armories, exhibition centers, libraries, schools, arenas, or auditoriums are excluded, except insofar as they are part of multipurpose public buildings.

It should be kept in mind in any study of this sort that some general purpose space will be in specialized structures and that specialized purpose office space will be found in generalized structures. It is assumed that the two factors are compensating.

(b) *Accepted Standards*

Widely accepted standards for office space needs, published by the Building Research Advisory Board, indicate that office buildings should have an average of 80 square feet per employee. This is for buildings having 10 percent or less private (individual) offices. They give a range of from 50 square feet per employee in multiple occupancy offices to 175 square feet in private offices.

Other standards suggest higher space requirements per employee. The American Society of Planning Officials' report on "civic center planning" suggests that 100 square feet per employee is a good average. An estimate for the future, suggested for the city of Akron by their central city consultant,[2] is 128 square feet per employee. The Public Administration Service in their report on "Space Needs in Municipal Buildings" indicates that for city halls an overall average, allowing for council chambers and conference rooms, of 200 square feet per employee or more may frequently be necessary to provide adequately for all functions.

In a recent survey of public office space needs, conducted by the American Public Works Association, the cities that responded indicated that they leased space on the basis of 100 square feet per employee. Cities over 100,000 population indicated that for city-owned public office buildings the space needs varied from approximately 100 to 500 square feet per employee. The median was from between 200 and 300 square feet per employee. This generally corresponds with the overall average suggested in the Public Administration Service's report for municipal buildings allowing for council chambers, conference rooms, corridors, etc.

For cities under 100,000 population the range of space needs reported was somewhat greater, being 100 to 1,000 square feet per employee. (In some small communities the figure was even higher.) The median was also somewhat greater, being 500 to 700 square feet per employee. It is perhaps interesting to note that statistics developed in the course of this study indicate that, on the average, there are 1

[2] Walker & Murray, Associates.

to 2 persons in the city for each square foot of public office space; i.e., an average city of 50,000 people would have from 25,000 to 50,000 square feet of public office space.

The figures given above, it should be recognized, are averages. In planning for building needs space requirements should be established by function—clerical, drafting, department heads, etc.

Policy formulation is critical in order to answer questions related to space needs and standards. If every community designed buildings adequate to meet future needs, located these facilities properly, took advantage of all economies and had sufficient funds to pay for them, there would be no problem. Policy formulation, of course, is as critical on the local level as it is on the State and Federal level.

TABLE I.—*Space needed in hypothetical city halls serving populations of 25,000, 50,000, 100,000, and 200,000, by function*

Function	25,000 population		50,000 population		100,000 population		200,000 population	
	Number of employees	Space allocated (square feet)	Number of employees	Space allocated (square feet)	Number of employees	Space allocated (square feet)	Number of employees	Space allocated (square feet)
Council chambers	-------	1,500	-------	1,700	-------	2,000	-------	2,000
Executive offices	17	3,950	17	3,950	19	4,350	24	4,550
Finance offices	11	2,300	14	2,600	17	3,350	22	4,700
Personnel offices	2	300	3	450	5	1,300	10	1,500
City clerks' offices	4	750	5	900	7	1,200	11	1,850
City attorney's offices	2	350	4	600	4	600	6	850
Planning office	5	850	7	1,350	9	1,450	12	1,850
Parks department	2	300	2	300	2	300	3	400
Recreation department	3	750	4	850	6	1,050	10	1,650
Traffic engineering department	2	450	3	600	4	750	6	900
Civilian defense	2	-------	2	-------	2	300	3	400
Public health	7	1,750	11	2,750	18	3,900	28	5,750
Public works department	23	4,100	30	4,850	40	6,500	56	8,900
Total	80	17,350	102	20,900	133	27,050	191	35,300

Source: "Space Needs and Departmental Inter-relationships in Municipal Building," Public Administration Service, p. 27.

(c) *Past and Present Characteristics*

The civic center has traditionally been the section of the city or town, usually near the center, where administration buildings, courts, libraries, and other public buildings have been grouped. It is the history of the construction of public office and court buildings such as city halls, State capitals, administration buildings, county courthouses and other general purpose public buildings that is discussed here. Special-purpose buildings, libraries, fire stations, etc., are discussed in other chapters.

Civic centers have basically aimed to serve the public administrative needs of the area served. This may be a city, county, metropolitan region or State. This concentration of public business has also facilitated the conduct of interdepartmental affairs. As needs have grown, wings have been added to existing buildings and new structures have been added. As the core of cities has become more and more congested, there has been a growing trend to decentralize certain functions such as maintenance shops and refuse collection. However, this trend generally applies to large cities only where congestion is significant and distances between remote districts are great.

The modern design and layout of public buildings considers the future growth potential of governmental services to be accommodated as well as the practical problems of adequate parking, employee facilities, general utilities, and public access and convenience. Esthetic opportunities of impressive vistas, pleasant settings, and harmonious design should not be overlooked. There are no special formulas or standards for solving any of these problems. However, the number of people who come to government offices, the number of service cars, and the amount of employee and public parking to be accommodated are factors to be considered when civic centers are being planned or expanded.

This gives the general setting and background of the building and construction of public office and court buildings. A detailed analysis of the past and present characteristics of these buildings is discussed on the pages that follow.

2. EXISTING CAPITAL PLANT

(a) *Number, Distribution, and Floor Area*

It is estimated that there are about 25,000 [3] public office and court buildings in the United States that have been constructed by State, county, and local units of government. These buildings have a gross floor area of about 330 million square feet or an average of 13,500 square feet per structure. In cities of 50,000 to 100,000 population there is on the average one or two structures with a total floor area of 50,000 square feet.

On the basis of population of city, the number of these buildings per typical city varies from one in cities of less than 10,000 to five or more in cities over 500,000. Towns of less than 2,500 (there are 13,389 such places according to the census), account for almost half the city-owned space being used.

It goes without saying that cities that are county seats or State capitals will have many more buildings and public office space than the average city in their size range. Thus, in a typical county seat of 50,000, there will be about four structures with 100,000 square feet of office space. A State capital is likely to have about 15 structures including county and city facilities with a million or more square feet of space.

TABLE II.—*General-purpose public buildings, distribution of structures by size and type for the United States*

CITY-OWNED FACILITIES

Population (thousands)	Number of cities	Population (thousands) 1960	Average number per city	Structures	Total floor areas in square feet (thousands)
500 or more	21	28,484	5	100	20,000
100 to 500	109	22,000	3	300	15,000
50 to 100	180	12,511	2	360	7,200
10 to 50	1,344	27,781	1.5	2,000	20,000
2.5 to 10	3,000	15,267	1	3,000	24,000
Less than 2.5	13,389	9,600	1	13,400	67,000
Total	18,088	115,911	1.1	19,160	153,200

[3] Based on APWA survey.

TABLE II.—*General-purpose public buildings, distribution of structures by size and type for the United States*—Continued

COUNTY-OWNED FACILITIES (COUNTY SEAT)	
Number of counties	3,000
Average number per county	1.7
Total floor area	125,000,000
Total structures	5,100
STATE-OWNED FACILITIES (CAPITAL CITIES)	
Number of States	50
Average number of structures per State	12
Total structures	600
Total floor area	50,000,000

NOTE.—U.S. total: 25,000 structures; 330,000,000 square feet.

Sources: APWA Civic Building Survey. U.S. Census of Population, 1960.

TABLE III.—*Age of general-purpose State and local public office and court buildings in the United States*

	Since 1961	1941–60	1921–40	1901–20	Before 1900
Number constructed	3,400	5,400	6,600	5,000	4,600
(Percent)	14	22	28	21	19
Floor space in millions of square feet	60	86	114	32	38
(Percent)	18	26	35	10	11
Average square feet per structure	17,600	16,000	17,300	6,400	8,300

Source: American Public Works Association Civic Building Survey, 1966.

Over 80 percent of our civic buildings are less than 50 years old. However, put another way, this means that one in five public buildings presently in use is more than 50 years old. The median age is about 35 years. However, since World War II there has been a sharp increase in the size of structures, thus half the available space is located in structures less than 25 years old.

(b) *Ownership and Current Value*

Public office and court buildings broadly include general purpose buildings owned by municipalities, counties, and States. It is estimated that about 75 percent of these buildings are owned by municipalities. State governments account for about 1 to 2 percent of all facilities, the balance being owned by county governments.

The estimated value of existing general purpose public buildings is about $7 billion. County buildings account for a little over one-third of this amount or $2.5 billion. City buildings account for $2.4 billion. There are more city owned general purpose public buildings however, which because of their small size account for a smaller part of the dollar value. A breakdown of estimated values of general-purpose public buildings is illustrated below:

TABLE IV.—*Estimated current (1966) value of general-purpose public buildings in United States*

Ownership	Square feet (millions)	Dollar cost per square foot	Cost (millions)
City:			
Less than 2,500	70	10	$700
2,500 population and over	85	20	1,700
County	125	25	3,125
State	50	30	1,500
Total	330		7,025

Source APWA Civic Building Survey.

B. Costs and User Charges

CONSTRUCTION COSTS

Construction costs for multipurpose public buildings may vary widely. A simple structure, with a minimum of mechanical requirements, may be constructed for as low as $7 a square foot. At the other extreme, a complex multistory structure highly mechanized with sophisticated electrical, mechanical, and air-control systems can cost more than $60 per square foot.

On the basis of a recent survey conducted by APWA a rough estimate of the current cost of facilities has been prepared. A median cost of $30 to $40 per square foot was reported including land costs. It can be seen from the following table that there is considerable variation. Many factors such as land costs, community standards, labor costs, et cetera, contribute to this variation.

TABLE V.—*General-purpose public building costs*

Size (square feet):	*Total cost*
10,000 to 15,000	$400,000 to $800,000.
15,000 to 75,000	$1,000,000 to $2,000,000.
100,000 to 200,000	$4,000,000 to $7,000,000.
200,000 to 500,000	$10,000,000 to $30,000,000.

Source: APWA civic building survey.

C. Trend of Capital Outlays

Since the end of World War II there has been a rapid rise in annual expenditures for general purpose public buildings. In 1950, State and local governments were spending about $50 million per year. By 1960 that amount had increased threefold. The current rate is approximately four times what it was in 1950. The figures are given below:

TABLE VI.—*Value of general-purpose public buildings put in place (1950–64) (State and locally owned only)*

[In millions of dollars]

Year:	*Amount*
1950	53
1955	83
1958	135
1959	140
1960	151
1961	175
1962	164
1963	195
1964	218

This sharp increase in annual expenditures reflects several changes in our society. One is that the population of the United States is expanding rapidly and virtually all of that growth is in urban areas. The increase is in part related to the inflationary trend of prices in the period designated. Another factor is the generally increasing affluence of our society and consequently, not only an increasing ability to pay for governmental services, but the willingness to pay for more sophisticated public works facilities.

Of the current capital outlay of $200 million for general purpose public buildings almost half is spent by county governments. Another

one-third is spent by municipal governments and the balance, about one-sixth, is expended by State governments.

SUMMARY

In summary, there have been about 25,000 public office buildings built by State and local governments in the United States with a total gross floor area of about 330 million square feet. On the average, these structures are 35 years old (18 percent are 60 years old or older). The value of these existing structures is about $7 billion with a median replacement cost of about $30 to $40 per square foot. The rate of capital expenditure for general purpose public buildings has been increasing rapidly (threefold in the last decade) and is currently at the $200 million per year level. In the past the majority, or 70 percent, of civic buildings have been financed by tax-exempt municipal bonds. Federal grants have accounted for about 10 percent of the cost of these facilities. Another 15 percent of the cost has come from direct appropriation from tax sources, particularly used in the case of State financing. The remaining 5 percent came from miscellaneous sources such as State aid, rents, utility service charges, et cetera.

D. Needs and Prospective Capital Outlays

In estimating the probable "unmet needs" for the next 10 years with respect to general purpose public buildings, there are several major considerations. The basic projection is a continuation of past trends. However, possible modification due to changes in policy or economic conditions are considered. The resultant projection gives a range of probable costs for the next 10 years.

Indications are that during the next decade, 1966–75, that the capital requirements for general purpose public buildings will exceed $3 billion. The annual capital expense is projected to rise from $200 million per year at present to about $400 million per year by 1975.

This 100-percent rise in annual capital expenditures over the next 10 years is based on these trends:

Population, current rate of increase: 20 percent per 10 years.

Construction cost, current rate of increase: 20 percent per 10 years.[4]

Government employment, (local and State only) current rate of increase: 50 percent per 10 years.

General rise in quality of facilities: At least 10 percent per 10 years.

In the recent APWA survey, those responding indicated a need for an increase of at least 10 percent in additional revenue from other sources such as Federal grants.

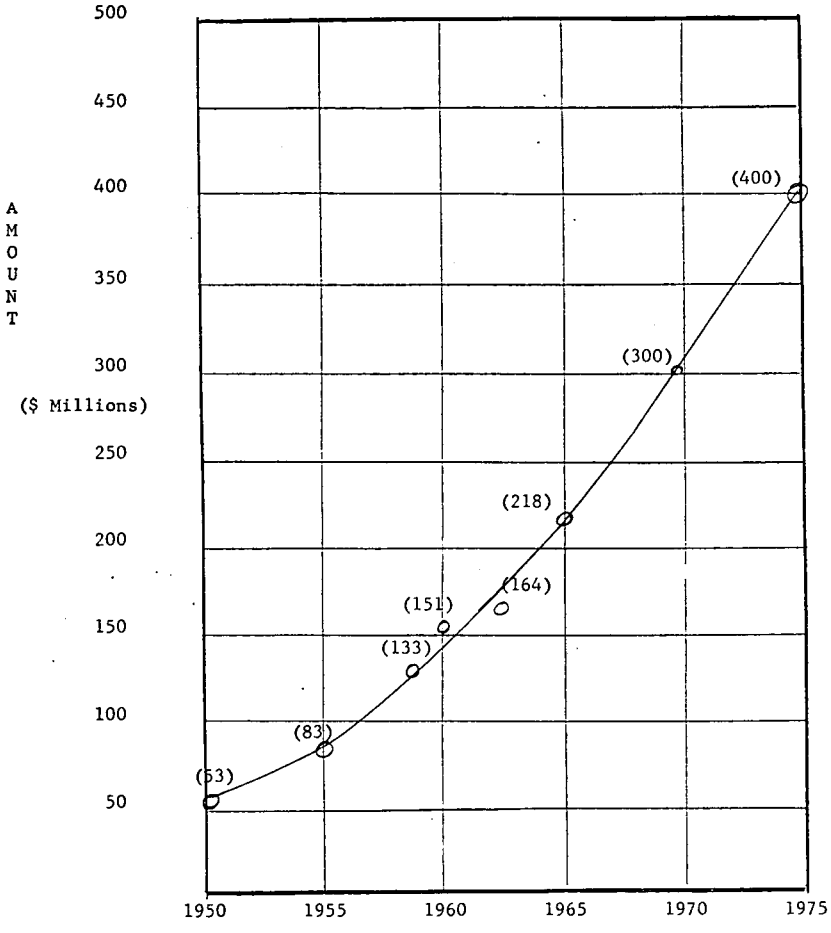
It is important to point out that the projected expenditures for general purpose public buildings are primarily a projection of past trends. The amount that will actually be spent can vary considerably depending on general economic conditions as well as governmental policy. As an example, there are now large antipoverty programs and youth training programs, all requiring space that had

[4] The increase for 1965 was 3 percent and there is some indication that 20 percent may be a conservative figure.

CHART I

TREND OF CAPITAL OUTLAY

For General Purpose Public Buildings



Sources: Statistical Abstract of the United States
Census of Governments, 1957 and 1962
Construction Review, United States Department of Commerce
APWA Civic Building Survey

not been foreseen. Between 1925 and 1935, because of the depression, expenditures for nonresidential public buildings dropped 50 percent. Other factors affecting cost of construction include policy decisions on when and where to buy land. Property purchased well in advance of need can frequently be procured for much less than property acquired at the time of construction. Careful site selection providing for future expansion can also reduce the overall cost of construction. Cooperation between different levels of government,

such as city and county in the construction of facilities should also, in some cases, reduce costs. One larger facility may very well be less expensive than several smaller facilities. And the efficiency of operation should be considered in any such decision. A further consideration of expense is the ownership of public buildings versus the rental of space for public needs. There is no clear consensus on whether it is better to rent or to own. Generally, each situation has to be evaluated on the basis of overall cost, permanency of occupancy, future space needs, location, use and public convenience. At present, about 10 percent of general purpose public building space is rented, an indication of preference for ownership over renting. Another alternative that has been used successfully is the long term lease or lease-purchase contract whereby the structure is built privately and leased or purchased over a long period by the public agency. Pennsylvania is following such a program.

Between 1950 and 1960, the dominant population growth has been in metropolitan areas over 500,000. Their population has increased by 45 percent. Most of this growth has been in the suburban areas. On this basis it is projected that a little less than one-half of the capital requirements during the next 10 years will be in these suburban areas. Cities with populations of less than 2,500 have only increased in population by 1 percent between 1950 and 1960. Since these cities represent less than 5 percent of the total population it is projected that the need in these cities would be only a small percent of the total. Most of the balance of the projected needs, a little more than one-half, is projected to be in the central cities which have half the urban population. It is estimated that about 10 percent of the projected needs are in "independent" cities between 2,500 to 50,000 population; that, is, cities outside metropolitan areas.

It is expected that in the next 10 years there will be no significant change in the proportion of capital outlay for general-purpose public buildings spent by the State and local governments. This would suggest that about half these expenditures would be spent by county governments, a little less than a third by municipal governments and the balance by State governments.

Past trends indicate that about 70 percent of the general-purpose public buildings have been financed by tax-exempt bonds. About 15 percent have been financed directly from appropriations from tax resources. Federal grants have accounted for about 10 percent. In view of current trends in such areas as pollution control, urban renewal, et cetera, and a growing municipal financial pinch, Federal participation may be expected to increase in the next 10 years.

In summary, then, the possible variation over the next decade is considerable. It could range from a low of a little over a billion dollars, in the case of a major depression, to as much as $5 billion or more depending on the degree of inflation, quality of construction and design, and local, State, and Federal policy.

The probable range of capital cost for general purpose buildings during the next decade is likely to be in the order of $3 billion. Assuming a variation of 10 percent the range would be from $2.7 billion to $3.3 billion.

The indicated "gap" between local funds available and cost is about 10 percent or $300 million in the next 10 years. This would be a gap of $20 million annually starting in 1965 and increasing to $40 million annually by 1975. Since this figure is a projection of his-

torical data it does not reflect increased governmental activity in public works fields. The annual gap will increase proportionately to increased activity in these areas. Furthermore, if financing is eased by some form of subsidy, it may be assumed that obsolete buildings will be replaced at a more rapid rate than at present. This would further tend to increase annual expenditures and increase the gap.

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CHAPTER 42

Industrial Plants Financed and Owned by Local Governments*

The issuance of tax-exempt bonds by a municipality or other local government to finance the acquisition, construction, or improvement of industrial facilities to be leased to a private company is known generally as "municipal industrial financing." Such financing by local governments is authorized at present in 28 States, as shown in table 1, and limited types of such financing are authorized in a few additional States.

After widespread defaults in the period 1837–45 in bonds issued by local governments to assist certain types of private business, most of the States adopted constitutional amendments prohibiting the State or its municipalities from issuing bonds or loaning their credit in aid of private business. To permit municipal industrial financing in States with such constitutional prohibitions against the use of local government credit for the benefit of private business, constitutional amendments were required in some States, but in other States the courts held that the authorizing legislation was constitutional on the ground that it was basically for the benefit of the public or that, in the case of revenue bonds, it did not involve a pledge of the credit of the local government.

The present type of municipal industrial financing was initiated by Mississippi in 1936. Kentucky followed in 1948 and Alabama and Tennessee in 1951. This type of financing originated in an attempt to attract industrial plants to a few Southern States. Several States have authorized such financing in recent years only so that they could compete with other States by offering the same inducements to attract or keep industry.

Table 2 lists the number of issues and the dollar amount of municipal industrial financing in each State in the period 1956–64. This table shows that 5 States (Alabama, Arkansas, Kentucky, Mississippi, and Tennessee) have accounted for 88.4 percent (465) of the 526 issues in the indicated period and that those 5 States have accounted for 82.4 percent ($652 million) of the $791,342,000 in the dollar amount of such issues.

Table 3 lists the dollar amount of municipal industrial financing in each year from 1956 through 1965, a total of 526 issues aggregating over $791 million. Table 3 includes all of the issues of municipal industrial bonds for which information has been obtained by the research department of the Investment Bankers Association, but it is believed that there have been substantial additional amounts of such financing.

Table 3 indicates the tremendous expansion in the use of such financing in recent years, with the total dollar amount only $40 million in 1960, but over $213 million in 1965. In the first 5 months of 1966 there already have been five large issues of revenue bonds which aggregate over $200 million.

*Prepared by the Investment Bankers Association, with minor editing by committee staff.

Most of the States which have authorized municipal industrial financing permit only revenue bonds; that is bonds which are secured only by a pledge of the revenues from the facility financed by the bonds. Some States, including Alabama, Louisiana, Mississippi, and Tennessee, permit either general obligation bonds or revenue bonds. General obligation bonds are secured by a pledge of the full faith, credit and taxing power of the issuer, so that if the revenues from rental payments on the industrial facility are not sufficient to pay the principal and interest on the bonds, the municipality is committed to levy taxes in sufficient amount to pay such principal and interest. Mississippi accounts for a large percentage of the general obligation bonds which have been issued by municipalities to finance industrial plants, with 229 issues aggregating over $79 million out of the total of 315 issues of general obligation bonds aggregating $173 million.

Where municipal industrial financing is effected by revenue bonds, which is now the case for most issues outside of Mississippi, the only security for the bonds is the revenue from rental payments from the industrial facility, a private corporation.

The principal feature of all municipal industrial financing is the fact that tax-exempt bonds of local governments are issued to finance plants for the use of private companies. Since the tax-exempt bonds obtain a lower rate of interest, increasing numbers of large corporations are utilizing this type of financing. This trend is reflected in table 3 and in table 4 which lists the 15 largest municipal industrial bond issues. The industrial facilities financed by municipalities through tax-exempt bonds and leased to private companies have included chemical, tire, aluminum, fertilizer, sugar refining, paper, plastics and petrochemical, steel, meat processing, shoe, paint, textile, clothing, furniture, luggage, and container plants or factories.

The tax exemption of bonds issued by States and municipalities is based on a statutory exemption and the constitutional doctrine of reciprocal immunity, on the theory that bonds issued by local governments will be for governmental purposes. The use of tax-exempt financing provides industrial facilities with a competitive advantage over other companies in the same business that do not employ tax-exempt financing.

TABLE 1.—*Authorization for municipal industrial financing, Apr. 15, 1966*

Legislation authorizing the issuance of municipal bonds to finance industrial plants to be leased to private companies has been adopted in the following 28 States (on the basis of available information as of this date, no bond issues in the States marked with a "†" and 6 or fewer issues in the States marked with an "*"):

Alaska [1]	Kentucky	New York† [2]
Alabama	Louisiana	North Dakota*
Arizona*	Maine†	Ohio*
Arkansas	Maryland*	Oklahoma*
Delaware*	Michigan†	Tennessee
Georgia	Mississippi	Vermont†
Hawaii*	Missouri*	Virginia†
Illinois†	Nebraska	West Virginia*
Iowa*	New Mexico*	Wyoming†
Kansas*		

[1] In Alaska there is no specific authorizing legislation but the constitution authorizes cities to exercise all powers not prohibited to them.

[2] In New York only a State development agency is authorized to issue bonds to assist in industrial development.

The following States have been omitted from the list for the indicated reasons:

Minnesota—because the legislation authorizes only 1 municipality and 1 port authority to issue bonds for industrial purposes.

Washington—because the legislation permits port districts created by counties to establish industrial development districts only to develop land use and advance credit.

Wisconsin—because the legislation authorizes the issuance of bonds only for the purchase of land for use as industrial parks.

TABLE 2.—*Municipal industrial bond issues, by State, 1956–65 (on basis of information available to Investment Bankers Association)*

	Issues	Amount
Alabama	79	$295,833,000
Arizona	1	22,250,000
Arkansas	38	100,106,000
Delaware	2	2,658,000
Georgia	7	14,090,000
Kansas	6	2,769,000
Kentucky	69	123,398,000
Louisiana	8	10,500,000
Michigan	3	970,000
Mississippi	237	86,388,000
Missouri	11	16,290,000
Nebraska	2	8,750,000
New Mexico	4	6,630,000
Oklahoma	6	5,167,000
Tennessee	42	46,289,000
West Virginia	2	2,604,000
Others	9	46,650,000
Total	526	791,342,000

TABLE 3.—*Municipal industrial financing, volume by year (number of issues and dollar amount)*

	General obligations		Revenue bonds		Total	
	Number	Amount	Number	Amount	Number	Amount
1956	9	$1,411,000	1	$110,000	10	$1,521,000
1957	14	3,461,000	6	3,871,000	20	7,332,000
1958	35	8,006,000	6	17,045,000	41	25,051,000
1959	31	8,200,000	5	10,306,000	36	18,506,000
1960	44	29,454,000	10	11,217,000	54	40,671,000
1961	36	11,531,000	10	60,240,000	46	71,771,000
1962	39	16,736,000	27	67,581,000	66	84,317,000
1963	39	29,572,000	31	105,913,000	70	135,485,000
1964	40	49,339,000	51	143,838,000	91	193,177,000
1965	28	16,026,000	64	197,485,000	92	213,511,000
Total	315	173,736,000	211	617,606,000	526	791,342,000

TABLE 4.—*15 largest municipal industrial bond issues*

1961: $25,000,000 (March) Cherokee, Ala. (population 1,400) to build a chemical plant for Armour & Co.

1962: $21,000,000 (December) Opelika, Ala. (population 15,678) for U.S. Rubber.

1963: $50,000,000 (October) Lewisport, Ky. (population 750—employs 1,000) to build an aluminum plant for Harvey Aluminum Co.

1964: $23,000,000 (June) Helena, Ark. (population 11,500) to build a fertilizer complex for Arkla Chemical Corp., a subsidiary of Arkansas-Louisiana Gas Co.

$22,500,000 (September) Maricopa County, Ariz. (population 663,510) for American Sugar Refining Co.

$20,000,000 (October) Blytheville, Ark. (population 20,797) to build an anhydrous ammonia plant for Continental Oil Co.

$45,000,000 (December) Prattville, Ala. (population 6,616) to build a plant for Union Bag-Camp Paper Corp.

1965: $25,500,000 (March) Selma, Ala. (population 28,385) for Hammermill Paper Corp.
$45,000,000 (March) Phenix City, Ala. (population 27,630) for Mead Corp. and Inland Container Corp.
$55,000,000 (August) Scottsboro, Ala. (population 6,449) Revere Copper & Brass Co. plant.

1966: $60,000,000 (February) Clinton, Iowa (population 33,589) for construction of a plastics and petrochemical plant for Chemplex Co., a venture sponsored jointly by Skelly Oil Co. and American Can Co.
$30,000,000 (announced February) Lorain, Ohio (population 68,932) Litton Industries of Los Angeles shipbuilding enterprise.[1]
$70,000,000 (April) Camden, Ala., to finance construction of lumber, plywood, and paperboard facilities for United Fruit Co., Boston, and MacMillan, Bloedel & Powell River, Ltd., Vancouver, Canada.[1]
$35,000,000 (April) issued by Northern Delaware Industrial Development Corp., an agency of the State of Delaware to finance acquisition and modernization of steel plant from the Phoenix Steel Corp. for that corporation.
$34,400,000 (April) Ashland, Ky. (population 31,283) to build a steel plant for Armco Steel Corp.[1]

[1] Sale expected soon.

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