448

GUIDELINES FOR ESTIMATING THE BENEFITS OF PUBLIC EXPENDITURES

HEARINGS

BEFORE THE

SUBCOMMITTEE ON ECONOMY IN GOVERNMENT

OF THE

JOINT ECONOMIC COMMITTEE

CONGRESS OF THE UNITED STATES

NINETY-FIRST CONGRESS

FIRST SESSION

MAY 12 AND 14, 1969

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GUIDELINES FOR ESTIMATING THE BENEFITS OF PUBLIC EXPENDITURES

MONDAY, MAY 12, 1969

CONGRESS OF THE UNITED STATES,
SUBCOMMITTEE ON ECONOMY IN GOVERNMENT
OF THE JOINT ECONOMIC COMMITTEE,
Washington, D.C.

The Subcommittee on Economy in Government met, pursuant to notice, at 10:15 a.m., in room S–407, the Capitol, Hon. William Proxmire (chairman of the subcommittee) presiding.

Present: Senators Proxmire, Symington, Jordan; and Representative Conable.

Also present: John R. Stark, executive director, Robert H. Haveman, economist, and Douglas C. Frechtling, minority economist.

Chairman PROXMIRE. The Subcommittee on Economy in Government will come to order.

This week, the Subcommittee on Economy in Government will hold 2 days of hearings on "Guidelines for Estimating the Benefits of Public Expenditures." Today's session opens this investigation.

At this point in the record we will include, without objection, the announcement of these hearings and list of witnesses.

Monday, May 5, 1969.

CONGRESS OF THE UNITED STATES: JOINT ECONOMIC COMMITTEE

SUBCOMMITTEE ON ECONOMY IN GOVERNMENT

Senator William Proxmire (D-Wis.), Chairman of the Subcommittee on Economy in Government of the Joint Economic Committee, announced today that the Committee will hold two days of hearings on the procedures applied by Federal agencies in evaluating the economic benefits of public expenditures. The hearings will be held on May 12 and 14. The schedule of witnesses is attached.

In announcing the hearings, Chairman Proxmire noted that: "The Joint Economic Committee has had a deep and longstanding interest in the question of applying economic criteria to public investments. In recent years, this concern has focused on the procedures employed in the Planning-Programing-Budgeting System.

"The hearings of this Subcommittee last year on the application of appropriate discounting practices has stimulated improved practice in the Executive agencies. Moreover, the Bureau of the Budget has assured us that they are developing a guideline document to agencies which will insure consistent discounting practices throughout the government. It is my hope that these hearings on benefit estimation will result in another guideline document.

"With increasing demands on the Federal budget," Chairman Proxmire continued, "it is absolutely essential that we develop a meaningful set of techniques by which to measure the economic worth of government expenditures. The advances made by economists and analysts in Federal agencies in estimating the benefits of government expenditures are impressive, but a substantial effort is still needed before this sort of analysis becomes an effective force in budget allocation."

"Sensitive analysis of public expenditures," Senator Proxmire said, "has already taught us much about the economic effects of public expenditures, even though we are as yet unable to precisely estimate some of the impacts. Procedures to value these nonmarketable outputs must be developed and present inconsistencies among agencies in the application of benefit estimation must be erased. The Bureau of the Budget must begin to play a stronger role in insuring that these procedures are developed and applied. The reluctance of the Congress to inform itself on the importance of the Planning-Programing-Budgeting System for effective decisionmaking must be overcome. The testimony should assist the Congress and the Executive Branch to focus on the value of government expenditures in searching for the most worthwhile alternatives. It should assist the Bureau of the Budget in defining the appropriate concept of national benefits and in framing guidelines for on-going calculation of expenditure benefits by Federal Government agencies." Senator Proxmire added, "We should learn a great deal about the problems which the agencies are facing in implementing the Planning-Programing-Budgeting System and better appraise how the Legislative Branch can inform itself on the value of PPB-type information."

HEARING ON GUIDELINES FOR ESTIMATING THE BENEFITS OF PUBLIC EXPENDITURES
MAY 12 AND 14, 1969

MONDAY, MAY 12, 10 A.M.

Guidelines for benefit estimation in the Federal Government

Jack W. Carlson: Assistant Director for Program Evaluation, Bureau of the Budget.

Elmer B. Staats: Comptroller General of the United States.

WEDNESDAY, MAY 14, 10 A.M.

The benefits of public expenditures—Concepts and measurement

Robert Dorfman: Professor of economics, Harvard University.

Jack L. Knetsch: Professor of economics and director, Center for Natural Resource Policy Studies, the George Washington University.

Julius Margolis: Professor of economics, Stanford University.

Chairman PROXMIRE. During the past several years, the Joint Economic Committee has attempted to stimulate an increase in the level of economic analysis which is applied to Federal expenditure decisions. We have encouraged executive branch efforts to develop estimation procedures and to provide decisionmakers with more information and analysis on program decisions. When the Planning-Programing-Budgeting System was introduced in 1965, we strongly supported its implementation. Similarly, we have encouraged the development of an analytic capability in the General Accounting Office. We must not relax our efforts to rationalize and objectify the process of making expenditure decisions in both the legislative and executive branches.

Basic to a more open and explicit process of making expenditure decisions is information on the benefits and costs of the alternatives with which we are confronted. While the costs of many programs can be quantified with some accuracy, the social benefits of most programs are more difficult to estimate. It is generally recognized that meaningful procedures of benefit estimation must be developed if the PPB System is to realize its potential.

In this set of hearings, we will look at both the appropriate concept of economic benefits viewed from a national point of view and the practice of benefit estimation as it is carried on in the Federal Government. With respect to the question of benefit concepts, we hope to distinguish between primary and secondary benefits and determine

the appropriateness of each of these for Federal Government expenditure evaluation. The difficulty of evaluating programs which serve multiple objectives will also be investigated.

In studying the practice of benefit estimation, we want to learn of the quality and consistency of benefit estimates in Federal agencies and of the efforts of the Bureau of the Budget to generate improved practice through the PPB System. Hopefully, these hearings will stimulate the Bureau of the Budget to develop a set of guidelines to assist the agencies in their benefit estimation efforts. The recent efforts of the General Accounting Office in this area will also be of interest to us. I am sure that our witnesses of this morning and next Wednesday will be able to enlighten us on these matters of concept and practices.

Before hearing the statements of Mr. Staats and Dr. Carlson, I would call attention to the recent Annual Report of the Joint Economic Committee which stated:

> Because of its responsibility for directing the PPB System, the Bureau of the Budget should, without delay, formulate more specific and detailed guidelines for agency analysis of their expenditure programs. One area in which guidelines are necessary is in the application of discounting analysis to public investment with benefits and costs which extend into the future * * *. We judge that the Bureau of the Budget can be of substantial assistance in improving the appropriate use of this technique as well as in developing improved procedures for measuring the national economic benefits and costs of various public expenditures.

Efforts to improve the practice of benefit estimation and the concepts on which it is based are especially necessary today in the face of developments which would weaken existing standards of benefit estimation and emasculate the benefit-cost criterion.

We welcome Elmer B. Staats, Comptroller General of the United States, and Jack Carlson, Assistant Director for Program Evaluation at the Bureau of the Budget. On Wednesday, May 14, 1969, we will hear the testimony of three prominent economists on "Guidelines for Estimating the Benefits of Public Expenditures."

Mr. Staats, you have a concise statement. You may proceed, sir.

STATEMENT OF HON. ELMER B. STAATS, COMPTROLLER GENERAL OF THE UNITED STATES

Mr. STAATS. We are pleased to appear before your subcommittee to express our views on the importance of measuring the benefits of federally funded programs. We know that your committee has done much to demonstrate the need for more accurate measurements so that the potential value of program-budgeting can be realized more fully.

We were pleased to appear before your subcommittee in January 1968 to report on the results of our survey of discounting practices in Federal agencies. We have followed with interest your subsequent efforts to improve understanding of these important matters. In the area of measurement of social program benefits, many conceptual and analytical problems remain unsolved. As a result, planning, programing, and budgeting (PPB) has not yielded the full range of improvements in decisionmaking which proponents expected of the system when it was launched by the President in August 1965.

Measurements and Goals

We believe that the lack of agreement as to how social or public benefits are to be measured is a major reason why departments and agencies have not made more use of the PPB system. In effect PPB was proposed on the assumption that goals and objectives were known or could be reasonably defined for each program. This assumption did not appear to recognize that no consensus has been reached regarding national goals and objectives. Thus, the public's preferences may frequently differ from the preferences indicated by the quantitative measures of benefit chosen by a particular set of analysts or program planners.

If our goal were solely economic efficiency, then a process such as PPB would guide us toward that one ultimate objective. But we do not seek one goal. Instead, we have numerous goals, such as security, progress, and prosperity, freedom of choice, strengthening of the free private enterprise system, and many others. These goals cannot in all cases be accomplished to be consistent with the highest degree of economic efficiency. However, there is an increasing public recognition that our resources are not unlimited and that for that reason at least we must try to develop better means for making more rational choices.

Some aspects of social programs which the public finds desirable are difficult to measure and quantify by numbers. We are interested in recognizing more clearly when such nonquantifiable preferences are involved as well as in the better measurement of what is quantifiable. For example, although studies of the Headstart program have shown very little economic benefit, it has continued to be a very popular program, among community leaders, parents, and many professional educators. This popularity implies values, for which a measurable basis has not yet been found. We believe it is important that such apparent distinctions in measurable versus implied benefit should be fully aired so that the public preferences can be tested.

Difficult problems are involved in providing improved measurements, particularly of social benefits. Data frequently is inadequately classified. What is collected is frequently incomplete, unreliable and unrepresentative. Analytical approaches are primitive partly because of the lack of data.

Measurement Benefits of Social Programs

Overall indicators of social benefit

I alluded earlier to the problem of setting goals as prerequisites to the selection of benefit measures. This is a fundamental consideration, and in the measurement of social program benefits it is more than usually troublesome because the Nation's social goals and premises are so frequently a matter of dispute. Many examples come to mind but a critical one is in the field of education.

The social benefits of education have long been recognized. Ten years ago, President Eisenhower's Commission of National Goals affirmed:

> Education is essential not only to the individual fulfillment but to the vitality of our national life. The vigor of our free institutions depends upon educated men and women at every level of society.

We would agree. We can also agree when the Commission urged that "every (educational) discipline be strengthened and its effectiveness enhanced."

However, we immediately face difficulties when we try to measure such things as the enhancement of effectiveness. First of all, we find that a number of basic assumptions underlying the educational process, and profoundly affecting crucial questions of educational policy, are still at issue. Some of these are pointed out in a recent article by Dr. Hendrik Gideonse, published in "The HEW Forum Papers."

They center, essentially, around the age-old question of heredity versus environment as a factor in human learning. While such matters may sometimes seem very abstract in the context in which they are often discussed, they immediately become very concrete and relevant when one is faced with the task of measuring the effectiveness, or benefits, of such efforts as a federally sponsored remedial education program.

What I am suggesting is that even when we can agree among ourselves as to our goals, we may still find ourselves uncertain of premises, standards, and assumptions leading to the achievement of those goals. Consequently, as a people we find ourselves uncertain about the quality of our measures.

Another influence affecting the quality of benefit measures—especially those of social programs—is the availability of data from which measures may be constructed. This is intimately related to the problem of uncertain premises, standards, and assumptions. Though some of our standards may be uncertain, the necessities of day-to-day performance require that such standards be set, either explicitly or implicitly. Having set them, we try to accumulate data on program activities so that performance can be measured against standards. We assume that the data that we gather, and the measures that we construct from them, are relevant to these standards. In other words, we would like to think that our data banks and information systems are created in response to, and follow from, our standards. This is often not the case.

Information systems tend to become inflexible over time. They may become ends in themselves to those concerned with their operation. This is a subject on which much could be said, and I do not want to belabor it here, but I think it is very important to recognize that measures of performance and of benefit, may sometimes simply be creatures of what data is available, and the data that is available may not be that data which is most relevant to the standards against which we would like to measure.

There is more than one reason for this. As we well know, some things—especially in the areas of social concern—are extremely difficult if not impossible to measure. There are other things which might in fact be measured, but upon which—for whatever reasons—data has not been accumulated. In such cases, efforts to measure benefits are foreclosed by data gaps in the information systems.

I think that the recent efforts of the President's Panel on Social Indicators are likely to provide a focus that will clarify our present circumstances and move us in the direction of doing better those things which are possible in the measurement of social program benefits. While fundamental questions such as hereditary and environmental influences in education are not settled—and they may remain unset-

tled for as long in the future as they have been in the past—and many of the measures which may be applied to the benefits of social programs are likely to lack a sound basis, there is no doubt that they will continue to be applied. Our social realities demand measurement; measured they will be; and, if the measures are not as good as we would like, I expect we will continue to use them as best we can. We must remind ourselves, and often, that, when we are dealing with the measurement of social program benefits, we are in an area the very complexity of which invites constant progress.

MEASUREMENT OF SPECIFIC PROGRAM BENEFITS

What I have said to this point is a rather long preface to some specific illustrations of measurement of social program benefits. The illustrations are drawn from GAO's efforts in response to the 1967 amendments to the Economic Opportunity Act of 1964 which required the General Accounting Office to evaluate the extent to which the programs authorized by that act were achieving their objectives.

I have selected three education programs for discussion—Headstart, Upward Bound, and adult basic education. We inquired into the performance of a wide variety of other programs such as in manpower, health, and education. But I have chosen to discuss three because they provide some interesting contrasts in the problems and the possibilities of measurement of education programs designed for groups in the population which share the common denominator of disadvantage but which have little else in common.

The Headstart program is directed to the children who have not yet reached the compulsory school age and who come from economically disadvantaged families. It is intended to provide "comprehensive health, nutritional, education, social, and other services * * *" to help its participants "to attain their full potential * * *". While Headstart is popularly thought of as an education program, it is clearly more than that. Education is deliberately provided in a context of health, nutritional, social, and other services. In a sense, Headstart might be taken as a model of the difficulties of measuring the benefits of a complex social program.

In our evaluation, we used both test scores and teacher evaluations to ascertain the extent to which the verbal skills, and motivational, social and emotional development of children who had participated in the Headstart program differed from non-Headstart children having comparable backgrounds. This is basically the same approach taken by Westinghouse Learning Corp. and Ohio University in their recently completed study of the impact of Headstart.

General statements of the plan of research for such studies conceal a multitude of specific problems. For example, the attempt to achieve comparability in selecting the Headstart group and the non-Headstart, or control group; the selection of Headstart centers for study; the procedures for collecting data; and the selection of testing instruments. There are pitfalls in each of these, especially in the attempt to match control and test groups, for it is on the quality of this matching that the proper isolation of program benefits from other influences on the test group depends.

But once these problems are overcome—and program benefits are identified—we are still left with the fact that a program such as

Headstart can, at best, be measured only in terms of relatively short-term benefits. The program is hardly 5 years old and for this reason alone, long-term benefits are presently indeterminable. A more fundamental fact is that long-term benefits are likely to remain indeterminable as the passing years bring a multitude of other influences to bear on the children who have experienced the program, as well as those who did not. As a practical matter, then, we are constrained to measure programs such as Headstart in a very limited way. Attempts to project our results very far into the future, particularly in terms of economic benefits, must be done with full realization of the uncertainty involved.

One is faced with a quite different set of circumstances in attempting to measure the benefits of a program such as federally sponsored adult basic education. Adult basic education programs have been funded cross the country by both OEO and HEW. They are generally managed as local initiative projects and are much less organized in content, and even in objective, than are Headstart projects. They are, in fact, quite diverse. GAO's review found that local program content varied from the most elementary kind of education to curricula bordering on vocational training. Local program objectives were not always clear. We found it difficult to measure program benefits by formal standards.

When we measured dropout rates and inquired into the reasons for them, we found that some of the participants had had as their personal objective the desire simply to learn to read well enough to acquire a driver's license. Upon achieving this, they dropped out. Here was a possible area of program benefit, which formal measures of dropout rates might tend to obscure.

When we tried to measure the positive results of the adult basic education programs in terms of the percentages of participants who proceeded to prevocational or vocational training programs, this measure also obscured areas of potential benefit. Many participants were housewives who, for a variety of personal reasons, were trying to improve their educational level, but were not interested in vocational training or in obtaining jobs. Other participants already had good jobs and were also attending simply to improve their educational level.

We concluded that unquestionably, some benefits were being achieved. But questions remained. Were these benefits worth the programs' cost in resources? Were the benefits achieved those which related best to the program goals of creating employability in its participants and making them "better able to meet their adult responsibilities."?

The third education program which I would like to discuss—the Upward Bound program—presents a different kind of challenge in the measurement of benefits. It was designed "to generate skills and motivation necessary for success in education beyond high school among young people from low-income backgrounds and inadequate secondary school preparation."

The measurement of the benefits of the Upward Bound program were found to be greatly facilitated by two factors: one, that a relatively large data base on the characteristics and performance of participants has been maintained. Two, that the long term benefits of a college education can much more easily be assessed than can the long term benefits of participation in a preschool program.

Unlike Headstart, whose participants are more than 10 years away from full-time employment, and the adult basic education programs, one-quarter of whose students are currently nonworking mothers, Upward Bound participants can shortly be expected to be in the job market. The expected economic benefits of this program although still uncertain, have been estimated. In fact, one of the contractors GAO employed to assist in evaluating the Economic Opportunity programs—Resource Management Corp. of Bethesda—was able to prepare a formal benefit-cost analysis of this program which indicates that direct economic benefits are quite likely to exceed costs.

Even with this relatively adequate data, the assessment of a program such as Upward Bound is still not without serious difficulties. They stem from a problem which I mentioned earlier in connection with Headstart. That is the problem of isolating program benefits from other influences and effects to which program participants are exposed.

In practice, it is the problem of matching a control group with a test group, and when we are dealing—as in the case of Upward Bound—with motivational question, we find that measurement is difficult. There are, in fact, measures which our contractor drew upon: measures of self-evaluation of intelligence, self-esteem, nonalienation, and other variables affecting motivation. We know when we employ these measures that we are operating on delicate subjects with relatively crude instruments and we know that appropriate caution is in order. Nevertheless, these attempts at measuring results appear to us to be far better than no measures at all of what is being attained nationally for the total funds appropriated for each program.

Education programs and the measure of their benefits—such as I have just discussed—are related in many ways to the manpower training programs sponsored by the Federal Government. Like the adult basic education and Upward Bound programs, much of our manpower training is directed to providing a second chance, educationally, to those who have failed in, or who have been failed by, our schools and standard curriculums. In a sense, our manpower training programs are, at least in part, an effort to correct past mistakes and to deal with the burgeoning effects of poverty, technological change, and other social dilemmas.

There is a clear danger that unless the Government knows what it is producing from these programs—unless the Government knows and knows very specifically what their benefits are—old mistakes will simply be repeated, or reinforced, and new ones invented.

I mentioned earlier that manpower training was an area into which GAO inquired in some depth during the course of its review of the Economic Opportunity programs. We conducted extensive examinations of work experience and training, Job Corps, and Neighborhood Youth Corps projects throughout the country. One of our contractors prepared a benefit-cost analysis of the latter two programs. We employed another contractor to locate and interview some 2,000 participants who had been in these and other manpower training programs—MDTA, institutional training, for example—and thereby to provide us with information on the post-training performance of these individuals in the job market. We employed a number of consultants who had achieved reputations as observers and analysts of Federal manpower training efforts.

We found that there are economic benefits of manpower training programs which are more susceptible to measurement and quantification than the benefits of many other programs directed toward social advance and rehabilitation. Manpower programs generally share the objective of increasing the employability of their participants and this is something that can be measured, at least in part, in terms of job performance and income gains after the participants leave the programs.

There are the same problems discussed earlier of obtaining satisfactory control groups or other means of isolating program effects, and there is a problem—an expensive problem in our experience—of acquiring reliable information on the post-training performance of the former program participants. These problems exist, but they can be dealt with and overcome, and the manpower training programs offer, in general, an excellent opportunity for the practical and productive analysis of benefits.

The General Accounting Office is seeking to build upon its experience in reviewing the economic opportunity programs by undertaking a number of further evaluations in the manpower training area. We hope these will contribute to the information of the Congress in making its decisions on how to deal best with the alternatives available to the Nation in this area.

It happens that the first veterans of the Defense Department's Project 100,000 are just now beginning to leave the service for civilian life. The Department plans to follow the progress of these men in the civilian job market and try to assess benefits of the program as it relates to civil society.

At the same time, OEO and the Labor Department have recently awarded a contract for the followup and comparative analysis of the job performance of participants in five civilian manpower programs: MDTA, NYC, Job Corps, New Careers, and JOBS.

We view these as studies of great potential value. We will follow with interest and close attention the progress of the civil and defense agencies in their assessments of these program benefits. We will attempt, insofar as our resources will permit, to provide some useful assessments of our own.

Measurement of Benefits in Other Federal Programs

The ultimate measure—social benefit

A number of federally funded programs have benefits that are related to social benefits but expressed in other terms. Among these are programs—including investment programs—having as a primary objective the obtaining, or building up, of a capability or capacity. There are difficulties in measurement of such program benefits where the capability, in some cases, is in the nature of insurance or protection against a single catastrophic event or against yearly events. In this category we might properly include such programs as Minuteman, civil defense, and the 68 local flood control projects listed for the Army Corps of Engineers in the 1970 budget.

Programs for meeting essential needs and having capability objectives also may be included under this heading. The fiscal 1970 U.S. budget provides a number of examples. The section on education and manpower speaks of emphasizing "support for academic research, con-

struction, and other investments which help colleges and universities to sustain a high level of quality and provide continued leadership for meeting complex national problems." These are certainly broad social purposes, yet these program outputs must continue to be measured in narrow terms, for example, numbers of academic facilities and numbers of grants for libraries. The precise link from these numbers to a stricter accounting of social benefits still escapes us.

In the health resources programs we find programs being budgeted for building hospitals, for supporting medical and osteopathy schools, and for scholarships and loans to physicians, osteopaths, and nurses. These programs are intended to build up in our Nation, the capability to deliver health services and care. Thus they are intended to contribute ultimately to a number of social benefits and yet do not have these as their primary output.

It may continue to be proper to measure benefits of these kinds in administrative terms such as numbers of beds, of graduates, or of class rooms. The approximate numbers of each for which we need to provide may be ascertained as a result of an analysis. A high level of analytical competence and the availability of reliable and representative data are needed in order for such an analysis to be useful.

Yet other examples of programs having benefits that are ultimately social, are those which enrich lives. They have been expressed in terms of esthetic, recreational, and intellectual benefits. The extent that resources are to be drawn from other programs having more immediate and direct social benefits, is a matter of public preference.

I might mention here, the program in which the Federal Water Pollution Control Administration is making grants to States for the purpose of constructing sewage treatment plants. The resulting benefits to society are essential in that ready sources of usable water are necessary to industry and to municipalities. At the same time, esthetic and recreational benefits are created. These we recognize as socially good, yet their exact contribution to enriching our lives have not been measured even though monetary values have been assigned to days of recreation of various types.[1]

It is of interest to note that at least some of the local flood control projects mentioned earlier may have the potential for contributing to these benefits.

Among the alternative ways to improve water quality there is the possibility of flushing streams of pollution at periods of low flow with the water impounded by the flood control dams.

Under the heading of intellectual benefits, are programs such as the NASA Orbiting Astronomical Observatory (the OAO), support of the Smithsonian Institution, and many of the National Science Foundation grant programs. The latter include funding of the global atmospheric, the international biological, and the ionospheric observatory programs. As in all intellectual undertakings—of which research is one—we may infer that social benefits will come about. Many times these are deferred to the far future. It appears that the Congress has recognized in many ways, the worth of obtaining intellectual benefits to the extent even of maintaining a favorable postage rate for books and educational material.

[1] This matter is more fully discussed in a conference paper by Ruth P. Mack and Sumner Myers entitled "Outdoor Recreation" (published with other conference papers in "Measuring Benefits of Government Investments," Robert Dorfman, ed., the Brookings Institution, 1965).

MEASURING LOSSES OF SOCIAL BENEFITS

In approving a program based on its expected positive results, more consideration should be given to measuring social disbenefits that may also result. These losses of social benefits have been called external diseconomies by economists. For example, Herbert Mohring [2] in discussing benefit-cost ratios of urban highway investments says in part "poorly planned freeways can do, and likely have done, serious damage by fragmenting communities, disrupting existing communications patterns, and the like." In this case, the primary economic benefits can be estimated. In a regional or more aggregate sense other positive benefits include personal travel including travel to beaches, parks, and the like—which yield other positive social benefits. The social disbenefits which need consideration tend to be local in nature and under older legislation, may have been frequently overlooked in determining whether an alternative route might have overall, a higher social benefit. Recent amendments to urban renewal legislation have also recognized the problems created by earlier projects in dislocating people from their communities and in many cases from the only housing available to them.

In a similar vein, positive benefits from different programs may not be compatible or the programs may be directed to objectives that are at cross purposes to other benefits that society considers as highly desirable. Examples of such incompatibility in benefits between programs or of benefits at cross purposes are dam construction versus conservation, foreign aid versus balance of payments, expanded census questionnaires versus the right of privacy, excellence in education versus universal education.

INTERACTION OF PROGRAMS—NET POSITIVE BENEFIT

The subject of interaction is discussed in a publication of the State-local finances project of the George Washington University in their PPB note 7. The complex interaction among public programs is exemplified as follows:

> Services provided by one agency through its program expenditures will have an impact on the output and effectiveness of other public programs. Airport activities can adversely affect noise abatement programs; traffic control systems may reduce or enlarge the volume of motor vehicle accidents, and affect the volume of emergency ambulance services. Paving of more highway mileage may enlarge rather than reduce traffic congestion and also increase downtown parking facility requirements. Solid waste disposal systems may increase air pollution or lower it, and what is done about solid wastes may impair water-waste treatment. Reduction in air pollution acquired at the cost of added water enlarges water treatment requirements.

Among the results from the Agricultural Research Service's continuing research on pest control has been an increased use of more potent pesticides which have decreased crop losses. Yet as one result, the Agricultural Stabilization and Conservation Service is making indemnity payments to farmers excluding milk from markets due to pesticide residues.

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[2] The Brookings Institution, op. cit.

Overall Appraisal

We have shown by example the difficulty of finding agreed upon measures of benefit which could support an ordering of priorities. The goals of our society cannot be simply stated. If our goal were solely economic efficiency, then a process such as PPB would guide us toward that one ultimate objective. But we do not seek one goal.

Instead, we have numerous goals, such as security, progress and prosperity, freedom of choice, strengthening of the free private enterprise system, and many others. These goals cannot in all cases be accomplished to be consistent with the highest degree of economic efficiency.

There is an increasing public recognition that our resources are not unlimited and that for that reason at least we must try to develop better means for making more rational choices. We believe the PPB process can help to better organize these multiple considerations in the executive and legislative process.

In our system of checks and balances, striving for local or for self-interest has generated many benefits, particularly economic, which cumulate to the aggregate national economic well-being. It appears obvious that the same approach has not worked equally well in increasing the social benefits which we all value.

A basic question is whether sufficient attention has been given by either the public or private sectors to disbenefits or undesirable results, of public programs and privately motivated actions.

We believe a main reason for limited consideration of undesirable results is that these are sometimes indirect, and are very difficult to measure with criteria on which all can agree. For example, under older legislation, some of the urban highways created problems by fragmenting communities and disrupting existing local services. Amendments to urban renewal legislation have recognized the problems created by earlier projects in dislocating people from their communities and in many cases from the only housing available to them. In another area, the continuing research on pesticides has led to decreases in crop losses, but as one result, some milk must be excluded from markets due to accumulated pesticide residues. It seems to us that greater efforts should be made to avoid overstatement of positive benefits on which proposals are based and the omission of negative aspects.

The statement which we are presenting to you today is drawn mainly from our study in response to the 1967 amendments to the Economic Opportunity Act of 1964. This required the GAO to evaluate the extent to which the programs authorized by that act were achieving the objectives spelled out in the statute.

Evaluation of Benefits by the General Accounting Office

We believe in general that GAO can assist in appraising the cost-effectiveness studies made in support of programs submitted to the Congress. To do this, we see the need in GAO to increase our knowledge and proficiency or capability in this area from at least three standpoints. First, we want to be in a position to assist the Congress in connection with hearings or studies made by committees, and in helping formulate those studies which would be made directly by the committees of the Congress.

Second, there is a possibility that we will be directed by the Congress to make other evaluation studies of Federal programs comparable in scope to the one we are just completing which is a review of the achievement of objectives by the economic opportunity programs.

I might say here that there was a strong move made last year in the Senate, and in the House, to direct us to do this in the manpower training field. But as I will explain later, we are going into the program in a major way in any event, and for that reason the Congress did not pursue the matter.

Third, we hope and expect to be able to undertake studies of this kind on our own under the broad authority that we have under the Budget and Accounting Act. How fast we can do this, and how many of these studies we can make will obviously depend on the capability and the total number of our staff capable of conducting these kinds of analyses.

ISSUES INVOLVED IN MEASURING BENEFITS

The Congress is entitled to know why possible program alternatives were not accepted by the executive branch as well as to know whether an adequate analysis was made of available alternatives. Moreover, the Congress needs to have available to it information with respect to long-term costs and benefits, total costs and benefits, the relationship of program growth in one agency to that of related programs in another agency, and so on.

Public Law 90–174, cited as the "Partnership for Health Amendments of 1967" provides that a portion of the appropriations for certain programs and grants be made available for program evaluation. If made available to congressional committees, these evaluations would be more meaningful in the legislative process especially if the Congress specified some of the alternatives to be analyzed or issues to be dealt with. Specifically—there should be more emphasis, we believe, upon the comparison of long-term benefits and costs. This should not be limited to only those programs whose benefits are measurable in dollars. We must make comparisons of these economic benefits with the benefits of other major programs which meet other objectives. The judgments made by Congress are now influenced heavily by the percent of GNP allocated to different policy and program objectives. However, the Congress can test these judgments on other bases such as comparisons of the relative cost over 20, 30, or 50 years of meeting various objectives. Part 4 of the Special Analyses of the Budget of the United States for fiscal year 1970, indicates that obligational authority of about $8 billion for strategic defense is roughly four times as great as that for the housing objective. Is this a good indication of the relative long-term expenditure of our resources for these two objectives? Assuring that the proportion of investment to the total costs shown is about the same, we are comparing two investments, one of which will last from 30 to 50 years and the other for perhaps 10.

During the 20-year period, 1949 to the present we have invested in three major bomber aircraft forces which have had an effective life of about 10 years, and one major bomber modification to overcome obsolescence also with a life of from 5 to 10 years. We have invested in eight major land-based strategic offensive missile systems of which only two have had an effective life of over 5 years, even though there

were several models of some. We have procured one major sea-based strategic missile system which is being converted after about 5 years in service to a new system at a cost similar to that of the original system.

To sum up this point, the public and the Congress should realize that we are allocating not four times as much to strategic forces as to housing objectives but 16 times as much in terms of the period in which benefits will be derived. If similar strategic defense investments are assumed to be required at 10, 20, and 30 years in the future to maintain the defense capability for a period similar to the life of housing, and if these are discounted to present value, the multiple of strategic defense investment over housing is not four but nine.

The agencies should be expected to explain assumptions on which their choices are based. Whether or not alternatives are shown, there should be some understanding of the range of uncertainty surrounding the proposed output or benefit. Substantial sums are spent in performing studies and analyses. It appears to us that these public funds would be more fully utilized if more of the insight produced by them could reach the Congress.

Efforts should be made to clarify what are regarded as legitimate measures of public benefit. This should lead to definition of the output measures which can be generally agreed upon as indicators of the ultimate benefit. We have discussed at some length the problems involved in doing this, but we have also tried to demonstrate that feasible improvements in measurements are possible.

It should be a requirement that all legislative proposals identify the magnitude of problems requiring Federal funds for their solution. The total national need can be recognized, for example, 26 million housing units or remedial care for 4 million mentally retarded children and youth, but State-local and private sources of funding should also be identified.

We encourage efforts to improve economic analysis of alternatives. Economic analysis has been used in varying degrees as a method of allocating resources most effectively within major categories of activities. Alternative water resources projects have been and should be compared on this basis. As examples in quite different fields, we believe economic analysis also can provide useful insights in health programs such as maternity and infant care, in education programs such as Upward Bound, and in manpower training programs such as Job Corps.

We are not proposing that the Congress should decide against a program of one type simply because one of a much different type is shown to have a higher numerical ratio of economic benefits to costs.

In fact, on the basis of measurable effects and projected direct economic benefits, a benefit-to-cost ratio of much less than unity is probably characteristic of the Headstart program.

Many water resources projects have been shown to have an economic benefit-to-cost ratio greater than unity. A number of these, including some already authorized, which have a benefit-to-cost ratio of 1.3 or less based on a 50-year life and 3⅛-percent interest rate, drop below a ratio of unity under the 4⅝-percent interest rate established in 1968 by the Water Resources Council.

The measurement of benefits and costs of these projects now needs to be given careful review. Although the higher interest rate implies more efficient allocation of resources between the public and private

sector, the actual evaluation of projects is equally dependent upon the estimates of undiscounted benefits and costs.

The question may arise as to whether certain Government activities such as power generation or even manpower training compete directly with the private sector in terms of the good produced. We believe it is quite important for such reasons that benefit cost calculations should be based upon the more tangible benefits and costs and that the calculation of primary benefits should be carefully distinguished in the overall analysis from any significant estimated secondary benefits.

It will be helpful also if anticipated secondary benefits are clearly described, differentiating things which are simply redistribution from those which represent a net addition. It follows that indirect costs should also be recognized and disbenefits should either be offset against positive benefits or added to costs. We believe such clarification will be helpful to the Congress in making judgments on both a correct economic basis and in terms of other considerations. However, we believe there would be little advantage in an attempt to precisely quantify many of the indirect benefits in economic terms.

Mr. Chairman, I have discussed both the importance and the difficulty of measuring the ultimate public benefit of various Federal programs.

Rational approaches, such as PPB, to allocating our resources must be continued but with a full realization that some of the measurement problems may never be fully resolved. We favor extending the use of economic analysis, and requiring that uncertainties and assumptions be more clearly delineated in the proposals submitted to the Congress. The GAO will attempt to demonstrate the application of these principles in studies it will be performing and in its evaluations of studies performed by the executive agencies.

Mr. Chairman, this completes my prepared statement.

Chairman PROXMIRE. Thank you very much, Mr. Staats.

Dr. Carlson?

STATEMENT OF JACK W. CARLSON, ASSISTANT DIRECTOR FOR PROGRAM EVALUATION, BUREAU OF THE BUDGET

Mr. CARLSON. I appreciate this opportunity to talk to this committee. Since the Budget Director has asked me to take the lead for the Bureau of the Budget where it is involved in the PPB system, I too am very much concerned with relating the potential of this innovative device to decisionmaking in the Federal Government.

If it is all right with you, Mr. Chairman, I will insert my prepared comments in the record. They are some 20 pages long, and I believe it will take too much time to read all of them.

Also, if it is all right with you, I will just add to Mr. Staats' comments. I find myself in agreement with the views he has expressed.

Before talking about estimates of benefits in particular, I would like to discuss one of your earlier comments about discounting practices.

We participated in your hearings last summer, and we have read your excellent report resulting from those hearings. As you may recall, we testified in favor of improving discounting practices in the Federal Government. And as you may recall, many of the other Federal agencies, including the Water Resources Council, also testified

in favor of improved discounting practices. As Mr. Staats has said, since then we have seen an improvement.

The Water Resources Council recommended and the President approved the proposal to base discount rates for evaluating water resource projects on the current yield on Government bonds. The current yield on long-term Government bonds now provides the standard discount rate used in the water resources area, subject to the limitation that the year-to-year change in rate is restricted to one quarter of 1 percent. I frankly think that this is a marked improvement in water resource project evaluation, and it should be continued.

In fact, we intend to follow the lead of the Water Resources Council and provide the same standard as a minimum rate for discounting evaluation in the rest of the executive branch. We hope to have a circular out on this subject within a matter of days.

We also testified last summer before your subcommittee that we thought that it would be useful—and you subsequently supported this in your report—to study the opportunity costs of public expenditures. That study is in progress. We need measures of the opportunities forgone in the private sector when funds are taken from the private sector to finance public sector expenditures, and some insight is expected later this year.

In the meantime, we need to provide agencies with some tests for sensitivity in their discounting analysis of major policy issues that have been identified through the PPB system this year. The guidance this year is to use a 10-percent discount rate with tests for sensitivity at a lower rate—current yield on Government bonds—and a higher rate when evaluating alternatives associated with the major policy issues.

In the discounting practices circular that I referred to earlier we also have tried to provide guidance for treating uncertainty and risk in the costs and outputs of Federal investments, a problem that Mr. Staats referred to in his prepared statement. The Bureau favors treating risk and uncertainty explicitly in separate calculations of benefits and costs over including a factor for risk and uncertainty in the discount rate. To check on the uncertainty of a particular investment a high and low as well as a most likely estimate of benefits and costs is recommended.

And I think these minimum guidelines will help agencies handle the problem of the uncertainties and risks often associated with particular benefits and costs more consistently and appropriately.

Now, I would like to discuss the broader subject of benefit estimation, which is our principle reason for being here today. Mr. Staats has indicated the complexities of evaluating public expenditures. I would like to add to his statement and also talk about the importance of improving the different benefit measures we now have, particularly national income benefits which at present can be measured more rigorously than any of the others. Then I would like to turn your attention to recent efforts to measure benefits, particularly an experimental project called "Program Overviews," and finally finish with some suggestions to complement those of Mr. Staats on guidelines for improving benefit estimation in the executive branch.

There seems to be general agreement now that public investments should not be made unless the benefits exceed the costs. The problem

is the actual measurement of benefits and costs, and the form in which they appear. Measuring benefits is difficult in the public sector and far more difficult than in the private sector, because many of the objectives of the Federal Government are not found in the private sector, or at least not required by the business sector's planning mechanism. I would like to mention five of these broad public-sector objectives:

First, providing public goods. Public goods are peculiar in that one person's consumption does not affect the amount available for another's consumption. If a person were to provide a public good, he would find himself unable to require other people to pay him if they used the good. Thus, he could not recover his costs. Consequently, there is no incentive for private enterprise to make investments in public goods because it cannot secure an adequate return. Examples of these types of goods are deterrents of war or protection of scenic beauty—very valuable objectives in our society which the private sector is unable to supply.

A second broad objective is redistribution of income—that is the transfer of funds to particular groups that society thinks is particularly worthy or in need of assistance—the poor, the aged, the handicapped. These transfers take the form of cash, as in the case of public assistance; or in-kind assistance, such as food distribution programs; or provision of future income or in-kind assistance, such as provision for subsidized housing now for the well-being of those affected for the next 40 years.

A third broad objective is the elimination of spillover effects or externalities. Much of the legislation, concerned with the quality of our environment is associated with this objective, such as providing a mechanism whereby one person who emits soot and causes damage to others compensates these persons for the damage he causes or is limited in the amount emitted.

A fourth objective of the Federal Government is to maintain a smoothly running free-enterprise economy by preserving competition, securing economies of scale, and making markets for goods and services more efficient by providing additional information to buyers and sellers.

The fifth objective of Government is to manage those resources which for one reason or another are under the control of the Federal Government. Many of our national forests are natural resources of this kind, and Government owes a responsibility to the public to manage them efficiently.

These are broad objectives. But each one of them—I think you will readily agree—could be divided into many subobjectives. Thus it is clear that there are a multitude of objectives.

And, as luck would have it, almost every investment achieves more than one objective. Take education, for example. Education provides benefits not only to to the recipient but also to the general public. A better educated electorate improves the democratic process; increased incomes associated with higher education helps reduce crime; labor market efficiency is improved as workers' knowledge increases.

Multiple objectives add to the complexity of benefit estimation and evaluation of projects in such instances depends on how one weighs each of these objectives and the extent to which they are achieved. For

example, analysis of the Manpower Development and Training Act institutional training program indicates that average net earnings gained by participants in the program are almost triple the per trainee cost. Two-thirds of the recipients are poor, and 40 percent are under 21 years of age. On the other hand, a competing program, the Neighborhood Youth Corps Out-of-school program, increases the average earning of participants by only 120 percent of the per trainee cost. However, all of the participants are poor and under 21. In order to choose between these programs, a decisionmaker must assign weights to each of the objectives: assisting the poor, assisting youth, or the greatest return to national income per dollar invested. Until you have those weights you do not have a decision.

Moreover, the nature of our democratic process means that there are many participants in the decisionmaking process. The weights established by a program manager may be different for each of these objectives than his department head; the weights of the department head may be different than the President when the President makes his recommendations to the Congress. The recommendation of each subcommittee and committee of the Congress to the entire Congress will likely reflect different weights. An analyst in order to do his job correctly must therefore, prepare achievement measures for each objective if he feels that someone along the decisionmaking process will need the information.

When benefits cannot be expressed in dollar terms, the possibility of an automatic decisionmaking mechanism is substantially deminished. In these cases—and especially when national income is not the only objective—the technique of cost effectiveness analysis rather than cost benefits analysis must be used. Cost effectiveness analysis does not provide information on whether the gain in value from a project is greater than its cost. Rather, it only indicates standards of performance in one area which cannot be compared with standards of performance in another area, although costs are often measuable in both areas. Thus cost effectiveness analysis or cost performance analysis is a less powerful analysis tool than cost benefit analysis for comparing public expenditures. However, even in areas where benefits cannot be expressed in dollar terms and where only performance levels can be established, the decisionmaker can be assisted. For example we can show how much education is given up for, as Mr. Staats indicated deterrence as measured in a useful way. We can compare the results of a billion dollar expenditure in headstart with the results of a similar expenditure for natural resources development. In other words, cost effectiveness analysis can provide a decisionmaker with a better basis on which to exercise his intuition and his judgment.

So far I have taken for granted that there is a reasonable definition for benefits. And, in fact there is. S. Doc. 97, for example, provides an acceptable broad definition. It states that benefits are: "Increases or gains in the value of goods and services which result from conditions with the project, as compared with conditions without the project."

The problem, however, is not so much in adopting a definition as it is in establishing standards for measurement. Fortunately, some relatively vigorous standards for measurement can and have been established for one objective, national income benefits. Professional economists and the Government have done more in improving the

measurements in this area than for any other objective. Because of this effort and because national income benefits are important to decision-makers, continued improvement is important.

Although the difficulties of measuring benefits is our principle concern today, we should not overlook the fact that similar problems often are associated with cost estimation. Normally cost estimation is assumed to be simple because technical and engineering data usually are available and normally the costs are closer in point of time than benefits, which tend to be strung out further into the future. But these factors are not always adequate. We just went through an example of this with a study of the fast breeder reactor, in which the Government may invest more than $3 billion, and in which society in general may invest something around $5 billion. Great uncertainty surrounds the cost necessary to produce the required technology.

Senator SYMINGTON. I can't follow you based on your statement. What were you talking about then?

Mr. CARLSON. The costs, the difficulty of estimating costs.

Senator SYMINGTON. What costs?

Mr. CARLSON. The cost of any public investment.

Senator SYMINGTON. What was the reactor you were referring to?

Mr. CARLSON. The liquid metal fast breeder reactor. I am referring to a study that has been completed and published by the Atomic Energy Commission. And if one reads that study one can appreciate the difficulties associated with estimating the cost necessary to bring that technology into operation. My point is that estimation is not a simple matter even on the cost side—even though we tend to say that cost estimation is less of a problem—because of uncertainties about technology and about the timing of its development. The range of uncertainties is often very great. My example was merely to illustrate these complexities and difficulties.

On the benefit side, we try to find out what the conditions would be with and without the project, and assign to a particular project those benefits that otherwise would not occur. In a smoothly operating economy, these benefits normally take the form of direct benefits, or primary benefits, as they are also called. There are no secondary benefits, because an investment in one area is offset by the loss of an investment in another area; and from the Nation's standpoint, the net addition to national income from secondary benefits is zero.

But when the economy is not operating smoothly, as when pockets of unemployed resources exist, benefits can be generated. Take, for example, a water project in Appalachia. A couple of years after the initial investment a cannery might find locating there profitable and would employ some unskilled labor who would otherwise be unemployed—because the workers prefer to remain in Appalachia even when jobs exist elsewhere. To the extent these resources otherwise would have been unemployed, a legitimate claim for estimating secondary benefits exists.

One has to be very careful, however, because conditions are not static. I was talking to Governor Ellington a couple of weeks ago, and he remarked that that part of his State of Tennessee which is in Appalachia is growing faster, and per capita income in that region is passing the other half of his State. Four years ago this was not the case. And unemployed resources were present. To be

accurate, any calculation of secondary benefits from employment of otherwise unemployed resources 4 years ago would have had to recognize the termination of these benefits after 4 years because of the rapidly changing situation. So one ought to be very careful when using secondary benefits.

I think it is also important to keep measures of national income benefits separate from the benefit estimates of other objectives because of the importance of national income benefits and the less vigorous definition of other objectives. To mix additions to national income with regional benefits or with enhanced preservation of wildlife is mixing apples and oranges and will not help various decisionmakers. I think it would be better to provide separate benefit measures for each objective and allow the decisionmakers to weigh each objective than to have them aggregated and weighted in one arbitrary way.

Another problem which should be avoided is attempting to arbitrarily allocate costs to particular objectives. We frankly do not know how to do this on a useful basis. And arbitrary techniques must be resorted to when allocating joint costs to multiple benefits. I would argue that, given the present lack of existing analytic techniques, allocating joint costs to multiple objectives according to an arbitrary procedure is liable to be misleading. The present practice of comparing total costs with nat onal income benefits appears more sound.

Now, let me change to some recent efforts in the Federal Government to improve benefit estimates. Each year in the planning-programing-budgeting system the Executive offices of the President and each agency identify the important major policy issues for the forthcoming planning and budgeting cycle which lend themselves to analysis. Then each agency d rects its analytic staffs to identify alternatives which will resolve the issue and to measure the benefits and costs of each alternative and to display the results for the decisionmakers to make their judgments.

This year we are concentrating our scarce and limited analytical resources on 75 major policy issues, and a like number of lesser policy issues. Hopefully we w ll have some rather intensive measurements of benefits and costs. But I think it is only candid for me to mention that the production of useful analysis has been disappointing. We are learning, and we are developing capability to make these estimates better and more often.

In addition to the emphasis on a few important major pol cy issues, we have an experimental project that I thought might be interesting to this subcommittee. And I would like to emphasize the fact that it is experimental. It is called the program overview project. If you will look on the last page of my prepared statement, you will find an attachment in the form of a table. And I would l.ke to talk from that table. (Page 28.)

With this project, we are to identify the broad objectives of most major Federal programs and then to provide some general or summary measurements of the extent to which these programs are contributing to the accomplishment of those objectives. We realized when we started that we didn't have very much analysis to go on, so many of the estimates were based on judgment and labeled as such. Therefore, the table is intended to show both our level of ignorance and our level of knowledge of the achievement of these particular objectives. The

objectives inherent in this display are the particular goods or services that are provided for this area of public expenditures.

The example before you is the format for manpower program overview. The objective of adding to national income is measured in terms of net national income. Net program benefit is indicated by the benefit-cost ratio. The objective of redistributing income is recognized in our measure of income transfer. The objective of assisting particular target groups is presented in measures of expenditure distribution by household income, age, race, location, and, in this particular chart, education. The last column in the table presents an index which shows the potential for redistributing the program if in fact a decision-maker was thinking about shifting expenditures among programs.

If you don't mind, I will go through one example. The example I will discuss listed under "Work support" and is entitled "The Neighborhood Youth Corps Out-of-School Program." The sheet shows an estimated new obligational authority of $103 million for 1970. Expenditure is estimated at $102 million. Unlike the programs in some other areas, no growth in expenditure is anticipated in the manpower training area from current policies. So we showed expenditure in the Neighborhood Youth Corps out-of-school program at the same level for the fiscal year 1973.

The first output measure is the number of man-years of training provided by this program, which is estimated to be 34,000 man-years for 1970. However, as the next column shows each participant on the average stays in the program 20 weeks.

With regard to "Participant costs," $825 is estimated for allowance and subsistence. This figure also corresponds to income transfer, which can be considered as another program objective. Additional costs are $275; the total Government cost is $1,100. Private costs are estimated to be zero for both employers and other sources. So total social costs are $1,100.

Notice that parentheses are placed around the next figure, trainees' average annual wage gain. The parentheses indicate the weakness of the estimates. Double parentheses indicate the weakest data on this sheet. The only distinction between figures in double parentheses and a blank item is that we thought that enough information was available to show a figure that would be more helpful than misleading. Otherwise we would have left it blank. No parentheses indicates fairly strong data; The accuracy of data in single parentheses lies between the two extremes.

To make estimates for the additions to net national income, presented under column 13, we had to make some assumptions which may or may not be reasonable. We assumed that each trainee's annual income, on the average, is increased by $190 for a 10-year period as a result of participating in the program we calculated the present value of this additional income, using a discount rate of 10 percent to determine the net additions to national income, of $775—after subtracting out the $1,100 cost. The other measure that is useful to show achievement of the national income objective is the benefit-cost ratio which is 1.7 or benefits are 170 percent of the costs.

The characteristics of the beneficiaries of this program—the trainees—are: 97 from poor households or households with annual incomes of less than $3,500, 3 percent from households with incomes be-

tween $3,500 and $10,000, and none from households with incomes over $10,000. One hundred percent of the trainees are under 21 years of age. Twelve percent have an eighth grade education or less; 18 percent have an education level ranging from the 8th to the 11th grade; and 7 percent are high school graduates. Fifty percent are Negro, and 50 percent are white. Twenty-eight percent of the trainees come from the central part of cities over a half million population; 8 percent come from the suburbs of those cities; 16 percent come from other cities with populations ranging from 2,500 to 500,000; and 48 percent are from rural areas. To assist in comparing the distribution of expenditures among the trainees with the general population, the national distribution of the population by these characteristics is presented at the bottom of the page.

In the last column an experimental index is presented, redirection potentional. The higher the number the easier it is, in our judgment, to redirect the program toward different target groups, should that be desirable.

Some observations, I think, could be made about this particular table, besides stressing the fact that it is experimental. First, we need to develop more precise definitions. Just the greater precision in definition could change the number considerably.

Second, I was frankly quite surprised that so few studies attempting to measure benefits of these programs are available. In many instances, we had to rely on fragmented data.

Three, for large areas of public expenditure not even fragmented information about what is going on is available. One prime example is the impact of law enforcement expenditures.

Four, many program managers are understandably reluctant to develop this kind of information and share it with others, because they feel it might reduce their role in the decisionmaking process.

Five, the information system we now have are not very helpful. They are primarily aimed at financial control—and even weak in this area—and not at efficiency or planning. Investment in information systems has produced a lot of information, but we don't have much that is useful for estimating benefits.

Now, just to give some perspective on some other experimental projects, I would like to mention one other. And that is the social achievement indicators project, which is supposed to complement the Program Overview project. This project will attempt to provide statistical information on those social conditions which are particularly relevant to the objectives of many Government programs.

In the case of manpower programs, we are thinking about unemployment and underemployment statistics, and broken down by age, income, and location. This information would be presented in a table corresponding closely to the Program Overview format and would indicate the kind of demand or need in our society for public action, or private action as far as that is concerned—but at least social action of some kind.

The social achievement indicators project is intended to indicate the need and Program Overview will show the Federal response. We are just getting started in this effort, and we have a lot of work to do.

In another experimental project we are attempting to show both Program Overview and social achievement indicator information by

standard metropolitan statistical areas and by regions. But this project is in an even earlier stage of development than the other two.

Many of our expenditures in the Federal Government go through States, especially in the form of grant-in-aid programs. In the future, and particularly if we move into revenue sharing, the need for estimates of benefits at the State level will vastly increase. In anticipation of this need we have initiated some experimental and cooperative efforts with some of the States to improve their measurements of estimates on a continuing basis.

So far we have initiated two projects, one with Governor Cargo of New Mexico and another one with Governor Ellington of Tennessee. This is in addition to the 5–5–5 project that we initiated a few years ago through the George Washington University. As you can image, these efforts are just beginning, though I think it does show a movement and a very important movement toward improved benefit estimation.

With regard to the future, I would offer four guidelines for improving benefit estimation.

First, we need to encourage improved measurement of the national income benefits and costs and keep them separate from measurement of other objectives. Second, we need to display separately, and on a more regular basis, benefit measurements of the other objectives, along with the national income objectives. Third, we need to provide a comprehensive format for presenting benefit estimates to the different levels of decisionmakers, such as the experimental Program Overview is attempting to do.

Fourthly, we need to audit our estimates of benefits for completed or ongoing programs and see how accurate they were. Such a review exercise can help show us how we can improve benefit estimation in the future. We have done this infrequently, but in the case of costs in the water area. We have found that our estimates of costs were pretty good. However we have not done it, even in the water area, for benefits.

I hope these comments have been helpful to you.

In the executive branch, we plan to be moving as we have toward providing improvements in the coming months in cooperation with the Federal agencies.

Thank you.

(The prepared statement of Mr. Carlson follows:)

PREPARED STATEMENT OF JACK W. CARLSON[1]

Mr. Chairman and Members of the Subcommittee: I am happy to appear before this Subcommittee to discuss "guidelines for estimating the benefits of public expenditures." This question is, of course, at the heart of public expenditure evaluation. In recent years the major executive departments and agencies, and the Bureau of the Budget in particular, have devoted much effort to improving the process through which Government resources are allocated to accomplish the various objectives of public policy. My remarks will be organized to try to set the problem of measuring benefits in the context of the existing conceptual framework and available measurement techniques.

[1] Edward Whalen and Frank Lewis, senior staff members with the Bureau of the Budget, assisted in the preparation of this statement.

Improvement in Discounting Practices and Guidelines

Some aspects of program evaluation already have been considered by this Subcommittee and have been recorded in several useful reports, especially the excellent report of this Committee on discount policy last summer. During the Committee's discount hearings last summer, the Bureau of the Budget and other executive branch agencies testified in support of consistent and improved discounting procedures. The Water Resources Council testified in support of a new formula for arriving at a more appropriate discount rate than was then being used. Since those hearings, the Water Resources Council has recommended to the President a new procedure for estimating the discount rate to be used for evaluating projects. The new formula has been approved and is based on the current yield of Government bonds with changes in the rates limited to one-fourth of one percent per year. I believe that this was an important step in improving discounting procedures. Our objective is to apply this guidance in all areas of public investment and we hope to have a Circular published this month.

During the hearings last year, the Bureau also testified in favor of studying the appropriate conceptual basis and measurement techniques for estimating the opportunity cost of private spending which the financing of Government expenditure displaces. That study has been initiated and should provide further insights later this year. In the meantime, agencies have been requested to us a range of discount rates for program evaluation efforts. The Bureau's letter identifying major program issues for agency evaluation this year stated that all agencies should use a 10 percent discount rate with tests for sensitivity at higher and lower rates.

Complexity of Program Evaluation

Obviously, evaluation of public investment is important because Government expenditures absorb valuable inputs and produce valuable outputs. And equally obvious, the Government should invest only when benefits exceed costs. But the multiplicity of objectives of public expenditure often makes actual determination of benefits and costs extremely difficult. In summary form, the objectives of public programs effecting resource allocation can be classified as follows:

—The provision of public goods—that is, goods whose consumption by one individual does not reduce the amount available for consumption by others, and the consumption of it does not provide direct return on the provider's investment. Decisions about such goods have to be made collectively. Examples are deterrence of war and preservation of scenic beatuy and wildlife.

—The redistribution of income—that is, assistance to specific groups such as the poor, the aged, and the disadvantaged. Redistribution may be effected by the transfer of money, future income, or by the provision of goods and services. Examples are: public assistance programs, public investment in education programs, and food distribution programs, respectively.

—The elimination of spillover effects—that is, situations where one person's actions may benefit or harm another in ways that cannot be ignored in the original decision, as when one firm emits soot which damages others in the absence of appropriate charges or prohibitions.

—The removal of imperfections in the operation of the private market or the alleviation of their effects—for example, providing a competitive standard for public enterprises where none would otherwise exist; improving market information to consumers, producers and workers where the market would otherwise work badly; developing large-scale projects where significant economies of scale exist.

Management of Public Resources

Even this multiple classification vastly oversimplifies the objectives of the public sector. Each classification could be broken down into a multitude of more narrowly defined objectives; for example, income redistribution programs include such diverse groups as young people in central cities, older people in rural depressed areas, and American Indians in both rural and urban localities.

Moreover, unfortunately for simplicity in the evaluaiton of Government programs, almost all of the broad objectives have implications for more than one public sector objective. Public expenditure on education may provide trans-

fers of income to beneficiaries and a public good to society in the form of a better educated electorate. Additional benefits associated with increasing educational levels in the area where the beneficiaries live may include a reduced crime rate and a more efficient labor market as individuals become more aware of their opportunities through education. Clearly not all of these dimensions of the performance of our public education program can be subjected to measurement in terms of dollars. The dollar yardstick for measuring benefits is relevant only when a private market for goods and services does or could exist, or where reasonable proxies for private markets or "shadow prices" can be calculated. Since no private market can evaluate the political value of a better educated electorate, that element of the output of public education programs must be measured in nondollar terms, or must be considered qualitatively. This, as I shall discuss below, has important implications for the evaluation of public expenditures.

A Cabinet Secretary may have different weights for each objective when he makes recommendations to the President than the President may have when he makes recommendations to the criterion for selection of improvement of programs were solely the addition to national income no matter whose income is increased. But it does matter who benefits. For example, analysis of the Manpower Development and Training Act, Institutional Training Program indicates that average net earnings gained by participants in the program are almost triple the per trainee cost. Two-thirds of the recipients are poor and forty percent are under 21 years of age. On the other hand, similar information on the Neighborhood Youth Corps Out-of-School Program suggests that this program increases the average earnings of participants by only 120 percent of the per trainee cost; however, all of the participants are poor and under 21. In order to choose the desired mix of programs or for possible reorientation of each program, a weighting for each criterion—income increases, assistance to poor, assistance to youth—is necessary, but we have no objective social basis for assigning a specific value to a dollar transfer to a poor person relative to a dollar transfer to someone with higher income, or to a young person relative to an older person.

Moreover, the weights attached to each objective will differ for each participant in the decision-making process. A cabinet Secretary may have different weights for each objective when he makes recommendations to the President than the President may have when he makes recommendations to the Congress, or than each of the substantive committees and appropriations subcommittees have when they make recommendations to the entire Congress. This fact is important for selecting guidelines for benefit estimation and does require measures for a wide range of objectives in order to assist all participants in the decision-making process.

When we are dealing with programs that have provision of public goods or redistribution of income as important objectives, evaluation must take the form of cost-effectiveness analysis rather than cost-benefit analysis. Cost-effectiveness analysis compares the cost of alternative ways of achieving a given objective with output measured in physical, social, or some other nonmarket oriented term. I contrast it with the typical cost-benefit analysis which compares cost and benefits directly in dollar terms.

This distinction has important implications for analysis of public resource allocation. *Unlike cost-benefit analysis, cost-effectiveness analysis does not provide an obvious decision rule for approving or disapproving a specific project or adding to a program*—assuming the use of the national income objective. To choose an obvious example, the meaningless of a dollar value of changes in the strength of our nuclear war deterrence makes it necessary to determine the level of deterrence by the judgment of responsible officials. In the investment of electric power generation, by contrast, there is general acceptance that only projects where dollar benefits equal or exceed cost should be undertaken.

The inability to compare the value of additional spending on national security and water resources, or education, or highways, means that formal, quantitative analysis cannot determine the broad priorities among areas of Government spending. Nevertheless, if the principal role of analysis is, as I believe, to assist in choosing efficient ways of achieving public objectives within each of the broad areas of public activity, it has an important role to perform in improving the process by which political, social and economic considerations are combined to determine broad priorities. I believe it can exercise this role by expressing and summarizing more effectively the cost and consequences of alternative resource allocations.

Benefit Estimation

Let me turn from the evaluation of public expenditures in general to the estimation of benefits. First, we need a definition of benefit. A reasonable definition can be found in the basic guidance for evaluating water resources projects, Senate Document No. 97:

Benefits: "Increases or gains, net of associated or induced costs, in the value of goods and services which result from conditions with the project, as compared with conditions without the project." (p. 8)

The document explains further that "associated costs" are "the value of goods and services over and above those included in project costs needed to make the immediate products or services of the project available for use or sale." In practice it is used in the evaluation of increases in net farm income resulting from irrigation projects and refers to the cost of additional inputs required to increase farm output. Induced costs are "all uncompensated adverse effects caused by the construction and operation of a program or project, whether tangible or intangible" (whether measured in dollar or nondollar terms). Deterioration in environmental quality resulting from a water resource project can be cited as an example of this type of cost.

This definition of benefits is useful. Whether to include associated and induced costs as a subtraction from benefits or an addition to cost is largely a matter of convention. The effect on the benefit-cost ratio of either alternative usually is very slight, and consistent practice makes the issue somewhat pedantic.

Although our attention is appropriately directed to the difficulties of estimating benefits, cost estimation presens its protblems too. This is especially true when measuring costs outside the area of water resources. Accounting systems that have been established for bookkeeping purposes are often of little value for analysis. Moreover, in new areas of public endeavor, such as investment in the Liquid Metal Fast Breeder Reactor, technical and engineering uncertainties are often great, compounding an already difficult problem.

After finding an acceptable concept for benefits and costs, procedures for measuring benefits must be developed, and less is known here. Beyond the area of water resources projects, far less attention has been given to it.

One distinction in measuring benefits is whether or not benefits can be expressed in dollars. Dollar benefits are those gains or benefits which have a counterpart in the private economy which reflect the values of society by the pricing system. Another distinction is one of principal and subsidiary benefits, which merely categorizes those benefits which contribute to accomplishing the main or major objective or objectives of a project and those that contribute to lesser objectives. A third distinction is that of direct and indirect benefits. Direct benefits are those gains or increases which are closely related in a cause and effect relationship with the project. Indirect benefits are more tenuously related. In Senate Document 97 direct and indirect benefits are called primary and secondary benefits.

This leads me to the benefit measurement called national income benefits. To qualify, benefits must be expressible in dollar terms and include both principal and subsidiary benefits and both direct and indirect benefits—net, in practice, of associated and induced costs which can be expressed in dollar terms.

Since national income benefits are expressed in dollar terms, they can be compared with costs to provide a basis for evaluating a project and developing a decision rule. In water resource project evaluation, for example, a benefit-cost ratio based on what is taken to be national income benefits and project costs which is greater than one provides some assurance that society in general will gain more by doing the project than if the resources were consumed elsewhere.

Note, I say some assurance. There is no guarantee that this is always the case. A project with a benefit-cost ratio less than one may still be desirable because nondollar benefits may provide enough additional benefits in the judgment of a decision-maker to make the project worthwhile. Similarly, a project with a benefit-cost ratio greater than one may not be desirable because induced and associated costs were not adequately considered or because project costs were understated. Whether or not such an approach consistently understates or overstates the benefit-cost ratio for water resource projects is a matter of measurement accuracy and comprehensiveness of all estimates, and better project evaluation lies in improving both cost and benefit estimation. Nondollar benefits and

costs should be recognized and quantified—and, if feasible, valued in dollar terms—to the greatest extent possible. Reasonable men can certainly agree that the way to improved project evaluation is by improving measurement of total dollar benefits so that they can be compared with total project costs with greater confidence.

One area of possible improvement in national income (total dollar) benefits may lie with what Senate Document 97 calls secondary benefits; that is, indirect benefits. Just what indirect benefits really are from a national standpoint is difficult to establish as a practical matter. However, conceptually it is clear that secondary benefits only arise when the economy does not run smoothly. If the economy is reasonably close to full employment, if labor and capital resources are mobile, and if economies of scale of pertinent commodities generally have been exhausted under competitive conditions, a change in secondary benefits and costs in one region of the country tends to be offset by secondary benefit and cost changes elsewhere in the economy. Therefore, there is no reason for accounting for secondary benefits.

However, if unemployment does occur, if resources are not entirely mobile, and/or if monopoly influences exist, then secondary benefits are present and should be measured and will change the calculation of benefits and costs.

A word of caution is appropriate because the imperfections of the marketplace giving rise to potential secondary benefits change through time, and one should not assume that observable benefits this year will exist three years from now. Also, the mere fact that a public investment project reduces the costs for other investments in its vicinity is not enough to demonstrate secondary benefits; rather, the *differences* between the reduction in cost in this location and a like dollar investment cost in any other location is needed—if positive, then a secondary benefit; if negative, then a secondary disbenefit. As a practical matter, the claim that secondary institutional, physical or social changes caused by a project are not nullified by changes elsewhere in the economy is difficult to prove.

The current degree of accuracy of national income benefit estimates is fortunate. Most decision-makers feel that the objective of securing the greatest dollar return per dollar spent is important. In some projects, it evidently is the sole objective. But in others, nonmonetary benefits and redistributive benefits are also important. Thus, there is a problem of combining measures of diverse objectives. The only way I feel comfortable in doing this is to keep the measurement of each objective separate and not try to mix them. Therefore, I would show the national income benefit with national income cost and then show nonmonitized benefits in whatever physical or social units that are useful such as lives saved, numbers of more informed citizens, scenic beauty preserved, assistance to particular locations or to certain target groups—Appalachia and the poor, the aged, the blind.

Some people contend that one should aggregate all benefits and all objectives by monetary proxies for incommensurables, such as national income benefits, regional income distribution and assistance to Appalachian poor. This, I think, is misleading and does not allow each participant in the decision-making process to weigh the importance of each objective himself.

Also, I feel it is misleading to arbitrarily allocate project or program costs to each measure of different objectives. We frankly do not know how to allocate project costs when a project provides multiple outputs. Until we know we should not dilute the one measure that can appropriately compare national income costs and benefits.

Recent Efforts to Measure Benefits

Keeping in mind the diversity and multiplicity of objectives, we have initiated some *experimental* projects to improve benefit estimation and provide summary measures of the important indicators which are used to justify public assistance.

The first of the interrelated projects, *Program Overviews*, is an effort to display benefits measures related to the major objectives of public policy and to summarize the degree of accuracy of each measure. Where measures are not available and judgment is inadequate to develop even speculative measures, then no measure is recorded. In short, the project summarizes both our knowledge about the benefits of Federal programs and our level of ignorance.

MANPOWER PROGRAM DATA 1/

Program (Agency) (1)	HOA 2/ ($M) 1970 Est. (2)	Exp. 2/ ($M) 1970 Est. (3)	Built-in Growth to 1973 3/ ($M) (4)	Man-years 1970 Est. (5)	Avg. Duration (wks) (6)	Participant Unit Cost: Allow. and Subsist. (7)	Other (8)	Total Govt. 4/ (9)	Private 2/ (10)	Total (11)	Trainees' Average Annual Wage Gain 5/ (12)	Benefit Values: Add to Net National Income 7/ (13)	Benefit-Cost Ratio 8/ (14)	Income Transfer 9/ (15)	Enrollee Characteristics ($): Household Income 10/ -3,500 / 3,500-10,000 / 10,000+ (16)	Age 21-21/55/55+ (17)	Education -8/11/12+ (18)	Race W/NW (19)	Location 11/ 500K CC/Sub / Other Urb / Rur (20)	Redirection Potential 12/ (21)
On-the-Job Training	496	398		100																
MDTA Regular (Labor)	64	66		37	20															
JOBS (Labor/CED)	438	256		89	24															
JOPS (Labor)	50	33		11	24															
Vet's OJT (VAO)	40	40		42	21															
Indian OJT (Interior)	4	4		1	15															
Institutional Training	440	455		90																
MDTA	229	240	240	60	18	780	650	1430	((170)	1600	((700)	((3097)	((2.9)	(780)	65/35/0	40/58/2	11/53/36	50/50	(46/26/18/10)	5
Job Corps	180	188		22	24															
Indian Training	31	27		8	36															
Work Support	337	334		174																
NYC Out-of-School (Labor)	163	102	102	34	20	825	275	1100	((0)	1100	((190)	((775)	((1.7)	(825)	97/3/0	100/0/0	12/81/7	50/50	(28/8/16/48)	7
NYC In-School (Labor)	62	62		73	(26)															
NYC Summer (Labor)	121	120		53	(8)															
Operation Mainstream (Lab)	41	41		10	34															
Foster Grandparents (HEW)	9	9		4	42															
Comprehensive	896	837		682																
Voc. Rehab. (HEW)	500	460		497	53															
Vet's Voc. Rehab. (VA)	38	38		12	24															
Work Incentive (HEW)	130	148		135	(36)															
CEP (Labor/CED)	209	178		35	(16)															
Title V MDTA	20	13		3	18															
Labor Market Adjustment	459	459																		
Employment Service (Labor)	373	373																		
CAP Manpower	17	16																		
Equal Empl. Oppor. (EEOC)	16	15																		
Project Transition	18	18																		
Indian Mobility	8	10		3																
Project 100,000	27	27																		
Research & Development	23	24																		
Other, incl. Overall Admin.	76	75																		
TOTAL	2,828	2,582		1,126																
National Distribution															21/49/30	41/41/18		8/8/12	22/21/27/30	

1/ Parentheses indicate estimates are tenuous. Double parentheses indicate estimates have high potential range of error.
2/ Contained in revised 1970 budget request as of 5/9/69.
3/ Expenditure level in FY 1973 necessary to fund program on an annual basis under current program levels and policies.
4/ Includes Federal, State and local.
5/ Usually measures enrollees' foregone earnings net of allowances; for on-the-job training, measures employers' costs.
6/ Estimated value of average increase in annual earnings as a result of participating in the program.
7/ Benefits to net national income is net value of benefits; specifically, (a) discounted value of future earnings increase + (b) value of work performed - (c) economic costs.
8/ B/C denotes efficiency benefit/cost ratio, specifically (a) present discounted value of enrollees' annual wage gain (discounted over 10 years @ 10%) + (b) value of work performed ÷ (c) social costs, including enrollees' foregone earnings.
9/ Value of cash or in-kind consumption items per participant while engaged in program.
10/ -3,500 denotes in poverty category; 3,500-10,000 denotes family income between poverty and $10,000.
11/ 500K CC denotes central city of SMSA with 500,000 population or more; 500K Sub denotes corresponding suburbs; other urban denotes all other urban areas; rural denotes all areas with less than 2,500 population.
12/ Index of potential for redirection of program to specified target groups on scale of 1 to 10. Programs with low potential for redirection (formula grant programs) would be rated low, while those with high potential (operated directly by Federal Government) would receive high rating.

Because of the multitude of objectives and thus measures of benefits, we developed definitions and a data format that would display measures of the major objectives decision-makers use. Compromises had to be made, however, to make the project manageable and the presentation of information concise. The attached table for the Manpower Program Overview shows the format that we are currently using, with two examples displayed. The data includes the following:

(*a*) Federal programs (and relative tax advantage) listed according to closeness of interrelationship with other programs and irrespective of managing agency [Column (1)];

(*b*) Obligation and expenditure data for each identifiable program for the current or anticipated fiscal year [Columns (2), (3) and (4)];

(*c*) The unit of output provided by the program and the average output provided beneficiaries [Columns (5) and (6)];

(*d*) The cost for each unit of output, broken down by major components [Columns (7), (8), (9), (10) and (11)];

(*e*) The annual national income benefit of the unit of output, where possible [Column (12)];

(*f*) The net benefit based on addition to national income, where possible [Column (13)];

(*g*) Benefit-cost ratio, where useful [Column (14)];

(*h*) Average income maintenance benefit per beneficiary [Column (15)];

(*i*) Characteristics of the beneficiaries of each program, by income, age, education attainment level, race, geographic location—both size of community [Columns (16), (17), (18), (19) and (20)] and region of country (shown on another format); and

(*j*) Judgment as to the flexibility of redirecting the program to other beneficiaries [Column (21)].

The data is identified as to its accuracy by the use of parentheses; no parenthesis indicates the estimate is based upon a high probability of accuracy; a double parenthesis indicates a very low probability of accuracy. In addition, each data presentation is accompanied with a description of sources and estimation methodology.

Two examples are given: Manpower Development and Training Act (MDTA), Institutional Training Program and the Neighborhood Youth Corps (NYC), Out-of-School Program. The 1970 budget request contemplates that the NYC program will spend $102 million, which will provide 34,000 man-years of training; however, the average duration in the program per trainee in 20 weeks. The Federal Government spends $950 for allowance and subsistence (income maintenance) and $300 for other expenditures for a total cost of $1,100.

Although the benefits are uncertain, available data indicate that the annual salary increase is $190 per year. If the differential continues for 10 years, the present value of the net benefits is $775 (10 percent discount rate), and provides a benefit-cost ratio of 1 : 7.

The characteristics of the trainees are: 97 percent from poor households, 100 percent under the age of 21, 93 percent with less than a high school education, 50 percent Negro, 28 percent live in the central city of a city over 500,000, 8 percent in the suburbs of cities over 500,000, 16 percent from smaller cities, and 48 pecent from rural areas.

A similar format is used for each Program Overview so that the relative achievement of objectives across programs can be compared. For example, assistance to the aged could be observed in manpower, health, transportation, natural resources and other program areas, even though other objectives that are measured are not commensurable, such as days of health care vs. days of manpower training vs. lane miles of road vs. military airlift capacity.

Although the analysis is far from complete, some observations can be made. First, more precise definition of terms is needed. Variations in definitions of data can be misleading. Second, relatively few studies have measured or attempted to measure all the benefits or for that matter all of the costs of individual Federal programs. In order to obtain estimates, judgment from fragmented information has to be employed. Third, for large areas of Federal expenditures, not even fragmented data upon which to base benefit estimates are available. Fourth, program managers often are reluctant to develop this information because they feel that their role in the decision-making process will be diminished. Fifth, the information systems in the Federal Government are not geared to provide benefit data useful for setting priorities and decision-making. Rather, almost without exception, the data are for financial control, and even here inadequacy exists. Yet less relevant data are abundant.

Two other related projects are being attempted on an even more experimental and crude basis than the Program Overview Project. The first of these is the Social Achievement Indicators Project, which is intended to relate public expenditure to the indicators of social condition. In the case of manpower training programs, for example, unemployment and underemployment information would be displayed in a format which is similar to the impact measures presented in the Program Overviews: by income levels, age, race and location. Also, we are attempting to determine in a very crude but hopefully useful way the short- and long-run impact of current levels of social commitment and other social forces on these indicators.

The second related effort, again on an experimental basis, is intended to display both Federal program benefits (Program Overview information) and social conditions (Social Achievement Indicators) by selected regions of the country and Standard Metropolitan Statistical Areas. A case study of each is being attempted now. Obviously these are ambitious projects, but even small and partial successes can make the attempt worthwhile.

Guidelines for Estimating Benefits

To sum up, the evaluation of public investments is complex and raises serious conceptual and measurement problems. Nevertheless, analysis of benefits and costs does help identify better ways to allocate public resources. Recent experience with the Program Overview Project has affirmed the usefulness of better benefit estimating and the paucity of good measurements at the present time.

A desirable program for the future would:

(1) Encourage improved measurement of national income benefits and costs;

(2) Require separate estimates and displays of nonmonetary benefits and nonmonetary costs;

(3) Provide benefit estimates for the major objectives that the decisionmakers consider important, such as is being attempted in the experimental Program Overview Project.

I believe that we have been and will continue to move toward these goals and that their attainment will produce significant improvement in the analysis of Government investment programs. In the coming months, the Bureau of the Budget will be continuing its work in cooperation with the Federal agencies and departments to improve benefit estimation.

Chairman Proxmire. Thank you very much. These are two excellent presentations. They are complicated, but enormously important subjects.

Mr. Staats, you say in your statement:

The Congress is entitled to know why possible program alternatives were not accepted by the Executive Branch as well as to know whether an adequate analysis was made of available alternatives. Moreover, the Congress needs to have available to it information with respect to long-term costs and benefits, total costs and benefits, the relationship of program growth in one agency to that of related programs in another agency, and so on.

I couldn't agree with you more. But I think that very few members of Congress have been able to get this information, certainly on any kind of a consistent basis, except in the water resources area, where of course we have had it for a number of years. And I think it has been enormously useful to us. But we have certainly not gotten it in other areas where it would be very helpful to us in making decisions. We all know that decisions we are going to have to make this year, in the next few years, are immensely important to the Nation.

Your view, do you feel that it would be realistic for Congress to get substantially more PPB information than we have been able to get and to get it this year, so that we could make our decisions more rational?

Mr. Staats. I am not so sure that my comment would be very helpful in terms of this particular year. But certainly the subject is one which

has been debated a good deal in connection with the Legislative Reorganization Act, as you may recall. I believe that witnesses from the executive branch as well as from the legislative branch all recognize the need in the hearings on that legislative proposal.

I think the problem is one basically of relationships between the two branches of Government. My own opinion, having served in both now, is that a great deal more information can be made available and should be made available to the Congress with respect to major public expenditure proposals.

There has been on the statute books for many years a requirement that all legislative proposals before the Congress contain a 5-year estimate of costs, and with respect to Government employment associated with that program.

This has been an extremely difficult kind of information to obtain from the executive branch agencies.

The imposition of this requirement, by the way, goes to the agency and not to the President or the Budget Bureau.

I would like to make a second point——

Chairman PROXMIRE. Let me ask about that point. Why has the agency simply refused to give it? Do they not have it? What is the reason why Congress isn't able to get this growth in cost, which I agree with you is very important?

Mr. STAATS. In many cases they are dealing with imponderables with respect to the legislation itself. They are uncertain as to what the cost growth is going to be. And therefore they are hesitant in my opinion in many cases, because it is going to show a sizable increase in costs.

Chairman PROXMIRE. In some cases they know, don't they, in some of the educational programs we have funded we know they are going to grow, if the intent of the authorization is fulfilled.

Mr. STAATS. They can state the population expectations, the growth of the student population, expected growth in the cost of education—these things can all be projected—those projections are susceptible to errors in estimates, as we all recognize. But what I am saying in my statement is that the best analysis of that cost growth that exists anywhere in the Government agencies should be made available.

Chairman PROXMIRE. There seems to be a hesitation on the part of the Government agencies, because admittedly this is a relatively new area. The President just gave this order for agencies in 1965. Feeling their way along, and it takes years to do this in a completely reliable and competent way. But I think that we would do much better if we had even the kind of limited information which the agency has been able to develop on the basis of their analysis rather than operate as one correspondent said recently, by hunch and by the seat of our pants, and by guesses and not by any kind of rational analysis.

Mr. STAATS. I have a second suggestion, Mr. Chairman. It seems to me that when the legislation is coming up for reauthorization, what happens in many, many cases, is that a law will extend a program, say, for 1 year or 2 years or some stated period of time, Congress can very well, in my opinion, specify the kind of alternative analyses they will need to make a decision with respect to the authorization or continued authorization of that program.

It seems to me that there is a potential here that would enable the Congress to state the alternatives that it would like for the executive branch to develop as a part of that justification. Too frequently now when the legislation gets in to the hearing process, that data just is not available, whereas if it has been known a year or 2 years previously, it would have probably been possible to develop that data and make a more meaningful kind of analysis.

Chairman PROXMIRE. Congress is a decisionmaker, too. The President is a very vital and important decisionmaker, and certainly the most important single decisionmaker, but Congress is also important, and in some cases more important. Therefore, there is every reason to inform the Congress so that we can make our decisions as rational as the President's; isn't that correct?

Mr. STAATS. I would agree.

Chairman PROXMIRE. Let me ask you, Mr. Carlson, you said there are 75 issues on which some kind of analysis of this kind will be made in the coming year; is that correct?

Mr. CARLSON. Yes; that is what we have asked for. We don't always get what we ask for.

Chairman PROXMIRE. Would you tell us for the record—I wouldn't expect you to list the 75 now—can you tell us what those are, and in your view, would it be proper for the Congress to get reports on this analysis to the extent that they are available—and to the extent of course they are not classified, obviously, of course in the defense area there is some classified information that can't be released—but the other items where they are not classified, and in the defense area where they are not classified, could we secure that?

Mr. CARLSON. One of these issues has already been completed and shared with the Congress and the public. The Atomic Energy Commission finished its study of the liquid metal fast breeder reactor and published the study 2 weeks ago. And I might say——

Chairman PROXMIRE. That was published, that was made available?

Mr. CARLSON. Yes.

Chairman PROXMIRE. Will those other 75 issues be made available to us with studies on them?

Mr. CARLSON. Let me go back to a question you asked of Mr. Staats. I think there is a feeling in the Congress that we have lots of analyses that we are withholding. Quite frankly, one should not be misled into thinking there is lots of information about these programs. We just do not have it. It is a compliment to think that we might.

Chairman PROXMIRE. Let me ask you, are there any analyses that you are withholding?

Mr. CARLSON. I think if you will examine some examples I have placed in a paper being prepared for your compendium on PPB which will be published shortly, you will see the improvement in budget justifications which has taken place over the last 3 years. It is quite a marked improvement that has taken place.

Senator SYMINGTON. What do you mean by that?

Mr. CARLSON. Justifying the budget by showing in fact what the impact of Federal expenditures would be. The example I used was the impact on Indian education of additional funds, or at least the funds the agencies requested be put into their budgets. Their presentation

showed how many Indians are going to be affected and in what way they are to be affected and what the conditions are now.

And I think that is useful information. In earlier budget justifications, we just presented requests to the Congress and said a need exists and left it for the Congress to decide how much of a need.

And going back to the point you asked about projecting ahead what expenditures might be or what the universal need might be—this is difficult to do. It is not easy. And not only that, there is only one——

Chairman PROXMIRE. That was Mr. Staats' emphasis and suggestion, and I agree with it.

Mr. CARLSON. There is only one decision-forcing mechanism we have in the Federal Government, and that is the budget process. You can authorize all you want, but it is the actual expenditures that really reflect resource use. And that happens only 1 year at a time.

Chairman PROXMIRE. Right; and you can't predict what the Congress and the appropriations committees are going to do, and what the economy should suggest that we should do. Obviously if you had tried to project the expenditures 5 years ago you might well be far off. They might be considerably lower than your projection in many areas. But to get this projection would still be invaluable to us to make our decision. And it seems to me that our decisions which we made last year on which we just put a flat ceiling on all spending might have been far better informed if we had had this kind of projection.

Mr. CARLSON. Well, for instance, you can provide a projection of the working of the economy to the year 2000. Just assume that it will grow at its potential 4.2 percent. And as to the universe-of-need which I thought you were addressing in terms of how many people needed education——

Chairman PROXMIRE. We are talking about the fact that certain legislation passes the Congress authorizing us to go ahead with a particular educational program. And it would seem that the agency would be in a position to tell us what the cost increments are likely to be in that program over the next 5 years, based on full funding of that authorization. You can't guess that the Appropriations Committee is not going to fund it fully, but what you can do is tell us what the full funding would be.

I would like to ask Mr. Staats——

Mr. STAATS. Could I comment on this question?

Chairman PROXMIRE. Yes.

Mr. STAATS. You will recall perhaps that during the debate on the Legislative Reorganization Act there was considerable discussion of the possibility of having a longer term projection on the budget, 5 years or some longer frame of time. I believe that there is a good deal of merit to this idea, recognizing that it has to be done periodically, to recognize changing circumstances.

But it is a useful way to indicate at least perhaps the high side of the range, the low side of the range, and to bring out the variables which are going to affect the growth of that particular program.

There are variables that can be identified. Take the cost of medicare and medicaid, for example. If we could have had that kind of analysis I think we might not have been quite so surprised as most of us are now with the growth that has taken place in the cost of those pro-

grams. It has been fantastic. But it is that kind of an analysis which gives Congress the benchmarks to make judgments that seem to me it would be useful.

Chairman PROXMIRE. We might have done a better job in drafting that legislation if we had this projection before us, we might have had some second thoughts on how to limit it.

Mr. STAATS. The situation in New York State, for example, might not have taken place.

Chairman PROXMIRE. Mr. Staats, would you describe for the subcommittee the efforts which GAO is currently undertaking in the PPB area and your plans for increasing your capability in this area, number one.

And then as part of that question, has the GAO developed a program structure for itself to assist in making budget allocations to different audit and evaluative efforts? And the third part of the question is, could this be a part of the reason why such a disproportionately small share of the allocation of GAO's budget is made to evaluation of the Defense budget?

Mr. STAATS. If I could start with the third point first, it might help.

Chairman PROXMIRE. Fine.

Mr. STAATS. We have approximately 40 percent of our total professional staff allocated to work in the Defense Department. This comes out to roughly 1,000 professional staff members who are concerned with one aspect or another of the Defense budget. I have noted some erroneous information in the press to the effect that we had only a handful of people working in this area. This was strictly a misunderstanding.

Chairman PROXMIRE. I know you have done a lot of good work at my request in this area.

Mr. STAATS. Thank you.

The portion of our staff that we assigned to work in any one of these areas is going to be a combination of about three factors. First, we try to identify the problem areas and the areas where we can potentially make useful reviews and build up our program on that basis rather than from any a priori allocation based on, say, the size of the budget, although we do try to take that into account in developing projects and studies that we would make in any given program area. The Truth-in-Negotiations Act, with which you are quite familiar, is an example. We went into this area and made a major allocation of staff resources because it was a new program. A new statute had been enacted in 1962 and we wanted to see how it was working out.

We are currently reviewing again the work that we are doing in the defense area from the standpoint of whether we can do more in management of weapons systems procurement. And if we feel that we can we are going to allocate more resources to this area.

Our allocation of resources must depend in part on the size of the budget, but it is largely built up in terms of areas where we feel that we can usefully move in to a particular program area.

But as of the present time, about 40 percent of our professional staff is on Defense Department work. That means that we have about a thousand men in that area. We have about 200 working in the interna-

tional area, and the remainder, making up a total of about 2,400 professional people, are in the civilian area.

Now, with respect to what we can do to assist the Congress in this area, we have given a great deal of thought to this subject in the 3 years that I have been with the General Accounting Office. We have as our objective to be in a position to make studies either at the request of the Congress itself or on our own initiative. We have broad statutory powers, as you know, to review programs.

The statute does not explicity say that we are to review the cost effectiveness of programs. This term is not used. But the law does speak in terms of economy, efficiency, and the application of public funds.

We have construed that third aspect to be broad enough to encompass the interests of the Congress in how effectively public funds are spent. And it is for this reason that we feel that we need to put more emphasis in this area. Not that we will give up our concern and interest in the other areas, but we are going to try to devote more resources to this area.

Now, the question arises as to how to let information be transmitted to the Congress in a way which will be useful to it in, say, the authorization process or in the appropriations process. I think this has to come about as a result of exchange between ourselves and the committees to determine their interest, for one thing, to find out whether they are interested in a particular area. It may be that the Congress as a whole, as it did in the case of the evaluation of the poverty program, should express this desire. In the case of manpower training there was a definite statement in the committee reports indicating interest in our making effectiveness reviews of the manpower training program.

I don't know whether this answers all of your question or not.

Chairman PROXMIRE. My time is up. I will come back to this.

Senator Jordan?

Senator JORDAN. Thank you, Mr. Chairman.

Mr. Staats, I am interested in one point you developed in your statement, wherein you said: "there should be more emphasis upon the comparison of long-term benefits and costs." And then you use, for example, the strategic defense and the provisions of decent housing, you use those two examples of expenditures. You say that while the fiscal 1969 budget provides authorization four times as much for strategic defense as for housing, yet if we take the time factor into account it is actually an expenditure or an authorization or an allocation of—probably better say an allocation of not four times as much, but 16 times as much. It makes it pretty hard to justify a lot of strategic authorizations if we take it in that framework. Doesn't it?

Mr. STAATS. We are pointing this out as a kind of an analysis which we think should be made available in connection with authorization of programs of this kind. As I see it, it is not really unlike a business which is going to undertake an investment. If it knows that its product is going to be obsolete in 5 years or 10 years, it may look at that investment quite differently than it would if it knew that that investment was going to pay dividends, say, for 30, 40 or 50 years. That is the kind of emphasis that we are trying to place in this statement.

Senator JORDAN. Then I would ask Dr. Carlson if this factor is

taken into account when priorities are set up between cuts in domestic programs and cuts in defense programs. For example, the cuts that have been made in domestic programs are substantially lower in dollar volume than the cuts in defense programs. And I wonder if you are using the same kind of yardstick as Mr. Staats.

Mr. CARLSON. One technique that Mr. Staats has indicated would be useful in putting these on a comparable time basis. We don't do that now. But in terms of cutting back on, say, an educational program versus a military program, even if you put it on a comparable time basis, you have to make a judgment as to the relative value of each. And this is a judgment that different people will make differently.

Even if measures are provided, the decision is still a matter of judgment for individual policymakers.

For example, take education versus defense. The sacrifice of a $1 billion cut in expenditure on education programs and the number of fewer students assisted in a particular way can be estimated, as can the sacrifice of a similar cut on the number of, say, airplanes, and maybe what the loss of these airplanes means in terms of a reduction in deterrence. The decisionmaker will have to decide whether the loss in deterrence is more important than the reduction in the number of people that would be going through an educational program designed to achieve a certain reading level, for example.

Pair-wise comparisons are the best we can do with these two dissimilar outputs. We are very limited in directly comparable measures.

Senator JORDAN. It points up the difficulty of using a standard set of criteria for all phases of Federal spending.

Mr. CARLSON. The best we can do is present measures of the objectives of the Congress that should exist for Federal programs, and then the Congress and other decisionmakers must weigh those particular objectives. But combining them in some sort of an aggregate measure is like putting apples and oranges together. And that combination is only good for that decisionmaker who has combined them in that way. From an analytical standpoint, I would maintain they should not be combined. Each decisionmaker must weight each output measure according to his own assessment of its importance when making his decision. Analysis will not solve the problem of weighting for decisionmakers.

Senator JORDAN. I can understand that. But someone has got to make a decision. And the Congress is going to have to express its will in the shape of legislation. But our congressional committees are not properly equipped to make meaningful evaluations as between programs so widely divergent and different in their application, we will say, as student loans, or manpower training, and ABM or supersonic transport.

Mr. CARLSON. You have some outstanding people that can provide program evaluation, but very few. I frankly think that Congress is not very well equipped to provide such evaluation. And I am really pleased to see the GAO becoming increasingly involved with efficiency considerations in addition to financial control aspects of their responsibility. Its efforts will provide benefits to the Congress as well as to our society. And the sharing of results of analysis between the executive and legislative branches should be enhanced, also.

Senator JORDAN. The Congress desperately needs all the guidance

we can get. Now let us look at the chart you presented. I am not at all sure that I understand the table that you gave us on the programs that you have analyzed. You are talking about two programs, the NYC program which you have analyzed and calculated to have a 1.7 to 1 benefit-to-cost ratio, and on the one above it, Manpower Training which you gave a 2.9 to 1 benefit-to-cost ratio. And yet in your final column over here, as I understand it, you gave the first program I mentioned, the NYC program, a redistribution potential of 7 against 5 on the manpower training. Now, explain to me why you did that.

Mr. CARLSON. The redistribution potential has nothing to do with the benefit-cost ratio; it is just the degree of flexibility we believe the Federal Government has to change the beneficiaries of the program. For example, in the case of the MDTA program, a program manager may change the degree of emphasis on young people. He might shift it to a higher or lower level. Instead of 40 percent young people he might redirect it to 50 or 60 percent.

The index indicates there is less flexibility to shift the target groups in the first program than in the second. The index is a matter of judgment. Its absolute value is not particularly significant.

Senator JORDAN. With a given amount of money to spend, if you had to make a sole judgment as between these two, where would you spend it on the basis of your analysis?

Mr. CARLSON. As a decision maker, I would have to first assign weights to the various objectives. For example, say the total of my weights is 100. I might put a weight of 50 on the net additions to the national income. And then I might put a weight on age or the income of the household that those trainees came from. My decision would be influenced by the distribution of these weights.

That is where judgment comes in.

Now, my weights would probably be different from yours, and you might prefer another alternative. The information here won't tell you what your decision should be unless your sole objective is to add to national income. Then I could tell you, there is no question about it, you ought to choose MDTA.

Senator JORDAN. This is comparatively easy. But how do you compare either one of these programs, then, to Safeguard?

Mr. CARLSON. The only way to do that is on a pairwise comparison. I can show you what $100 million will give you in terms of 34,000 man-years of training. And then I can show you what $100 million will give you in terms of Safeguard, and provide an output measure maybe in terms of how much Sprint missiles involved——

Senator SYMINGTON. I do not understand.

Mr. CARLSON. The only thing I can do from an analytical standpoint for Senator Jordan is to show pairwise comparisons of what a given budget will provide if it is spent all in terms of ABM or all in terms of a particular manpower program. And then he can see, if in fact he wants to add more to ABM, how much he would lose in a manpower program, assuming that was the trade off. Other programs can be compared in a similar fashion, but that is all I can do from an analytical standpoint with public goods that do not have a common measurement.

It is unfortunate, but this is the best analysis can do for a decision maker.

Now, I can help you compare program benefits for the same ob-

jective. If you say your objective is national defense, but that you also are interested in taking care of poor households, young people, and you are worried about the distribution of public expenditures, I can show you what these programs are doing for these other objectives. Because the benefit measures for some of the benefits are expressable in relatable terms, I can provide comparisons of those particular objectives among programs. But I can't compare in terms of the public good itself, deterrence versus man power training.

Senator JORDAN. Thank you. My time is up.

Chairman PROXMIRE. Senator Symington?

Senator SYMINGTON. Thank you, Mr. Chairman.

Dr. Carlson, as a background, on January 13 I talked before the Water Resources Council and said:

> For some time many of us who have been working for development of our national water resources have been concerned that Federal agencies responsible for arriving at benefit cost ratios frequently understimate the benefits.

In passing, I am becoming more and more worried about the amount of money we are investing in foreign countries as against what we are investing in this country; and also about the waste abroad. If you look at the five or four major bases in Thailand it is now known we have there, you know that, regardless, we are never going to get those investments back for our taxpayers. You look at something like Cam Ranh Bay and see another billion dollars or so, down the drain. No matter what happens, win lose or draw, we will never get it back. And I can remember—thanks to Comptroller General Staats, when he was Deputy Director of the Bureau—I met some people in Thailand, and found there was some $300 million of contract work out there in a conglomerate; and $120 million of that $300 million had disappeared, 40 percent of the total amount. I don't think we ever did recover it. And somebody must have it somewhere.

In any case, it is from that background that I said before the Water Resources Council, last January:

> Unless action is taken to correct a long-standing inequity—to cost-benefit ratio the net effect of the high discount rate will be far reaching negative results.

I pointed out that in connection with the Table Rock Dam in my State, as late as 1956, after we had the dam really going, the ratio was 1.2 to 1. By 1961 the benefit-cost ratio was stated as 1½ to 1. Today it is 3.4 to 1.

In a talk before the Merrimac River Basin 3 months later, April 25, I said:

> In the past cost-benefit ratios established by the Army Engineers and approved by the Bureau of the Budget have often under estimated actual benefits, particularly those in the area of social rewards which nevertheless bring in income.
>
> They are not as easily measured, but often are equally important with the primary benefits. Actual experience has demonstrated also that they are often inconsistencies in the method of evaluating benefits.

In this connection, I don't see why we are relatively casual about the great sums of money we are spending abroad, primarily in Southeast Asia and Europe.

I pointed out that, in 1954, for example, the St. Louis flood control protection project, with which many of you are familiar, was estimated to have a benefit-cost of 1.39 to 1. In 1960 that rose to 3 to 1.

Today it stands at 4.5 to 1, which means that for every Federal dollar invested there will be a return of $4.50.

In the past, inaccurate cost-benefit ratios have been the prime reason for the failure to go ahead with badly needed projects in my State. I believe, therefore, it is time to look at this whole system and its planning with more care.

With those premises, I would mention that back in December the Water Resources Council, when it announced its decision to raise the discount rate used in evaluating water resources projects, also said that it had formed a special task force to develop improved practices and benefit evaluations; also, that it would hold a hearing on this subject January 13. That was the hearing to which I previously referred.

The hearing was held, but we have heard nothing further on the task report. Could you tell us where that report is now?

Mr. CARLSON. Yes, sir. I understand the task force has presented its report to the Water Resources Council for further consideration.

Senator SYMINGTON. Shouldn't we have the report before we get into authorization and appropriation in the Congress?

Mr. CARLSON. When would that be, sir?

Senator SYMINGTON. You would know as well as I. It would be pretty soon. Why do we have to spend so much time in going over something that so much time has already been spent on prior to a report?

Mr. CARLSON. Such a reevaluation deserves careful analysis. This is not an easy matter, providing rigor and discipline and appropriateness of measures. And so taking a little time to develop them better—in a field that already does a reasonably good job—may be appropriate.

Senator SYMINGTON. In this connection, the Comptroller General mentioned that about 45 percent of his people were on defense matters. How many of your people, percentage, are on defense matters?

Mr. CARLSON. First you will have to recognize that we are much smaller——

Senator SYMINGTON. I said percent, not the number.

Mr. CARLSON. In percent, I think we are talking about around 15 or 20 percent.

Senator SYMINGTON. Maybe that is part of the problem.

Do you think this is because the Defense Department is so influential, especially when it combines with State, it really doesn't make much difference what you all do over in the Budget Bureau?

Mr. CARLSON. I think one has to recognize first that we are a staff operation. The chain of command is not through the Bureau of the Budget; the chain of command is through the Secretary of Defense to the President.

Senator SYMINGTON. Yes; but I have defended military budgets, and believe I know where the chain of command is.

Mr. CARLSON. Yes; but not through the Bureau of the Budget.

Senator SYMINGTON. You have reclaimer power.

Your statement then, is that the Bureau of the Budget is not holding up this Water Resources Council report?

Mr. CARLSON. No recommendation has come forth yet from the

Water Resources Council, and we are just one of many participants in this effort.

Senator SYMINGTON. You would agree, would you not, that this is a matter we should look at?

Mr. CARLSON. Yes, sir. I think inherent in your previous comments is recognition of the necessity of distinguishing between primary and secondary benefits, and the question whether we are not really seeking other objectives when we discuss secondary benefits. I too would argue we ought to establish measures of secondary benefits and highlight them, but we should not include them in the benefit-cost ratio, which really measures additions to national income and total project costs. That may be the reason why your benefit-cost ratios grew and are so high now.

But I would also argue that some of the benefits associated with some scenic improvements or some water quality improvements are not measurable. If these are your principal objectives, you might accept a benefit-cost ratio that is less than 1, because a project gives us these other objectives to such a degree that you think it is worthwhile doing.

Senator SYMINGTON. I don't follow some of your thinking. We know the Japanese want Okinawa back. We have put about three quarters of a billion dollars into that island. Naturally they don't want to pay to get it back. They will want to renew the treaty in 1970, a treaty in which we give them full protection. They have no defense posture, and presumably we are out of Japan. But we are not entirely out, have some 83,000 people there.

Everything is going out. Nothing is coming back. I have just presented to you two cases in my State where the ratio has tremendously increased the net benefits, regardless of how you all figure it. Results are what count, not theoretical extrapolations.

Inasmuch as about half of all income goes back into the payment of taxes, I should think, instead of making a point of trying to hold all this down as much as possible, the executive branch would be interested in building up the ratio as much as possible, so as to try, if possible, to keep this country solvent. The way things are going, that is not going to be an easy job.

Under the leadership of Senator Proxmire, we have been conducting investigations as to methods of cutting down Government costs.

Is your office also making a study of Government costs?

Mr. STAATS. Those that we are making, you are referring to?

Senator SYMINGTON. I am referring to the investigations this committee is currently making.

Mr. STAATS. Yes, indeed. I think that it was this committee which was first to bring out in testimony last December, if I recall correctly, the cost overrun situation on the C–5A. We testified before the Congress at that time that this was one of the areas that we were looking at. But I think further testimony which came from the Defense Department indicated even further the magnitude of the cost overrun situation. And in the light of that further testimony we undertook a major review of what happened in this case. We have been working since early January on that review, and hope to have a report on it in the near future. I cite this only as an indication of the point I was making earlier, namely, the importance of close interchange of the interests

of our office and those of the committees of Congress concerning some of these programs.

I think we can be more useful in that way in helping the Congress.

Senator SYMINGTON. I agree. In the hearings chaired by Senator Proxmire, one of the defenses of the military was that on a particular contract there was a relatively low percentage increase, 25, then 40. But another study took 12 weapons systems at random; and the average increase in those 12 was 220 percent. Later, a Brookings Institution study showed an average increase in such contracts of from 300 to 700 percent. I would hope you would investigate a lot more of these contracts.

Mr. STAATS. Yes, indeed; we have under way now reviews in several of the major weapons systems programs. We have completed a study of the Sheridan weapon system, as you know. We also have investigations going on with the Cheyenne helicopter situation, with the Condor missile, and several others.

Senator SYMINGTON. Thank you, Mr. Chairman.

Chairman PROXMIRE. I thank the Senator from Missouri. And I would like to say with respect to the C5A, you haven't seen the last of that. We are now nearing 100 percent overrun, and perhaps when it is over it will be right in the same unfortunate category of 200 to 300 or 400 percent.

Mr. Conable?

Representative CONABLE. Thank you, Mr. Chairman.

This is a tough area for me. I find it hard to consider all the objective factors that are involved in comparing apples and oranges, in so many cases, where you are talking about completely different types of Government activities. And I wonder, in a philosophical sense, do either of you gentlemen anticipate serious problems from an increasing emphasis on cost effectiveness with respect to Government programs in any particular area of Government responsibility? Are we likely to find ourselves downgrading legitimate Government functions because of an overemphasis on cost effectiveness? And if so, what types of Government functions are most imperiled?

Mr. STAATS. I wouldn't see a problem from the standpoint of using cost effectiveness or cost benefits—this would not concern me, if they are properly presented in terms of the things which can be quantified and those which cannot be quantified. I think this may be the source of your concern.

Now, there are many programs of the type which we have just been reviewing in GAO of the OEO which are very, very difficult to quantify. We have been testifying before both the House and the Senate within the last week on the work we have done in the Job Corps. We have made all of the analyses that can be quantified in this case, and those are clearly set forth with the best data that we were able to obtain.

But you have to recognize, and our report does so recognize, that there are other values which cannot be quantified. And these are the ones that are more difficult to measure.

In the chart which Mr. Carlson has presented here, one point that interests me is on the age characteristic here. In the MDTA you had 40 percent in the category of age 21 or younger, whereas in the case of the Neighborhood Youth Corps, out of school program, 100 percent. How do you quantify the value of having people at a younger age in a

program of this kind? How do you quantify the value of having a child in Headstart from the point of view of the better health, better discipline, and maybe more loving care which it would not be able to get without Headstart?

These are the difficult things to quantify. But you can still identify them. And that is part of the value of the kind of analysis that I think both Mr. Carlson and I are talking about here this morning. If you can identify those, quantify those that you can quantify, project that quantification ahead far enough, and indicate the variables which will affect that quantification up or down, then you have rendered a real assistance to the decisionmaker in terms of the judgment that he has to reach.

And this is true in the water resources field, on which Senator Jordan and I have worked so closely together over the years. There are many factors here that are very difficult to assess.

Representative CONABLE. We have had some talk with the water resources people.

Mr. STAATS. Recreation, for example, was not included as a primary benefits until 1962.

Representative CONABLE. To what extent have we changed the criteria in determining benefit-cost ratios? We are now including other benefits than we did originally, and therefore a dam built back in 1956 may very well, as a result of a change in legislation, have a higher benefit-cost ratio than it did when it was originally built simply because we are able to consider more factors of benefit than we were able to in 1956. Has this been a problem—Congress' evolving attitude toward what can be quantified in the way of benefits?

Mr. STAATS. I would say, in response to that question, that it is only in fairly recent years that we have given much thought either in the executive branch or in Congress to what we are now calling cost-benefit analysis.

In the water resources field this is a term which is now a household term for everybody, because we have been using it over a long period of time. Now, the situation on the cost-benefit analysis for water resources has changed, just because times have changed and the needs have changed—power requirements, for example, and recreation requirements in areas which are inland areas where there is no other water-related recreation available.

Now, that is quite a different situation than a project that is right close to the coast, or right near a large natural recreation area.

These things have to be taken into account in some way in our cost-benefit studies.

Representative CONABLE. I would like to underline also the concern that was stressed by Senator Symington about benefit ratios with respect to expenditures abroad. It seems to me that in the foreign aid field we have had a great tendency to want to get this stuff out and get rid of it, and not to analyze the relative good that was being done by different types of projects. And I also think that is a serious area for further study.

Now, I would like to ask either one of you gentlemen where we are likely to get in trouble in the area of executive privilege if we start worrying about the kind of tradeoffs involved in the decision-

making process that has gone on in the establishment of administration priorities.

As you point out, quite properly, everything you do expend involves some cost in other areas in terms of deferred or foregoing expenditures. I can understand that in reviewing the decisionmaking process in the executive branch the legislative is very likely to get into the problems of executive privilege to a certain extent. How do we avoid this type of difficulty, if we insist on going further into the decisionmaking process in the executive?

Mr. CARLSON. I think that information about who put what weight on what factor before the President took a position is appropriately held within the executive branch. But measurements of particular objectives to which everyone can apply his own weights is, I would argue, appropriate information for anybody involved in the decisionmaking process. For instance, the information in the program overview sheet you have in front of you may provide information for making some decisions—though you need far more information than that—on the social objectives that you want to support, and you could identify the programs on which you want to spend money.

Representative CONABLE. There really is no legitimate basis on which the executive branch can withhold the kind of information you have given to us in this chart, is there?

Mr. CARLSON. Yes, in the situation where the data is more misleading than helpful.

Representative CONABLE. As decisionmakers ourselves we have a right to this kind of information, wouldn't you say?

Mr. CARLSON. Yes. And, in general, information is shared with the Congress, when it is developed. Unfortunately, we don't have very many good measures of what our programs are doing. And one has to decide when it is more misleading than it is helpful to share this information with someone else.

Representative CONABLE. One last question.

We all know that inflation has an impact on the private sector, and that it also has an impact on the public sector. Is inflation a serious factor in trying to anticipate cost-benefit statistics, and is there any generalization that can be made about this and the relative impact it has in the public and private sector? It seems to me that we may have more control over the variables in the public sector with respect to our own budgets than private business, for instance, would have. Is it a serious factor for us in trying to project Government expenditures.

Mr. CARLSON. Inflation does add complications to estimates, whether in the private or public sector. The additional uncertainty is an undesirable feature of inflation.

Normally, though, in our analysis we try to eliminate the effect of general inflationary effects—across-the-board inflation—while keeping in mind relative price changes when making our calculations of benefits and costs. We generally assume constant prices, except for those prices which change because of changes in the supply and demand of inputs needed for a project or goods and services produced by the project.

And the discount rate is handled in the same way. Normally,

inflationary effects are taken out so the discount rate does not allow for anticipation of inflation.

Representative CONABLE. Is the relative cost of hardware different in the Government than it is in the private sector generally? The Government really deals primarily in services, does it not?

Mr. CARLSON. No. At one time we made an estimate that the capital per worker in the Defense Department was $42,000 per Defense employee and in the rest of the economy less than $20,000.

Mr. STAATS. On the matter of projection of price changes, I agree with what Mr. Carlson has said. But one of the things that the analysis should point out is the possible change in the makeup of the economy, such as the shift to services. Or it may be in some sector that we may be susceptible to great uncertainties because of uncertainty as to supply.

I am thinking here about petroleum, for example.

Representative CONABLE. That is all, Mr. Chairman.

Thank you.

Chairman PROXMIRE. Apropos Mr. Conable's questions on sharing these analyses, Mr. Carlson, the difficulty is not so much in deliberate concealment from Congress. I am sure that you disclose these analyses when you are asked, unless they are classified.

The question, however, is whether there is a systematic disclosure to the Congress of this kind of information when it would be of any real use to the Congress. It seems to me that you ought to find a way of letting us know in as simple a manner as you can, and in as provocative a way as possible.

Mr. STAATS. Maybe what you should do is this: with every budget request there should be a statement that no analysis was conducted, or some analysis was conducted, and this is what it shows. Something of this kind would provide a regular systematic understanding of the basis for a specific decision and we could make our own decision as sensibly as we can.

Mr. CARLSON. I think that would be useful.

Let me also say that the President circulated a memorandum just 2 or 3 weeks ago that reinforced his desire to have full disclosure to the Congress. Only in the very most exceptional cases will any information be withheld.

Mr. STAATS. Could I add, Mr. Chairman, to that in this respect. When it comes to the appearances of executive branch agencies before the Appropriations Committee the ground rule has been for many years that agencies must respond to the question of what did they originally ask for, if they are asked. And this question is traditionally asked. So that Congress does have that kind of alternative available to it in terms of what the agency felt that their needs were as against what was set forth in the budget request.

What I was referring to a little earlier was of a somewhat different nature. Analyses are made in the executive branch of alternatives. It may be at different levels in the organization. I am thinking here about the Defense Department particularly. These analyses traditionally have not been made available to the Congress.

And to the best of my knowledge, they are still not made available to the Congress. I am not suggesting necessarily that all of that kind of analytical material should be transmitted.

Chairman PROXMIRE. Why not, to the extent that they can declassify?

Mr. STAATS. To the extent that it is directly relevant to the final decision, it should.

What I was suggesting a few minutes ago was that I think the Congress itself needs the capability to define the alternatives in such a way as to bring forth from the agency a full statement of support or nonsupport of alternative approaches to problems. It could be weapons systems, or it could be——

Chairman PROXMIRE. We may not even know, the defense budget is so enormous we may not even know what the alternative is. Even the people who serve on the Armed Services Committee have limited time and limited opportunity really to inquire in depth into this enormous $80 billion operation. The executive branch does have specialists who have the responsibility of making some of these studies. And that is not only true of the defense budget, it is true all along the line. So many of these budgets are enormous, with all kinds of complicated opportunities available. And we are not informed, it seems to me, because we don't ask, we aren't told.

Mr. STAATS. One of the reasons I cited the Partnership for Health Amendment of 1967 was that this is an indication of the congressional interest in evaluation and defining alternatives. I think it is an area where the Congress does need to develop additional capabilities. And I hope for one thing that we can assist the committees in this respect.

Chairman PROXMIRE. Let me move very briefly into the area that Senator Symington developed on evaluating the water projects.

Mr. Carlson, what in your judgment should be the proper concept of economic benefits to which all agencies should adhere in evaluating expenditure programs.

Mr. CARLSON. I think that each of the objectives that the Congress thinks important should be measured and displayed separately. The national income objective, for example, ought to be measured and presented separately. And that would be the addition of goods and services——

Chairman PROXMIRE. I am asking for a proper concept of economic benefits.

Mr. CARLSON. The proper concept of national income benefits is the goods and services that are provided by projects versus conditions without the projects. These benefits can be related to the costs that are entailed by building the projects versus not building them.

Chairman PROXMIRE. Now, are secondary benefits consistent with the proper concept of economics which you have just described?

Mr. CARLSON. As I mentioned in my paper, if you had a smoothly operating economy there would be no secondary benefits. As a practical matter, there are some. But they are very, very difficult to measure. And they often exist only for short periods of time. One has to be very careful. In the canning factory example that I used earlier, for instance, secondary benefits do not include the total employment of that particular canning factory; only the net addition to total employment counts, and it is determined by subtracting from the factory's total employment whatever employment would have been created by a similar investment elsewhere in the economy. Secondary benefits may prove to be a very small sliver of total project benefits.

Now, regional development objectives exist and they should be measured separately. And I do not suggest that we shouldn't measure them, because they are important in the eyes of the Congress.

Chairman PROXMIRE. This is going to require a value judgment on your part, and maybe you won't want to answer it. But I think it would help us if you could. In your view has this system of determining whether or not to go ahead with water projects based on cost effectiveness meant that we have had a wiser and more sensible and more useful decision for our economy and society, or not?

Would we have been better off if we had not had that or better off with it.

Mr. CARLSON. Far better off by having the measure.

Chairman PROXMIRE. No question in your mind at all?

Mr. CARLSON. No question at all.

Chairman PROXMIRE. There is no question that Congress is going to make better decisions in this area to the extent that we have fuller information of this kind.

Mr. CARLSON. Yes.

Chairman PROXMIRE. Then the question, it seems to me—one of the big questions certainly in addition as to the secondary benefits is whether the discounts factor is fair, whether 3½ percent is about right, or whether we should have increased it to 4⅝—every economist we have been able to get to testify before this committee—I would certainly like to find one that disagrees—we haven't been able to—every one who has testified has indicated that it is too low, it ought to be higher. If you are going to have any kind of actual costs comparison that 4⅝ is very modest. The implication that Senator Symington suggested in his question, and that many, many Members of the Congress feel, and many people in the water area throughout the country feel, the water projects interest area, is that the 4⅝ is too high. But certainly if you have a private sector that is earning 12 percent on the average before taxes, 4⅝ would seem to me to be quite low, is that correct?

Mr. CARLSON. I think you will have to agree there has been quite a step up in the water area to the new level.

Chairman PROXMIRE. Yes, indeed.

Mr. CARLSON. Right now we don't know what the actual cost is in the private sector. We hope to know that figure by the end of this year. Until then, I do think that the leadership by the Water Resource Council has resulted in a marked improvement. The new rate contributes to better analysis as long as we also appropriately measure the different benefits that society wishes to gain from water resources projects.

Chairman PROXMIRE. It may be very hard, of course—I think it is almost impossible—to get any kind of useful cost analysis data that is going to help you determine whether you are going to vote for or against Safeguard as compared with Headstart. It just seems to me to be impossible, those aren't just apples and oranges, those are comparisons of two-dimensional figures with three-dimensional, or four-dimensional figures. So that in this area—it wouldn't be useful to me. It may be to somebody else—but in the area where you have similar programs—for example, if your objective is to try and provide the best opportunity for preschool children, couldn't you have some useful

comparisons of Headstart on the one hand, together with day-care operation on the other?

Even there, of course, you have to make your value judgments, but wouldn't you be better informed if you would tend to use this kind of analysis with this sort of limitation.

Mr. CARLSON. Yes, I think so. We have tried to look in the health care area to compare broad improvements in health care through the different mechanisms available. One mechanism is to build hospital beds, like the Hill-Burton program. Another is to provide training for nurses and doctors. And another is to provide comprehensive care of different kinds. One can start making judgments whether in fact the health of the general population or a particular target group is improved more by one of these mechanisms rather than another, and decide how much efficiency is lost if one is chosen over another. I agree that it could be helpful.

Mr. STAATS. I would add that I think that is a good area for purposes of illustration. And manpower training is another area that is good for illustration. What we attempted to do in our view of the OEO programs was to take individuals in a similar age group, or with backgrounds that were generally similar, and where they had options to enter into more than one program, and then we tried to measure the extent to which those individuals received jobs in the area in which they had received vocational training. We found that in the case of vocational rehabilitation and in the case of the MDTA the ratio was roughly double what it was in the Job Corps.

Now, this is one kind of test that we can make if we can get a control group, which is similar enough, and where we have the operations clear enough so that you can measure the benefits for that particular control group.

Chairman PROXMIRE. My time is up. Let me just ask one yes-or-no question. Yes or no, has the GAO developed a program structure to assist in making budget allocations to different audits and evaluating efforts.

Mr. STAATS. We do have one now. But I am not satisfied with it, very frankly. And we are trying to improve it. We have a study in process now where we are trying to make a judgment of whether we would allocate our staff resources on a program basis roughly along the lines of the functional breakdown in the budget or whether we will follow something different. We do need some improvement in this area, and we are working on it currently.

Chairman PROXMIRE. Senator Jordan?

Senator JORDAN. Thank you, Mr. Chairman.

Several others have dipped into this water resource matter. And so I am going to ask a question or two.

Mr. Staats, you and I have been in this field long enough to know that when resource projects were first started we established the benefit-cost ratio on the basis of the reimbursable items, that is the amount that power could pay back through the sale of kilowatts, the amount that the irrigators could pay back by reason of putting water on new lands and so on.

And this pretty generally was the original concept of how a benefit-cost ratio would be established, was it not?

Mr. STAATS. That is correct.

Senator JORDAN. And since then we have added a whole string of intangible but certainly no less important benefits—flood control, navigation, fish and wildlife enhancement, recreation, and this new word "ecology" that we hear so much about, how to improve the environment by public works projects, and so on.

It is generally conceded that these benefits are not reimbursable for the reason that it is too hard to ascertain the direct beneficiary. As a matter of fact, the whole public benefits from these things. So these are the items that make—that go for making public works projects and public investment for those purposes much more attractive than they were, let's say, 20 or 30 years ago when we were simply using power and irrigation and direct flood control benefits, isn't that a fair statement?

Mr. STAATS. I think that is a fair statement, Senator Jordan. Part of the reason I think we have added these additional benefits is that there have been new Federal programs, investment type programs, directed at the same purposes which did not exist back in the early days that you are referring to. And I think this has been one of the factors involved here. In other words, if we hadn't made the investment in this particular way, we would have possibly or probably made that investment by direct appropriation for the program.

I think this has been a very important factor which has brought about the addition of these additional benefits.

Senator JORDAN. Then it seems to me there is one entire area that we have overlooked. And frankly, I wouldn't know how to quantify it, I wouldn't know how to put it in terms of how you could assess its advantage. But I think we all recognize that since World War II or thereabouts, there has been a migration away from the farm, away from the rural areas to the big cities, thus compounding the problems of the cities, compounding the problems of the ghettos, and the great centers of population. We had around 30 million people on the farms when World War II started, and there are less than 10 million on the farms now. Certain public work projects tend to develop these outlying areas, making it possible to stem the tide of migration from the rural areas to the cities, and to make it possible to build entirely new communities based on an economy derived from certain public investments.

And it seems to me that we must give some time and attention to research, and how do we quantify, how do we put a proper evaluation and a proper priority to this national purpose.

This, which is one of the factors that hasn't been properly evaluated up to now. Would you agree?

Mr. STAATS. Some of these are extremely difficult to do. And in some cases it may be possible only by somewhat judgmental terms that cannot find their way in any kind of an income test. I am not thinking here so much about water resources as I am about some of the other more social type programs, programs established for this purpose by people who are most knowledgeable or expert in this field who can assign values to certain benefits. And albeit pretty judgmental in their nature, they may be highly valuable as a tool for the decisionmaker to have.

Senator JORDAN. I think before long we have got to reverse the trend instead of a migration into the city centers, we have got to start a migration out of the city centers toward the open country. And that is going to call for a substantial public investment in resource development, or building of communities, of public housing, or whatever you want to call it. But certainly that has got to have some Federal help.

Mr. STAATS. One of the things we pointed out in our study of the poverty program was that maybe one of the best investments we could make would be to try to stimulate economic development in the rural and small communities to minimize the migration into the large cities.

Once people get into the large cities, unless they have got immediate job availability, they become a high public cost for welfare and other types of services. We think as a result of the work that we did on this study that a great deal more attention and priority should be given to economic development in the less developed rural areas and the small cities of this country.

Senator JORDAN. I agree. And it is not necessarily tied in with a particular resource development, but it does tie in with the whole problem of how do we deal with the problems of the cities It is not a separate problem from the problems of the rural areas, the two are interrelated.

Mr. STAATS. You are quite right.

Senator JORDAN. And I think we have got to develop some intensive studies and intensive research in how to stem that tide and how to reverse it in fact, and get people out of the ghettos into clean air and the open country and provide employment for them. And it is going to be very definitely tied in with a resource development program of one kind or another.

Mr. STAATS. Mr. Carlson referred to the value of regional benefits, and I think it is undoubtedly one of the things that he has in mind.

Mr. CARLSON. I think your basis for judgment might be improved by examining alternative ways to get a desired pattern of population distribution to see what the costs of each of these are. You could then make some judgments whether or not changing the pattern from what it would otherwise be would be worthwhile. Or you might adopt a different approach and step back and see why people are going to cities. Is it because when they go to cities they pay less than the full cost of their being there? If that is the reason, maybe people moving to cities can be made to pay the full social costs so they are not enticed artificially to urban areas, and therefore stay in the rural areas. An examination of both approaches—a regional development program and a program affecting motivations to move to the cities—would provide an even better basis for selecting among policy alternatives.

Senator JORDAN. And there are other factors involved here, including the wide variance in welfare payments for one thing. But I am thinking of how this ties into the proper method of how to program public spending to—instead of spending it all to build highrises higher, to start the reverse trend working to get these city people out where the land and water are more abundant without the complications of the city problems.

Chairman PROXMIRE. I would like to just take a minute to pursue what Senator Jordan is pursuing before I get into something else here. It seems to me that the water projects which provided the benefit to some of our States did not necessarily slow down the migration from the farms. It might well have speeded it up, to the extent that it provides a more efficient way of producing food or producing cotton, for example, with less manpower. It means that there will be more of an exodus from the farm. One of the most dramatic examples of what happened is our great irrigation in Southwestern United States, which transferred our cotton production from the Southeast to the Southwest, an area where you could produce with far less manpower on an entirely different basis, but a more efficient basis, with the result that you have got a great exodus of people from the Southeastern farms to the big cities. But it is very complicated. And I think that Senator Jordan's point is most useful in giving a warning on recognizing the complications.

Mr. Staats, someone has suggested that GAO undertake a study to evaluate the quality of the economic analysis of a PPB sort undertaken by the agencies, and report back to Congress so that we can take appropriate steps to insure that the level of analysis improves. I think you had a report in January 1968 indicating the discount procedure and various procedures stating how inconsistent it was—some agencies didn't seem to use it at all. How do you feel about the potential effectiveness of this kind of report on the quality of PPB operations?

Mr. STAATS. Well, I haven't thought this out in detail, Mr. Chairman. But it does occur to me, as you raise the question, of whether or not we might have usefully pointed up different approaches to cost-benefit analyses in the same or roughly the same program areas when administered by different agencies.

I do feel the Bureau of the Budget has done a great deal of excellent work in this area. But it is possible that we might be able to do in this area, to some degree, the same kind of study we did in the discount field.

Senator PROXMIRE. I think the Bureau would welcome it. The Bureau is an excellent agency. I have admiration and respect for the people in it. But they are a modest agency in size, in their staff. As Mr. Carlson has said, they are all for, I think, implementing PPB. But there isn't any question that the agencies by and large have been very, very laggard, at least in my view they have been extremely slow to get to work and apply this. Only three or four of the major agencies have substantial progress in PPB in the last few years, although the President requested the agencies to move ahead in August of 1965.

Mr. STAATS. Mr. Carlson could answer the question of numbers more readily than I could. I imagine it is a question of degree. But there are many factors that enter into it. I would like to say that if this was a matter of interest to the Congress, we would certainly be willing to explore what we might usefully do here. Having been in the Bureau as many years as I have been, I am well aware of the fact that sometimes problems get resolved easier if the Congress displays an interest in some of these matters than if the agencies think only the Bureau of the Budget is interested.

Chairman PROXMIRE. The GAO has published a document entitled General Accounting Office Policy and Procedures for the Guidance of Federal Agencies, is this correct?

Mr. STAATS. Yes.

Chairman PROXMIRE. Does this document provide any guidance on how agencies should evaluate their expenditures, that is, does it elaborate the methods for undertaking benefit-cost analysis on a comprehensive basis?

Mr. STAATS. No, this document serves a somewhat different purpose. I think the only thing that might be relevant here is that we have specified in that document that in order for an accounting system to meet our approval it must be tied in and support any program categories established under the planning, programing, and budgeting system.

Chairman PROXMIRE. I would suggest that GAO develop a major supplement to the document, elaborating the procedure for the comprehensive economic evaluation of agency expenditures. Much of the ground work for this has now been done by the Department of Defense, which has prepared a document entitled "Economic Analysis of Proposed Department of Defense Investment," and it has now been adopted by the Comptroller of the Department of Defense. And I think that they are now in the process of training people to apply it to the full range of expenditure alternatives.

I have the document here, and I will put it in the record.

Do you have any plans for the preparation of this kind of document?

Mr. STAATS. No, we have not. The only question I would have, Mr. Chairman, is whether or not this could be more appropriately a matter that the Budget Bureau would issue if indeed they felt it was appropriate.

Chairman PROXMIRE. Before I ask Mr. Carlson that, let me ask you, what is your judgment on the need for this sort of document and the possibilities that it would hold for improving the quality and consistency of agency analysis?

Mr. STAATS. I am not familiar in detail with the document you refer to, Mr. Chairman. I would be happy to look at it.

Chairman PROXMIRE. We will make it available to you. For the record when you correct your remarks would you answer that question at that point?

Mr. STAATS. Of course.

(The document referred to follows:)

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DATE February 26, 1969
ASD(Comp)

Department of Defense Instruction

SUBJECT Economic Analysis of Proposed Department of Defense Investments

References: See Enclosure 1

I. PURPOSE AND OBJECTIVES

A. This Instruction establishes policy and procedures for consistent application of economic analysis to proposed Department of Defense investment projects, in order to:

1. identify systematically the benefits and costs associated with resource requirements so that useful comparisons of alternative methods for accomplishing a task or mission can be made;

2. highlight the key variables and the assumptions on which investment decisions are based and allow evaluation of these assumptions;

3. evaluate alternative methods of financing investments; and

4. compare the relative merits of various alternatives as an aid in selecting the best alternative.

B. Reference (e) is hereby superseded and cancelled.

II. POLICY

In the acquisition process:

A. Economic analysis will be applied to all investment proposals covered by this Instruction. Economic analysis will be used in planning studies involving relative comparisons and trade-offs among investment alternatives to achieve stated objectives, effect cost reductions, or add to, delete, or adjust the scope of approved programs.

B. The fundamental concepts contained in this Instruction constitute an integral part of the planning, programming, budgeting system of the Department of Defense. However, it should be recognized that economic analysis will have limited application in the budget process, if the problem is a matter of adjusting current budgets to support previously approved decisions.

C. An analysis of benefits and costs or cost/effectiveness will normally provide the primary basis for recommending

and selecting among investment options. Decisions should be made considering the benefit/cost implications of investment options. The procedures described herein will be used to provide information for recommending and making investment decisions.

D. Proposed DoD investments will be evaluated and the relative merits of alternative proposals compared for the purpose of recommending those investments which are likely to be the most productive and beneficial.

III. APPLICABILITY AND SCOPE

A. The provisions of this Instruction apply to the Military Departments and Defense Agencies (herein referred to collectively as "DoD Components") and subordinate organizational levels. Economic analysis has implications for all levels of management authority, e.g., Command, Subcommand. The provisions of ASPR will continue to govern for investments by Defense Contractors.

B. An economic analysis is required for investment proposals which involve a choice or comparison between two or more options. A determination of benefits and costs is encouraged for single option investment proposals, i.e., projects lacking feasible alternatives that can be evaluated.

1. Exceptions - An economic analysis is not required:

a. When it can be shown that an analysis would not be useful and/or not result in increased decision effectiveness.

b. For proposed acquisitions of principal or secondary items, justified on the basis of an inventory objective in accordance with DoD logistic guidance.

c. When DoD instructions and regulations provide for equipment age or condition replacement criteria, labor and equipment trade-off standards and requirements computations. (These may be used in lieu of the economic analysis called for herein, provided they can be demonstrated to be compatible with the basic principles of economic analysis contained in this Instruction.)

2. Examples - Following are investment proposals to which this Instruction applies but need not be limited to:

a. Repair or replace decisions. Specific policy and procedures for the replacement of machine tools and other industrial production equipment are prescribed by DoD Instruction 4215.14 (reference (j)).

(1) Basic criteria for machine tool replacement are provided according to a formula for cost analysis which includes an "implicit" discount factor. (When revised, reference (j) will include the use of a discount factor in a manner compatible with this Instruction.)

(2) DoD Instructions 4215.14 and 4275.5 (references (j) and (f)) provide additional criteria which apply to machine tool replacements of equipment in the hands of contractors.

(3) Comparative cost analyses for machine tool investments are to be made in accordance with procedures specified in these DoD instructions. However, when industrial plant equipment is proposed to be acquired for purposes other than replacement, the analysis of cost will be supplemented by an analysis of the expected benefits in accordance with the instructions contained in Format B, enclosure 3, provided economic benefits are considered to be a determining factor in the acquisition.

b. Lease vs. buy decisions.

c. Refurbishment to reduce operating and/or maintenance costs.

d. Fuel conversion to reduce cost of heat production.

e. Consolidation projects for warehouses, maintenance and storage depots, and repair activities, to increase efficiency.

f. Modernization projects to mechanize, prevent obsolescence, improve work flow and layout, or increase capacity, which lead to a reduction in costs.

g. Material and supply handling projects to increase efficiency or capacity.

h. "New Starts" - DoD Instruction 4100.33 (reference (h)) and Bureau of the Budget Circular A-76 (reference (k)) require that a decision to rely upon a

Continuation of III.B.2.h.

Government activity or upon a commercial source to provide products or services must be supported by a cost comparison when cost is a determining factor to disclose as accurately as possible the difference between the costs which will be incurred under the alternatives.

(1) The policy and procedures in references (h) and (k) also apply to cyclic reviews of existing Government facilities for the purpose of determining if it would pay to convert to commercial sources.

(2) The above mentioned policy and procedures, including the use of interest at the rate specified in reference (k) must continue to be the basis of recommended actions and decisions in this area. However, in order to develop a historical record and to accumulate, within DoD, general information as to the effect of that policy, cost analyses performed under references (h) and (k) should also include, as an additional computation for internal DoD information only, the results of using an interest rate of 10 percent in lieu of the rate specified. If conflicting recommendations result, this fact should be noted for resolution by the authority approving the investment project.

i. Acquisition of Automatic Data Processing Equipment (ADPE), to increase efficiency. In projects involving lease-vs.-buy decisions with respect to ADPE, the type of analysis required herein will be performed to satisfy the requirements for comparative cost analysis prescribed in DoD Directive 4105.55 (reference (i)).

j. Proposed investments in new, improved or expanded weapon systems, related military systems, or alternative force levels for such systems should be subjected to economic analysis to determine the benefit/cost relationships and cost/effectiveness, if appropriate, of the alternatives. This includes many force related Development Concepts Papers (DCP's), Program Change Requests (PCR's) and Requirement Studies that address two or more options.

k. Investment proposals in support of research projects to increase effectiveness and promote economies in military programs, including basic research, applied research, theoretical studies, scientific experiments, feasibility studies, design studies, related

weapon systems, operational, and cost/effectiveness studies and analyses, definition studies, exploratory development, advanced development, engineering development and operational systems developments and such other R&D programs and services as defined in reference (d).

C. It is not imperative that the present value (discounting) technique described in enclosure 3 be used in evaluating:

1. proposed RDT&E investments directly related to appropriation categories for "Research" (Program element 6.1), "Exploratory Development" (Program element 6.2), "Management and Support" (Program Element 6.5), and level of effort investments for work approved based on policy decisions; or

2. investment proposals having cash flows in only the first three fiscal years for all the options being considered.

IV. DEFINITIONS

Terms used in this Instruction are defined below and in enclosure 2:

A. Economic Analysis is a systematic approach to a given problem, designed to assist the manager in solving a problem of choice. The full problem is investigated; objectives and alternatives are searched out and compared in the light of their benefits and costs through the use of an appropriate analytical framework.

1. Economic analysis is a set of concepts involving:

a. analysis and evaluation of the resource implications of missions, goals, and objectives;

b. identification of alternatives, arraying and examining all significant impacts of proposals;

c. a process for permitting the determination of relative preference; and

d. a criterion for recommending preferred alternatives in a way which relates objectives, benefits and costs.

2. Some of the techniques or tools often used in making an economic analysis are listed in enclosure 4. The techniques used will vary from one study to another.

B. An investment as defined in reference (1) is the sum of money or capital employed for a given purpose or in a given area;

a security or other property right purchased or otherwise acquired or the cost of acquisition thereof. An investment is an acquisition made in the expectation of realizing benefits beyond one year. This includes acquisitions which in aggregate will be financed in more than one year.

V. PROCEDURES

A. General

1. Investments are proposed on a "project" basis. Projects should be so defined that all resource requirements (including the use of assets on hand and currently not fully employed but planned for alternative use in some future project) and all benefits related to the life cycle of the project are included in the investment proposal.

2. Alternative proposals for satisfying project objectives should be provided in sufficient detail to allow comparative evaluations to be made. An investment proposal should show the pattern of benefits (effectiveness) and costs for each alternative and any significant non-quantifiable considerations which may have an impact on the selection of an investment proposal.

a. Equal Benefits

(1) At one extreme, there are cost reduction investment proposals which can be evaluated almost entirely on the basis of discounted cash-flow analysis. These include "Lease-vs.-Buy" decisions, and some decisions involving replacement of an existing asset with a new model.

(a) The different methods of financing each proposal should be compared to determine which has the lowest discounted cost.

(b) The most common alternative to outright purchase available to DoD is a lease agreement. The costs associated with such an agreement should be discounted and compared to the total discounted cost of the buy alternative (investment and operations and maintenance costs) to determine which alternative (lease or buy) results in the lower total cost to DoD.

(2) At the other extreme, there are projects for which it is possible to quantify costs but difficult or impossible to quantify benefits. Examples of these are projects which involve weapon systems and personnel health or safety.

(a) In these cases every effort should be made to examine two or more alternative means of providing the same type and level of benefits so that the alternative can be identified whose total discounted cost is lowest. Costs can appropriately be measured in dollars, benefits - not necessarily. Therefore, various effectiveness measures should be calculated and correlated to the amount of resources required.

(b) One way to make time phased evaluations of projected military capabilities is as follows:

1. compute estimated total and present value (discounted) costs for each alternative;

2. specify a schedule of effectiveness over the useful life of each alternative; and

3. correlate cost and effectiveness to identify the alternative which minimizes the cost to achieve a stipulated level of effectiveness.

b. Equal Cost - It may be possible to construct equal cost alternatives (where the present value of the costs of each option are equated) so that the choice among them can be made on the basis of effectiveness. The procedure in this case is to identify the quantity of a proposed system which is judged to be more effective than that quantity of an alternative system which has the same total discounted cost or present value.

c. Unequal Cost and Unequal Effectiveness - The problem here is to determine if the extra effectiveness of a given alternative is worth the additional costs it requires. Only if discounted costs and effectiveness are shown to the decisionmaker, is he able to make his decision on the basis of more complete information.

Continuation of V.A.2.c.

The advantage of the discounting technique, where neither cost nor effectiveness is equal, is that the decisionmaker can assess the real additional cost of extra effectiveness.

d. Other Considerations

(1) In other investment decisions, e.g., to effect savings from "in-house" activities, the economic implications must be weighted against important nonquantifiable considerations. "Make-or-Buy" decisions involve an economic analysis but may also require a judgment as to whether the proposal is in conflict with the Government's policy of not competing with private industry, unless there are good reasons for competing.

(2) Even if the justification for a military system is based primarily on military necessity, the "satisfaction" of that need should be weighted against the discounted cost of the particular system to be employed.

3. The objective of an economic analysis should be to assist in providing a basis to recommend and select a plan of action. It applies both to situations in which the alternative outputs or benefits can be quantified and to situations in which the alternative outputs cannot be easily quantified. In both these situations the objective is to identify:

a. the least costly alternative of several equally effective ways to perform a mission, or

b. the alternative which is expected to produce the greatest benefits or effectiveness for a given cost level, or

c. the relative cost of various alternatives and the effectiveness that can be provided so a judgment can be made as to whether the increased effectiveness is worth the additional cost.

B. Time Period Covered by an Economic Analysis

1. The economic lives of the alternatives will govern the time period to be covered by an economic analysis. The period should be set so that the alternatives start yielding benefits in the same year. The analysis will be made using the same base year for all alternatives. That is

with two or more different sets of assumptions regarding the prices of the various items involved. Examination of the solutions under the different conditions will indicate the sensitivity of a proposal to possible changes in future prices.

G. Criteria For Recommending and Selecting Investments

The preferred alternatives, each of which is the best choice among its own set of alternatives, should be identified in order of preference. Cost-reduction investment proposals evaluated on the basis of the present value of incremental costs should show the ratio of savings to investment (Savings/Investment) thereby indicating the return on investment or payback. Each investment proposal should also include an explicit statement that the expected benefits or costs for the options considered are equal or unequal.

1. Least Cost Alternatives - When alternative investment proposals for achieving a given mission/objective have the same level of expected benefits, the alternative with the lowest discounted cost or lowest uniform annual cost should be preferred.

2. Alternative to Obtain Maximum Benefits - As a rule, the best criterion in cases where benefits are a determining factor in recommending projects is to prefer that project which yields the greatest benefits (or effectiveness) for a given level of cost (discounted). In situations where it is difficult to project benefits and to compute measures of effectiveness it is desirable to provide as much useful information as possible to enable a decision to be made as to which alternative yields the most benefits.

3. Unequal Benefits and Unequal Costs - There is no all-purpose criterion for identifying the preferred alternative in cases where both benefits and costs are unequal. If the benefits of the higher cost alternative are judged to be greater, the proposal should show the extent to which the extra benefits would have to justify that alternative.

H. Preparation and Submission of Investment Proposals

1. Investment proposals initiated by a DoD component or organizational unit will include an economic analysis in accordance with instructions contained in enclosure 3. However, new reporting requirements are not imposed by this Instruction. The formats provided in enclosure 3 represent suggested guidelines for summarizing the results of an analysis.

Continuation of V.H.

2. The analysis will be reviewed by the appropriate Primary and Collateral Action Officers normally responsible for approving investment proposals, as will the reasons for the absence of such an analysis. Review procedures currently in existence will be used to assure that investment proposals covered by this Instruction are supported by an economic analysis.

3. In iterative studies of the same proposal made at successive decision points (e.g., concept, requirement, design, procurement), an economic analysis should be prepared or updated at the point where the results of the study can influence investment or expenditure decisions.

4. Use of the various analytic techniques mentioned in enclosure 4 and the detail of documentation submitted at various levels of management should reflect analytical capabilities available and the magnitude of the project or alternatives being evaluated. When necessary, additional information and/or clarification will be requested from the initiator of an investment proposal.

VI. EFFECTIVE DATE AND IMPLEMENTATION

This Instruction is effective immediately. Two (2) copies of the implementing Instructions shall be forwarded to the Assistant Secretary of Defense (Comptroller) within sixty (60) days.

R. E. Moot

Assistant Secretary of Defense
(Comptroller)

Enclosures - 4
1. References
2. Definitions
3. Instructions for Preparing Formats A, A-1, and B.
4. Techniques of Economic Analysis

TABLE OF CONTENTS FOR ENCLOSURES AND ATTACHMENTS

REFERENCES

(a) DoD Instruction 7220.25, "Standard Rates for Costing Military Personnel Services," August 1, 1968
(b) DoD Directive 7000.4, "Output Measurement System," April 13, 1968
(c) DoD Manual 4270.1-M, "DoD Construction Criteria Manual," March 1, 1968 (authorized by DoD Instruction 4270.1, November 17, 1967)
(d) DoD Instruction 7220.5, "Research and Development Program/ Budget Costs - Definitions," January 24, 1968
(e) DoD Instruction 7041.3, "Economic Analysis of Proposed Department of Defense Investments," December 19, 1966 (hereby cancelled)
(f) DoD Directive 4275.5, "Industrial Facility Expansion and Replacement," November 14, 1966
(g) DoD Instruction 7040.5, "Definitions of Expenses and Investment Costs," September 1, 1966
(h) DoD Instruction 4100.33, "Commercial or Industrial Activities - Operation of," July 22, 1966
(i) DoD Directive 4105.55, "Selection and Acquisition of Automatic Data Processing Equipment (ADPE)," September 28, 1963
(j) DoD Instruction 4215.14, "Replacement of Machine Tools," September 10, 1957 (under revision)
(k) BoB Circular A-76, "Policies for Acquiring Commercial or Industrial Products and Services for Government Use," March 3, 1966 (see page 4)
(l) DoD Instruction 5000.8, "Glossary of Terms Used in the Areas of Financial, Supply and Installation Management," June 15,1961

DEFINITIONS

Continuation of Definitions (See Section IV).

A. Benefits - (See "Output Measures").

B. Discount Rate - The interest rate used to discount or apply the time value of money to future costs and benefits so as to arrive at their present values (See also Present Value/Time Value of Future Cash Flows).

C. Discounting - (See Present Value).

D. Effectiveness - The performance or output received from an approach or a program. Ideally, it is a quantitative measure which can be used to evaluate the level of performance in relation to some standard, set of criteria, or end objective. (See "Output Measures").

E. Economic Analysis - (See Section IV. A. of basic Instruction).

F. Economic Life - The period of time over which the benefits to be gained from a project may reasonably be expected to accrue to the Department of Defense. (Although economic life is not necessarily the same as physical life or technological life, it is significantly affected by both the obsolescence of the investment itself and the purpose it is designed to achieve.) The economic life of an investment project begins in the year in which the investment starts producing benefits. Thus, it is possible that the investment may occur several years prior to the time the project starts producing benefits.

G. Equipment - Machinery, furniture, vehicles, machines used or capable of use in the manufacture of supplies or in performance of services or for any administrative or general plant purposes.

H. Historical Cost - The cost of any objective based upon actual dollar or equivalent outlay ascertained after the fact. May use any of many methods of cost determination.

I. Investment - (See Section IV. B. of basic Instruction).

J. Investment Costs - (See also enclosure 3, paragraph II.A.8.a., page 3, for definition of non-recurring investment costs).

K. New Starts - A newly established Government commercial or industrial activity or a reactivation, expansion, modernization or replacement of such activity involving additional capital

investment of $25,000 or more, or annual costs of production of $50,000 or more. Consolidation of two or more activities without increasing the overall total amount of products or services provided is not a "new start".

L. Output Measures - Useful descriptors of functions, tasks or missions performed by an organization, expressed in relation to those assigned, and of capabilities possessed, compared to those for which the organization is designed. (See reference (b).

M. Physical Life - The estimated number of years that a machine, piece of equipment or building can physically be used by the Department of Defense in accomplishing the function for which it was procured or constructed.

N. Present Value/Time Value of Future Cash Flows - In every investment, explicit recognition should be given to the fact that a dollar today is worth more than a dollar tomorrow because of the interest cost which is related to all Government expenditures which occur over time. Thus, an annual savings or cash-inflow projected for tomorrow has a present value less than its undiscounted dollar value. Dollar benefits which accrue in the future cannot be compared directly with investments made in the present because of this time value of money. Discounting is a technique for converting various cash flows occuring over time to equivalent amounts at a common point in time - considering the time value of money - to facilitate a valid comparison.

O. Real Property - Land and rights therein, utility generation plants and distribution systems, building, structures, and improvements thereto.

P. Project/Alternative - A proposal which may include a single item or multiple facilities, or items of equipment and operating sites, which if taken together, serve a common investment objective. It is the accumulation of those DoD activities required to create, deliver, and sustain an operable and supportable product or service.

Q. Recurring Costs - Expenses for personnel, materiel consumed in use, operating, overhead, support services, and other items incurred on an annual basis.

R. Sunk Cost - A cost which is irrevocably committed to a project; such costs have no bearing on current management decisions.

S. Technological Life - The estimated number of years before technology will make available new equipment or facilities which will make the existing or proposed equipment or facilities obsolete.

T. Terminal Value - The expected value of either existing facilities, or facilities not yet in being, at the end of their useful life.

U. Uniform Annual Cost - (See enclosure 3, paragraph II.A.10.b., page 7).

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INSTRUCTIONS FOR PREPARING FORMATS A, A-1 AND B-SUMMARY OF PROJECT COSTS AND BENEFITS

I. General:

A. Format A (Attachment 1) - total life-cycle costs should be compiled for each alternative investment proposal under consideration, including any approved project. The life-cycle costs associated with an alternative are important for funding purposes and for providing a complete picture of the economic implications of an investment. Costs which have already been incurred at the time an analysis is made are "sunk costs" and should not be included in the economic comparison of alternatives. This cost information, however, is often useful and should be included as supplemental to the economic comparison of alternatives.

B. Format A-1 (Attachment 2) - Often it is critical for an economic analysis to focus on the amount of difference in those costs that are affected by alternatives (differential costs). In cost reduction investment proposals particularly, only those costs, direct and indirect which could be affected by one of the alternatives, are relevant for making comparisons to identify the least costly of several project alternatives.

C. Format B (Attachment 3) - The purpose of Format B is to identify and describe the benefits, output, or effectiveness of a proposed investment. This information will be provided in sufficient detail to permit a comparison of project alternatives. Format B need not be prepared for investment proposals which are to be evaluated strictly on the basis of cost. If one or more of the alternatives considered will provide a different level of non-financial benefits than any other alternative, then the cost information presented on Format A, or comparable cost schedule, should be supplemented with an analysis of the anticipated benefits for the alternatives.

D. Separate Formats A and B need not be prepared for each investment alternative being evaluated, if there is a comparable device for documenting benefits and costs. For example, cost/effectiveness studies are often based on computerized models involving multiple alternatives.

1. The format used for recording and summarizing project benefits and costs in such cases is a computer listing or "tab run." There is no single format or form for displaying and arraying project benefits and costs.

2. The specific documentation and format may vary depending on the nature of the particular problem subject to an economic analysis. Hence, Formats A and B are suggested guides for compiling the type of information necessary for project evaluation.

3. All cost reduction investment proposals should conform as closely as possible to Format A-1.

E. The important factors and assumptions used to compute benefits and costs require justification and should be explicitly identified on Format A (line 13. d.), Format A-1 (line 22.c.) and Format B (line 8. c.).

II. Detailed Instructions:

A. Preparation of Format A (Att. #1)

1. Submitting DoD Component - Self-explanatory

2. Date of Submission - Self-explanatory

3. Project Title - Self-explanatory

4. Description of Project Objective - Describe the purpose or reason for the proposal.

5. Alternative: When comparing two or more projects or comparing alternative ways to accomplish a given project, indicate the approach being evaluated by an identifying number, letter, or specific description.

6. Economic Life

a. Enter here the time period covered by an economic analysis. The economic life will probably differ from physical or technological life and should be used in lieu of depreciation guidelines established by the Internal Revenue Service, the Federal Communications Commission and similar regulatory bodies for the purpose of accounting for the historical cost of investments made in the past.

b. Economic life is a key variable, and it is important to make the best possible determination. To provide a basis for comparison between competing projects, maximum economic lives are established for the categories of investments listed below even though the equipment or facilities involved may have a physical or technological life for a greater number of years. Also, if the economic life of a project is expected to be less than the specified maximum life, the shorter life must be used for purposes of the analysis.

(1) Automatic Data Processing Equipment - 8 years

(2) Buildings - 25 years

(3) Operating Equipment - 10 years

(4) Utilities, Plants and Utility Distribution Systems - 25 years. (This category includes investment projects for electricity, water, gas, telephone and similar utilities.)

(5) Weapon/Support Systems - The maximum economic life will vary by type of weapon or support system. In general, the period of usefulness will be measured against a stipulated level of threat, or represent the period during which a given mission or function is required or can be supported.

7. Project Year - Identify the specific years in which costs will accrue to a project or alternative. Number years 1, 2, etc., and record the year from the beginning of the project to the end of its useful life. The base year is defined in Section VII. B. and should be the same for all alternatives being evaluated.

8. Project Costs - Few specific suggestions can be made as to what costs should be included in an alternative choice calculation because of the diversity of problems encountered. In general, life-cycle costs include all anticipated expenditures directly or indirectly associated with the alternative. They should be listed by the year in which they are expected to be incurred. All estimates of future costs should be shown in constant dollars (not adjusted for inflation), except as provided in Section V. F.

a. Non-recurring

(1) Research and Development (R&D). Any costs incurred for Research and Development (identified by year) as defined in DoD Instruction 7220.5 (reference (d)).

(2) Investment Costs - Are those costs associated with the acquisition of equipment, real property, nonrecurring services, nonrecurring operations and maintenance (start-up) costs, and other one-time investment costs. Investment costs need not all occur in a single year. They include:

(a) The cost of rehabilitation, modification or addition of land, buildings, machinery and equipment.

(b) The costs of rehabilitation, modification or other capital items such as furnishings and fittings required to put the project on a "ready-to-use" basis.

(c) The costs of plant rearrangement and tooling associated with the project.

(d) The costs of freight, foundations and installations required by the project.

(e) The value of nonrecurring services received from others, both internal and external to the DoD, when the cost of such services can be measured. However, it is inappropriate to exclude these costs simply because they may be difficult to measure.

(f) The costs of leaseholds will be considered as investment costs for the purpose of this Instruction.

(g) Working capital which is the amount of liquid funds and current assets on hand or on order. Included here are inventories of consumable - items and resources required for the project.

(h) The value of existing facilities replaced. In many DoD investments, the proposed purchase of a new piece of equipment or facility eliminates the need for an existing piece of equipment or facility. If property is sold, the proceeds benefit the Government because they are included in Miscellaneous Receipts by the Treasury Department. If property is redistributed to some other Federal agency, that agency is benefitted even though there is never any reimbursement or cash-flow to the agency which controlled the property initially. The fair market value of these replaced assets (as measured by sale price, scrap value or alternative use) will be treated as a reduction in the required investment for decision-making purposes only. The DoD component proposing the project must still request the full undiscounted amount of funds required, since receipts from the sales of replaced assets revert to the Treasury. In each case, the basis for arriving at the estimate will be documented.

(i) The value of existing assets to be employed on the project.

(1) The investment for a given project may consist of assets to be acquired plus existing assets, i.e., assets already on hand. However, the value of such existing assets will be included in the investment costs only when the existing asset is currently in use (or has an alternative, planned use) on some other project or is intended for sale. That is, when the use of the existing asset will result in a cash outlay which would otherwise not be incurred on some other project or will deprive the Government of the cash planned to be realized by sale.

(2) Such existing assets will be included at their fair market value (as measured by market price, scrap value, or alternative use) and the basis for arriving at the estimate will be documented.

b. Recurring (Operations)

(1) This item of cost includes personnel, material consumed in use, operating, overhead, the costs of support services required on an annual basis and any other recurring costs.

(a) Personnel. This category includes personnel costs (civilian and military) and employee benefits that will result from the implementation of the proposed project.

(1) Civilian Personnel Services

a. The cost of civilian personnel services involved directly in the work to be performed. The cost of civilian personnel paid at annual rates will be gross pay as shown in current pay tables, plus the Government's contribution (which is 8.75 percent of base pay) for civilian retirement, disability, health, life insurance and where applicable, social security programs.

b. If labor costs are determined on the basis of direct labor hours applied, the civilian pay rate should be increased by 29 percent to cover leave and other benefits of civilian pay. This factor represents the average cost of sick leave taken and annual, holiday and other paid leave accruals, plus the average Government contributions for other benefits. The total cost of civilian personnel services will be 137.75 percent of base pay for direct labor.

(2) Military Personnel Services. The cost of military personnel services involved directly in the work performed. This cost will be computed in accordance with instructions contained in reference (a). In comparing alternative investments, complete military personnel costs should be included. In some cases this may involve recognizing costs other than those specifically included in reference (a), e.g. training costs for various skill levels.

(3) Other Personnel Costs. The sum of personnel costs which pertain to performance of the function under consideration, and which are not included under items (a) and (b) above, such as travel, per diem and moving expenses, personnel training, etc.

(b) Operating. This category covers operating costs (other than labor) and includes:

(1) Materials, Supplies, Utilities, and Other Services. The costs to the Government of supplies and materials used in providing a product or service. Include in this figure the cost of base transportation which can be directly identified with the function, costs for handling, storage, custody and protection of property, and the cost of utility services including specifically, electric power, gas, water, and communications related to the function. Initial start-up operating costs for new activities will also be included. Cost of material and supplies will include consideration for reasonable overruns, spoilage or defective work.

(2) Maintenance and Repair. The cost of maintenance and repair to buildings, structures, grounds and equipment utilized by the function involved in producing goods or services. Capital improvements should not be included here, but should be included with investment costs. Include only those maintenance and repair expenses directly attributable to the project under analysis.

(c) Overhead Costs. Include estimates of overhead costs attributable to the project in question, particularly those costs that change as a result of the investment proposal. These may be costs for accounting, personnel, legal, local procurement, medical services, receipt, storage and issue of supplies, police, fire and other services. Include also the costs of terminating or cancelling any existing arrangements which will become due as a result of undertaking the project in question.

(d) Other. Other costs include the operating expenses of the currently approved program if it will remain in use until a new alternative is phased-in. It is inappropriate to include foregone tax revenues since they are already reflected in the discount rate.

c. Annual Cost - The sum of nonrecurring and recurring project costs included in columns 8. a and 8. b respectively.

d. Discount Factor - Enter the appropriate Project Year Factor from Table A (see attachment 4 to this enclosure) for the purpose of discounting project costs.

e. Discounted Annual Cost. The present value of annual costs is shown in column e. The present value is calculated by multiplying the Annual Cost of Column c by the appropriate Project Year factor from Table A.

9. Totals - Self Explanatory

10. a. Total Project Cost (Discounted) - Self Explanatory

b. Uniform Annual Cost. A constant amount that if paid annually throughout the useful life of the project would equal the present value (discounted) total cost for the project. It is computed by dividing line 10. a by the

factor from Table B (attachment 4) for the end year of the project. (If lines 11 and 12 are used, the uniform annual cost should be provided with and without terminal value.) The uniform annual cost convention permits comparison of projects having unequal lives and is based on the assumption that follow-on investments will exhibit the cash-flows forecasted for the initial investment. An investment option having the lowest uniform annual cost is judged to be the least costly alternative.

11. Terminal Value (Discounted) - Optional. Include the value of assets at the end of the economic life of the project.

    a. Terminal values are likely to be so small and occur so far in the future that they may have no significant effect on the decision. Moreover, any salvage values realized may be almost, or completely, offset by removal, dismantling, or disposal costs. Hence, such terminal values will not ordinarily be included in the analysis of a project.

    b. If, however, the terminal or residual value is expected to be significant (e.g., ADPE, precision machine tools), the terminal value may be included in the cost analysis. Terminal values should only be used when their inclusion would significantly affect the results of the analysis. The explicit assumptions used in the derivation of all residual values must also be provided.

    c. Include the terminal value of working capital as an offset to total project costs (discounted).

12. a. (Optional) - Discounted Total Cost (with terminal value). The present value of all costs of the alternative after terminal value is deducted. It is calculated by substracting line 11 from line 10.

    b. Uniform Annual Cost - This is the total project cost (with terminal value divided by the factor from Table B (attachment 4) for the end year of the project. See Paragraph II, A. 10. a., above).

13. Source/Derivation of Cost Estimates. Include the computations used to derive total project costs (Item 10 above). Describe in appropriate detail the method for estimating each item of cost. For example, if the estimate is based on a statistical cost model, explain how the model was derived, the variables, standard errors, etc. If factors are used, indicate their source and/or the basic assumptions used in their derivation.

Stipulate the number of personnel presently involved in the operation, a brief explanation of the source for cost estimates, any extraordinary expenditure, any major overhauls which will be required for modernization programs, and an explanation of any significant considerations which had an impact on the evaluation.

14. Name and Title of Principal Action Officer/Date - Identify the name(s) of the principal parties responsible for the economic analysis and the date the analysis was made.

B. Preparation of Format A-1 (Att #2)

1. Cost Reduction Investment Proposals - Under this category the distinction between "present" and "proposed" is made. The "present" alternative seeks to identify the level of costs that would accrue without the proposed investment project while the "proposed" alternative presents the costs that would occur if the proposed project is undertaken. The amount of cost savings is the difference between the discounted recurring cost of the currently approved project and the discounted recurring cost of each proposed alternative plus the present value of savings to be realized by the elimination of modification or refurbishment costs for the "present" alternative. The present value of changes in working capital and the terminal value of assets should be treated as adjustments to investment costs.

2. Alternative Financing - Where alternative methods of financing are available, Format A-1 should be prepared to show that the lowest cost method of acquisition has been considered.

3. Cash-Flows - It is possible for cash-flows to be different for each year of economic life. For example, if start-up costs are large, cost savings can be negative during the first year or two and then become increasingly positive during the middle and later years of the project. Recognition of the timing of cash-flows and discounting both the differential investment and recurring costs of the alternatives is an integral part of this analysis.

4. Cost Information - Formats A and A-1 contain the same basic cost information. However, Format A-1 focuses on the difference in costs between alternative projects. Format A-1 is derived from Format A, and the same procedures for compiling project costs apply to both formats. Therefore, to prepare Format A-1, refer to the detailed instructions for preparing Format A (Section II, paragraph A of this enclosure). The discounted differential cost (Column 11 - Format A-1) is obtained by multiplying each amount in Column 9 by the appropriate discount factor in Column 10.

C. Preparation of Format B (Att #3)

1. Submitting DoD Component - Self-explanatory

2. Date of Submission - Self-explanatory

3. Project Title - Same as Format A

4. Description of Project Objective - Same as Format A

5. Alternative - Same as Format A

6. Economic Life - Same as Format A

7. Benefits: Provide estimates of all benefits, outputs, or effectiveness expected to be received or achieved as a result of undertaking a proposed investment. Output measures shall be expressed quantitatively wherever possible. Insofar as practical and appropriate, this information shall be capable of historical accumulation, and must be auditable and relatable to significant organizational missions and functions, to relevant environmental factors, and to resources to be invested. The period of time for which these benefits will accrue is a function of the economic life of the project in question. Format B should be devoted entirely to quantitative and qualitative information which will set benefits completely apart from the financial or cost aspects of the analysis.

   a. Benefits, output, and indicators of effectiveness - Identify or briefly describe all measurable benefits, measures of productivity and effectiveness accruing to the alternative under consideration, and useful descriptors of functions, tasks or missions to be performed by an organization, expressed in relation to those assigned, and of capabilities to be acquired. Specify the benefits for each year and in total for the entire economic life of the project.

   b. Non-quantifiable benefits - Briefly describe in narrative form any unquantifiable benefits expected to result from the investment alternative evaluated.

   c. Present Value of Revenues - Identify any additional cash-inflows of possible revenues expected to result from the proposed investment. For example, a revolving fund activity may specify the cash-inflows in each year of the economic life of the alternative and discount these amounts. Care must be taken to assure that the cost savings reported in Section II, Paragraph B. are not included here.

8. Source/Derivation of Estimates. Include a narrative description of how the benefits of this project were derived or calculated.

9. Name & Title of Principal Action Officer/Date. Same as Format A.

Attachments - 4
1. Format A
2. Format A-1
3. Format B
4. Project Year Discount Factors

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(Att 1 to Encl 3)

ECONOMIC ANALYSIS - DOD INVESTMENTS
SUMMARY OF PROJECT COSTS
FORMAT A

1. Submitting DoD Component: _____

2. Date of Submission: _____

3. Project Title: _____

4. Description of Project Objective: _____

5. Alternative: _____ 6. Economic Life: _____

	8. Project Costs					
7.	a. Non-Recurring		b. Recurring	c.	d.	e.
Project Year	R&D	Investment	Operations	Annual Cost	Discount Factor	Discounted Annual Cost
1.						
2.						
3.						
.						
.						
.						
.						
25.						
9. TOTALS						

10a. Total Project Cost (discounted) _____
10b. Uniform Annual Cost (without terminal value) _____
11. Less Terminal Value (discounted) _____
12a. Net Total Project Cost (discounted) _____
12b. Uniform Annual Cost (with terminal value) _____

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(Att 1 to Encl 3)

ECONOMIC ANALYSIS - DOD INVESTMENTS
SUMMARY OF PROJECT COSTS
FORMAT A

13. Source/Derivation of Cost Estimates: (use as much space as required)

a. Non-Recurring Costs:

1) Research & Development:

2) Investment:

b. Recurring Cost:

c. Net Terminal Value:

d. Other Considerations:

14. Name & Title of Principal Action Officer	Date

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(Att 2 to Encl 3)

ECONOMIC ANALYSIS - DOD INVESTMENTS
SUMMARY OF PROJECT COSTS
FORMAT A-1

1. Submitting DoD Component: _____

2. Date of Submission: _____

3. Project Title: _____

4. Description of Project Objective: _____

5a. Present Alternative: _____ 6a. Economic Life: _____

b. Proposed Alternative: _____ b. Economic Life: _____

7. Project Year	8. Recurring (Operations) Costs		9. Differential Cost	10. Discount Factor	11. Discounted Differential Cost
	a. Present Alternative	b. Proposed Alternative			
1.					
2.					
3.					
.					
.					
25.					
12. TOTALS					

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(Att 2 to Encl 3)

ECONOMIC ANALYSIS - DOD INVESTMENTS
SUMMARY OF PROJECT COSTS
FORMAT A-1

13. Present Value of New Investment:

a. Land and Buildings _____
b. Equipment _____
c. Other (identify nature) _____
d. Working Capital (Change - plus or minus) _____

14. Total Present Value of New Investment (i.e., Funding Requirements) _____

16. Plus: Value of Existing Assets to be Employed on the Project _____

17. Net Investment (Line 14 minus line 15 plus line 16) $_____

18. Present Value of Cost Savings From Operations (Col. 11) _____

19. Plus: Present Value of the Cost of Refurbishment or Modification Eliminated _____

20. Total Present Value of Cost Savings $_____

21. Savings/Investment Ratio (Payback) (Line 20 ÷ Line 17) _____

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(Att 2 to Encl 3)

ECONOMIC ANALYSIS - DOD INVESTMENTS
SUMMARY OF PROJECT COSTS
FORMAT A-1

22. Source/Derivation of Cost Estimates: (use as much space as required)

a. Investment Costs:

(Itemize Project Costs)

1.) Changes in Working Capital

2.) Net Terminal Value:

b. Recurring Cost (Operations):

1.) Personnel

2.) Operating

3.) Overhead Costs

c. Other Considerations:

23. Name & Title of Principal Action Officer	Date

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(Att 3 to Encl 3)

ECONOMIC ANALYSIS - DOD INVESTMENTS
SUMMARY OF PROJECT BENEFITS
FORMAT B

1. Submitting DoD Component: _____

2. Date of Submission: _____

3. Project Title: _____

4. Description of Project Objective: _____

5. Alternative: _____ 6. Economic Life: _____

7. Benefits:

   a. Benefits, Output, and Indicators of Effectiveness: (Describe and justify)

   b. Non-Quantifiable Benefits: (Describe and justify)

   c. Present Value of Revenues: (Describe and justify)

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(Att 3 to Encl 3)

ECONOMIC ANALYSIS - DOD INVESTMENTS
SUMMARY OF PROJECT BENEFITS
FORMAT B

8. Source/Derivation of Benefits (Use as much space as required)

a. Benefits, Output, and Indicators of Effectiveness:

b. Non-Quantifiable Benefits:

c. Present Value of Revenues:

9. Name & Title of Principal Action Officer	Date

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(Att 4 to Encl 3)

Project Year Discount Factors

Table A

Project Year	PRESENT VALUE OF $1 (Single Amount - To be used when cash-flows accrue in different amounts each year). 10%	PRESENT VALUE OF $1 (Cumulative Uniform Series - To be used when cash-flows accrue in the same amount each year). 10%
1	0.954	0.954
2	0.867	1.821
3	0.788	2.609
4	0.717	3.326
5	0.652	3.977
6	0.592	4.570
7	0.538	5.108
8	0.489	5.597
9	0.445	6.042
10	0.405	6.447
11	0.368	6.815
12	0.334	7.149
13	0.304	7.453
14	0.276	7.729
15	0.251	7.980
16	0.228	8.209
17	0.208	8.416
18	0.189	8.605
19	0.172	8.777
20	0.156	8.933
21	0.142	9.074
22	0.129	9.203
23	0.117	9.320
24	0.107	9.427
25	0.097	9.524

Note: Table A factors represent an arithmetic average of beginning and end of the year single amount factors found in standard present value tables. Table B factors represent the cumulative sum of the factors contained in Table A through any given project year.

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TECHNIQUES OF ECONOMIC ANALYSES

I. GENERAL

The following techniques can be useful in performing an economic analysis and represent some of the methods for supporting the desired aim of an economic analysis, namely to provide information for solving problems of choice. However, economic analysis is not synonymous with the application of sophisticated techniques, and many important economic analyses may not use them.

Accounting
Analog Method of Cost Estimating
Benefit-Cost Analysis
Correlation Analysis
Cost-Effectiveness Analysis
Cost Estimating Relationships (CER)
Critical Path Method
Delphi Method
Discounting
Engineering Method of Cost Estimating
Gaming (Game Theory)
Linear Programming
Marginal Analysis
Modeling
Productivity Accounting
Operations Research
Queuing
Regression Analysis
Sensitivity Analysis
Simulation
Statistical Inference

II. USE OF THE PRESENT VALUE (DISCOUNTING) TECHNIQUE

A. Discounted cash-flows and the attendant aspects of economic analysis may tend to substantiate and provide clearer and more complete justification for proposed investment projects. Discounting is a very small, but significant, aspect of an economic analysis. That is, a discounted cash-flow analysis may critically affect the alternative choice decisions changing the results of an analysis from what they would be using undiscounted costs. However, it should be noted that discounting will not always change the alternative choice decisions. Discounting will demonstrate whether decisions which might be reached using only undiscounted costs are, in fact, valid. Discounting will also provide a better indication of the cost savings to be realized from a cost reduction investment proposal.

B. The degree of change in the relative cost of alternative proposals is influenced primarily by four factors:

1. The economic life - Discounting makes a bigger difference the longer the economic life.

2. The discount rate - The higher the discount rate the larger its impact.

3. The incidence of costs - An alternative with high costs in early years and lower costs later will appear less favorable, discounted, than an alternative with relatively lower initial costs.

4. The reliability of cost estimates - There is a need for greater accuracy in estimating costs whether or not discounting is used. The accuracy and adequacy of cost estimates is an important factor in a discounted cash-flow analysis.

C. The implication of the complexity of the procedures for applying discounting may be easily misinterpreted. The discounting technique represents an additional tool which should be applied during the evaluation of alternative investment proposals. This technique will most likely not be the most important analytic technique used in making an economic analysis, nor should it be heavily relied upon to always identify the most economical investment alternatives. For example, an investment proposal may involve long-range cash-flow projections which are subject to a high degree of uncertainity. This may be the case for certain weapon systems and research projects. The four factors noted in II.B. are the key variables which will influence the results of a discounted cash-flow analysis.

(Mr. Staats subsequently supplied the following:)

NEED FOR GOVERNMENTWIDE INSTRUCTION SIMILAR TO "ECONOMIC ANALYSIS OF PROPOSED DEPARTMENT OF DEFENSE INVESTMENTS," DOD INSTRUCTION 7041.3, DATED FEBRUARY 26, 1969

The instruction in question is a revision of an earlier Department of Defense instruction on this subject, dated December 19, 1966. The new version expands the requirement for economic analysis to formally extend its application to proposed investments in new, improved, or expanded weapon systems, related military systems, or alternative force levels for such systems and includes many force related Development Concepts Papers, Program Change Requests, and Requirement Studies that address two or more options. The instruction requires consideration of alternative methods of satisfying objectives, consideration of the time period covered by the analysis, consideration of discounting, specific treatment of uncertainty including the use of analyses which test the sensitivity of results to uncertain variables, and adjustment for inflationary trends.

In general, we endorse the principle of making systematic analyses of proposed investments of Federal funds to provide information for the use of decisionmakers. The implementation of Planning-Programing-Budgeting (PPB) has been accompanied by bulletins issued by the Bureau of the Budget which establish the requirement for systematic analysis of alternatives in the attempt to obtain desired benefits at least cost. We have endorsed the objectives of PPB and have incorporated in our prescribed principles and standards for Federal agencies the requirement that agency accounting systems provide support for the information needs of PPB.

With regard to specific techniques of economic analysis, we reviewed the use of discounting by Federal agencies and submitted our report (B–162719) to the Subcommittee on January 29, 1968. As one outcome of this report and the Subcommittee's hearings on the subject, the Bureau of the Budget plans to issue shortly an instruction on the use of discounting which will provide for more uniformity in practice by Federal agencies.

The concepts contained in the Defense Department instructions appear to be consistent with those we have endorsed with respect to all Federal programs. However, whether a specific Government-wide instruction similar to that promulgated within the Department of Defense should be issued requires much further study than we have been able to give the matter so far. It is our understanding that there was very little application of the 1966 instruction to specific investment proposals in the Department of Defense. The revised instruction has not been in effect long enough to permit any evaluation of its impact on investment decisions within the Department.

If a standard Governmentwide directive of this matter is to be issued, we believe it should be prepared and issued by the Bureau of the Budget for executive agency guidance. Such an instruction might well require individual Federal agencies to issue implementing instructions for specific application to proposed procurements within their agencies. Unless authorizing legislation is enacted, the General Accounting Office would not have the authority to prescribe instructions of this nature. To the extent that the General Accounting Office undertakes the preparation of standards for measuring the quality of economic analysis, we believe it should be primarily for the guidance of our own staff.

The Department of Defense instruction also prescribes procedures for the preparation of supporting information to accompany proposals for investments of funds. The application of similar instructions to other Government programs would require the development of specific procedures suitable for use in the particular agencies involved.

In general, before determining whether a Governmentwide instruction should be issued on this subject, we believe that the experience of the Department of Defense with its instruction should be evaluated further.

Chairman PROXMIRE. Dr. Carlson?

Mr. CARLSON. Providing guidelines that are applicable across the Federal Government is more difficult in the area of the estimating benefits than it is in the discount rate area. I would argue we ought to do more of it; we ought to refine and develop our techniques. But

to go ahead and try to develop one class of definitions and techniques to apply is, I think, premature.

Chairman PROXMIRE. Why would that be one?

Mr. CARLSON. I think trying to measure different objectives in the Federal Government, trying to provide rigor at this point with the little bit of scholarly analysis that has gone on in areas outside the measure of national income benefits would be jumping ahead.

I wouldn't argue, however, about providing a rather large frame in which to pursue analysis.

We are doing this with the discount circular that is about to be published, in that we are telling the agencies they ought to discount, using a minimum rate, and treat risk and uncertainty in a way that is generally useful. A standard procedure for estimating benefits would have to provide a much broader frame to begin with.

Chairman PROXMIRE. It would be very helpful if you could do that. I know you can't go as far as the Defense Department. They have been doing this since 1962. They had Secretary McNamara and Mr. Hitch also in the department pushing hard on this PPBS program for seven years.

You can't expect all the other agencies to be at the same level of development.

And furthermore, perhaps their investments are more subject to this kind of analysis can be standardized and you can be more rigorous some agencies.

Mr. CARLSON. The Defense Department has developed a cost effectiveness analysis for the particular objective of deterrence and related objectives that can be applied across the agency. Within agencies, this kind of analysis can be standardized and you can be more rigorous about it. However, a little more caution is required when a mix of other objectives is involved, and this problem can arise even in Defense. But I would be glad to go ahead and give some thought to what kind of guidelines might be helpful if any at all.

Mr. STAATS. It just occurred to me, Mr. Chairman—and this thought occurs to me only as we have been talking about it here—that perhaps an alternative approach would be to select, at least in the first instance, programs which cut across agency lines, which are designed to achieve the same objective. This gets in part at Mr. Carlson's point about trying to define this around objectives. One of the reasons the water resources area is subject to the kind of treatment that it has been on the cost-benefit approach over many years has been the difficulty of reaching judgments with respect to those things which are purely local, the benefits of a local nature, as against those which had national benefits, and therefore should receive Federal support.

This is one of the kind of things that would vary a great deal, depending on the program area that you are concerned with.

Chairman PROXMIRE. Mr. Staats, one of the greatest problems in the PPB System relates to the failure of agencies—and anyone else, for that matter—to go back and determine how expenditure programs turn out after they are undertaken. Studies to compare actual benefits with planned benefits are rarely undertaken. The pain of evaluating the extent to which costs exceed planned costs is often sufficient to deter even the most stouthearted from studying the reasons for the cost over-

Both continuing review and independent studies would be oriented toward outputs, types of benefits and types of capability desired, and would in many cases involve inquiries and evaluations across several agencies.

Mr. CARLSON. Mr. Chairman, the Congress has earmarked funds for evaluation of some programs, a half percent of 1 percent in several pieces of legislation. This practice might help provide more evaluation in the future.

Chairman PROXMIRE. That is good to know. Will you give me the legislative references so that I could use that?

Mr. CARLSON. I would be glad to.

(The following was subsequently received from Mr. Carlson:)

The following legislation enacted by the Congress provides that one-half of one percent of program funds in specified program areas should be earmarked for program evaluation:

1. Public Health Service Act:
   (*a*) Sec. 309(c)(2), grants to schools of public health.
   (*b*) Sec. 314(d)(1), formula grants for public health services.
   (*c*) Sec. 314(e), project grants for public health services.
   (*d*) Sec. 797, allied health profession.
   (*e*) Sec. 901(a), regional medical programs.
2. Community Mutual Health Centers Act, sec. 262 [sec. 303(a) of Public Law 90-574].
3. Social Security Act, sec. 513(b), maternal and child health.
4. Juvenile delinquency, sec. 404 of Public Law 90-445.
5. Vocational Rehabilitation Act, sec, 7(c).
6. Education programs, blanket authorization in sec. 402 of Public Law 90-247.
7. Work incentive programs, sec. 441 of the Social Security Act.

Chairman PROXMIRE. Dr. Carlson, could you give us a description and evaluation of the quality and consistency of benefit estimates prepared by agencies as these estimates appear in, say, the agency program memoranda?

Mr. CARLSON. I think one has to establish two criteria for judgment. One is what people thought would be the improvement when the PPB System was established in 1965, and the other in terms of what was going on at that time and the improvement since.

On the first criteria we are not doing very well. In terms of improvement I think the analysis that has been relevant for policy purposes and has been used for policy purposes has increased roughly 200 percent in the last 3 or 4 years.

Now, how can you measure that 200-percent increase?

Chairman PROXMIRE. It is only 3 to 4 years old, isn't it?

Mr. CARLSON. Yes. During the time the system has been in being I think the improvement has shown that kind of an increase. Now, some might maintain we merely moved from five up to 15 on a scale with a hundred being the desirable level. Admittedly, we still are a long way from a well-developed analytic system and the pattern of development has been mixed. Some program memoranda and analyses are first class, really first rate. And they were relevant. But many of them have not been relevant. And I have to say that at least half of them have been more descriptive than analytic in nature and not very useful.

But there has been improvement, and I think we have seen a marked improvement this year. The progress so far in this year on the major policy issues has been encouraging, including the study that we have already received this year on the fast breeder reactor.

Chairman PROXMIRE. Let me ask you about the guidance that the Budget Bureau has been giving the agencies in this respect.

Could you describe briefly the efforts of the Bureau of the Budget to improve the quality and consistency of these estimates? Have you developed a handbook or document to guide agencies on this matter? Have you attempted to formulate a statement of the correct concept of economic benefits or of procedures to measure benefits for the guidance of agencies? Do you feel that such a guideline document, if enforced, could lead to improved agency practice? Do you have any plans to develop such a document in the near future?

Mr. CARLSON. We do have documents that provide some guidance on analysis and the estimation of benefits. Budget Bureau Bulletin 68–9 is one of those documents. We anticipate making improvements to it later this year. And I would say that the documents——

Chairman PROXMIRE. How widely disseminated in this document.

Mr. CARLSON. It is widely distributed. Most agencies are operating with it now. In fact, several agencies have been added to the PPB System since January of this year.

It is a well-known document. It does have some flaws, and we were working to provide improvement. We hope to have better guidance issued by the fall of this year and in time for the fiscal year 1972 planning and budgeting cycle.

Chairman PROXMIRE. What is the status of the discounting document which the Bureau of the Budget assured this subcommittee would be developed and sent to the agencies?

Mr. CARLSON. It is in its final stages of clearance. I imagine we will have it out in a matter of days, certainly by the end of this month.

Chairman PROXMIRE. In its report of last September, the subcommittee recommended that the Bureau of the Budget undertake a study to determine the opportunity cost of displaced private spending with a view to estimating and publishing this discount rate on an ongoing basis. What is the current status of that study?

You have just said in response to another question that you couldn't estimate the actual cost.

Mr. CARLSON. The study is in progress, and we hope to have some insights by this fall.

Chairman PROXMIRE. Dr. Carlson, you refer in your study to the overview evaluation sheet for manpower training which displays benefit-cost information and estimates the characteristics of expenditure beneficiaries. This is most helpful information and vitally important to policymakers. Is this kind of information developed by agencies for each of their programs?

Mr. CARLSON. As I mentioned in my opening statement, this is an experimental effort both in terms of format and in terms of measurement. We anticipate developing these measurements for programs, or perhaps another format, during the month ahead in full cooperation with the agencies affected.

Chairman PROXMIRE. Is any of this type of information found in the program memoranda?

Mr. CARLSON. Yes. Study of the major program issues will provide better numbers than we have on these tables and much better than other numbers which are not displayed in the example before you and which are based more on judgment from fragmented data.

Chairman PROXMIRE. You indicated in your report that this indicated not only the degree of knowledge but the degree of ignorance.

Mr. CARLSON. That is right.

Chairman PROXMIRE. And you had blanks all the way across the page.

Mr. CARLSON. Yes.

Chairman PROXMIRE. Does this indicate that the estimates of this sort don't exist across many program areas?

Mr. CARLSON. Estimates for some program areas are particularly bad. I indicated that we need far more information of what is happening in programs affecting the law enforcement area. But there are both conceptual and measurement problems in this area. We just haven't bothered to measure what expenditures are doing for us in some areas.

Chairman PROXMIRE. In the annual report of the Joint Economic Committee, we recommended that precisely the kind of information which is described in your illustration be presented to the full Congress in summary reports. Are you able at this time to submit this kind of information on a regular basis to the Congress?

Mr. CARLSON. No, what you see before you is still experimental.

In time perhaps submitting such information would be useful. We do have a special analysis section associated with our budget document that we share with the Congress and the public which presents a tabulation of dollar amounts spent on related programs. And we are trying to upgrade this presentation. But program overviews are still in an experimental stage.

Chairman PROXMIRE. Let me ask you to study this matter and report back to this subcommittee in a few weeks if you can. We would like to have an estimate from you as to when you would be able to supply us with this information on a regular basis. As you know, we are having hearings this summer, further hearings on PPB after the second hearing on Wednesday. And I hope you will be able to report back to us at that time on this subject.

Mr. CARLSON. I would be glad to.

Chairman PROXMIRE. Gentlemen, thank you very, very much. I have kept you a long time. You have done an excellent job. And you have been most helpful.

The committee will reconvene on Wednesday morning at 10 o'clock in this room.

(Whereupon, at 12:25 p.m., the committee was recessed, to reconvene at 10 a.m., Wednesday, May 14, 1969.)

GUIDELINES FOR ESTIMATING THE BENEFITS OF PUBLIC EXPENDITURES

WEDNESDAY, MAY 14, 1969

CONGRESS OF THE UNITED STATES,
SUBCOMMITTEE ON ECONOMY IN GOVERNMENT
OF THE JOINT ECONOMIC COMMITTEE,
Washington, D.C.

The Subcommittee on Economy in Government met, pursuant to recess, at 10 a.m., in room S-407, the Capitol, Hon. William Proxmire (chairman of the subcommittee) presiding.

Present: Senators Proxmire and Jordan, and Representative Rumsfeld.

Also present: John R. Stark, executive director; Robert H. Haveman, economist; and Douglas C. Frechtling, minority economist.

Chairman PROXMIRE. The subcommittee will come to order.

Today is the second and final session in the current series of hearings entitled "Guidelines for Estimating the Benefits of Public Expenditures." The need to develop quantitative estimates of the impacts of Government spending programs is a most basic one. Indeed, the ultimate success of the PPB system depends upon the ability of analysts to make meaningful benefit estimates. Moreover, it is only by comparing the benefits and costs of alternative programs that Congress and decisionmakers in the executive branch can choose those alternatives which are in the public interest.

In our session on Monday, May 12, we heard statements by Mr. Elmer Staats, Comptroller General of the United States, and Dr. Jack Carlson, Assistant Director for Program Evaluation of the Bureau of the Budget. Both of these witnesses discussed the appropriate concept of economic benefits and the procedures which should be followed in evaluating other, noneconomic impacts.

We learned of a most significant study which is being undertaken by the Bureau of the Budget—the program overviews. In his statement, Dr. Carlson presented an example of the results of this study. For two programs in the manpower area, program costs, program benefits, the benefit-cost ratio, and the characteristics of the beneficiaries of the program are all provided.

This is most helpful information, and the Bureau of the Budget should be commended for developing it. We now look forward to the time when the full study can be presented to the Joint Economic Committee and to the Congress.

This morning, we will hear the statements of three prominent economists. We welcome Prof. Robert Dorfman of Harvard University, Prof. Jack Knetsch of George Washington University, and Prof. Julius Margolis of Stanford University. They will present their views

on the conceptual and practical issues in developing appropriate methods of benefit estimation.

And, gentlemen, I think Senator Jordan will be here shortly.

I have two other committees meeting this morning, at which my attendance is supposed to be mandatory, so I am probably going to have to skip out at least very briefly later on. But I will certainly come back.

We will start off with Professor Dorfman.

You gentlemen can handle your presentation any way you see fit. If you want to have a longer statement printed in full in the record we will be happy to do that. And you may present your statement as you wish.

Mr. Dorfman, we are now ready to hear from you, if you will, sir.

Please proceed in your own way.

STATEMENT OF ROBERT DORFMAN, PROFESSOR OF ECONOMICS, HARVARD UNIVERSITY

Mr. DORFMAN. Thank you, Mr. Chairman.

My name is Robert Dorfman. I am a professor of economics at Harvard University, and over the past 10 years or more I have been particularly interested in the problems planning and evaluating governmental investments, especially in the area of water resource development. My writings in the field include some contributions in a large book entitled, *Design of Water Resource Systems*, and the organization and editing of The Brookings Institution symposium on *Measuring Benefits of Government Investments.*

In the pursuit of this interest I have given a good deal of thought and study to a great many aspects of governmental decisions about capital investments and other expenditure programs, but I should make it clear that I am, by and large, an academic theorist. I have not personally confronted the task of planning or evaluating a large project in this country, though I have done so in the context of underdeveloped countries, where some of the difficulties are even more formidable.

I welcome the opportunity to present my rather academic viewpoint to you.

Since at least the days when Joseph recommended granaries to the Pharaoh, governments have been making investments and have been making decisions about them. Joseph's techniques are now considered to be unreliable, and I am going to devote my remarks to much more recent and objective methods of project analysis which had their inception in the Flood Control Act of 1936.

That act, and subsequent legislation, gave rise to the practice of evaluating projects largely by means of their "benefit cost ratios." Between those pioneering days and the present, the technique of evaluating projects within the framework of benefit-cost analysis has evolved strikingly, partly because we have learned more and more about how to do it, but mostly because our perception of the problem and, in fact, the nature of the problem have changed. The extent of the change is displayed most vividly in recent discussions in the water resources area, revealed most clearly by some recent proposals for including a variety of nonpecuniary benefits on an equal footing with

increases in national income when evaluating proposed Government projects.

The level of sophistication and complexity of these new proposals goes far beyond the original direction to compute and compile benefits to whomsoever they may accrue which was contained in the original legislation.

In simpler days of the 1930's it was easy to believe that the predominant purpose of Government investments was to enhance our national income. Even then it was not quite so, as is attested by the concentration of projects in the rural sectors and in the western part of the country. Probably the principal effect of the original benefit-cost computations was to set a floor under the national income consequences of projects designed to relieve the depressed agricultural communities of the Midwest and Far West.

No one then gave much thought to the effects of projects on what we now call the quality of life or to many other aspects that are excessively hard to measure. Over the years we became increasingly skilled at making economic projections and appraisals, but always until now within the framework of consequences that could be brought into contact with the measuring rod of money, which came to be called tangible benefits.

I do not want to ignore that there were always some complexities, for example, how to evaluate the lives that might be saved by a flood-prevention project? But, in the early days, the tangible benefits preponderated so heavily that the rest could be mentioned in a side-commentary as intangible pluses and minuses.

That simple early period was a very long time ago. As long as 5 years ago the Brookings Institution sponsored a conference on measuring benefits. At that conference we underscored very heavily the importance of the intangibles. There we studied such varied programs as aid to education, urban renewal, support of health facilities, encouragement of outdoor recreation, and so on. In every case it was emphasized that the critical benefits were, in fact, the so-called intangibles. Now it is becoming more and more widely accepted that even in the classic case of water resource development the contribution measurable national income does not merit any particular primacy.

Many economists now argue that virtually equal emphasis be placed on the esthetic, distributional, health, and recreational consequences of a project.

That is all to the good. It faces up to complexities and implications that have always been there. When we were poorer in material products and richer in the abundance of natural resources than we are at present we could afford to neglect these nonproductive consequences of Government undertakings, but we can do so no longer.

So today we confront the problem of taking them into account, and it is a much more difficult problem than traditional benefit-cost analysis. We should concede that at the moment we do not know how to do it very well, but we shall learn, just as we learned how to do benefit-cost analysis. Recent contributions have pointed out that as an essential first step, the report on a program or project should identify the major kinds of consequences, favorable and unfavorable, to which a program will give rise and then should estimate the amount of each of these consequences in the units most appropriate to it, without forcing it into a monetary measure.

In a few moments I shall suggest an essential second step, but first I should remark on the nature of the central difficulty that we now confront.

One of the advantages of the older system of concentrating on the effects of projects on national income was that this practice permitted a great deal of discretion to be delegated to technicians and other subordinates. Anyone who could follow the directions in the "Green Book" or in Senate Document 87–97 could appraise a project and could make design decisions that increased the favorability of the project. The project that contributed most to national income per dollar of resource cost was the best project, and that was that. But as soon as another dimension is taken into account, if I may use a technical term, things become vastly more complex.

For example, if a public housing project is intended both to increase the value of low-income housing available in a community and to increase the amount of play place available for ghetto children, then no mere technician can compare two designs one of which provides more dwelling units and the other more child-days of outdoor play.

That comparison becomes a political decision, depending on how much national income we are prepared to forego to obtain an additional child-day of outdoor play. And, although such decisions are beyond the technicians' competence, they have to be made every day in the drafting room. How, then, can we arrange to have such decisions made "in the public interest," which is so hard to define?

The listing of the magnitude of all important consequences is a critical beginning. To be sure, it does not help, initially, with the details of design, but it is the way by which technicians can digest the vast masses of detail that describe and influence every project into a few salient numbers that convey the essence of the choices that have to be made by responsible political officials.

This is as much help as the technician, at present, can provide: he can summarize the essential consequences in a way that facilitates political comparisons and judgments. This is not an altogether satisfactory procedure. The technicians still have to make many detailed but important decisions before they know what the customer really wants. The Congress and the top level officials of the administration are still burdened with more detailed decisions about specific projects than they can contend with. But that is how the task must begin and, as I shall mention in a moment, in some respects we have advanced beyond that stage.

In the course of time we shall learn increasingly how to remand these comparisons to the technicians, who are the people with the time and the technical competence to make them. This will come about in two ways. One is the establishment of operational precedents. As the Congress or other high officials make successive decisions about, say, public housing they will confront repeatedly and explicitly the question of the relative emphasis to be given to dwelling space and play space. Inevitably they will recall the record of their previous decisions and will evolve a consistent practice with respect to the comparisons that they make consciously and explicitly. This practice will become known to the design technicians, and they will respond to it. Eventually no one will recommend upstairs a project in which the proportion of play space to dwelling space can be improved in the light of the preferences that previous decisions have revealed.

In this way, the political officials will provide the technicians with the guidance they need, and the technicians will be able to perform more of the preliminary culling of proposals that is their proper function.

In the second place, the use of the multidimensional project reports will provide a vocabulary by which the Congress and the policy levels of the administration can express their intentions and formulate guidelines. This has already been done, particularly in the field of public housing, where legislation does incorporate specifications about the different kinds of consequences that admissible projects must provide for.

We shall, by experience, become more skilled in the use of this directive device, and shall use it increasingly in preference to specific project review.

Merely reporting the different dimensions of consequences of different projects will therefore lead to better design and better decisions—where "better" means in conformity with the public's wishes. But the current proposals rather minimize one crucial aspect of decisions about Government projects.

I do not have to remind elected political leaders that who is helped and who is harmed lies very close to the heart of every political decision. The next important step, then, in the developing art of preparing project reports will be to include information on this point.

Technically, this aspect of project analysis is known as its distributional aspects. It is inevitable that a Government undertaking will help some citizens more than others, indeed quite frequently some citizens are called upon to make sacrifices at least in the form of heavier tax liabilities. Or to put it a bit differently, projects tend to benefit some citizens directly—as public housing may benefit occupants of substandard dwelling units—some others indirectly insofar as they are interested in helping the first kind, and some not at all. Decisions about undertakings often depend, therefore, upon just whom they help.

Information about the nature of beneficiaries, as distinct from the nature of benefits, is not emphasized by and large in current and recommended practice in project analysis.

This does not prevent the Congress from obtaining this vital information, of course. Prospective beneficiaries and nonbeneficiaries make themselves known through congressional mail, public hearings, editorials, and the other apparatus of the political process. I do not have to call attention here to the virtues of the adversary political process, or even to its shortcomings. We all know that it is successful in eliciting many points of view, but on the other hand some people have louder voices than others and are more skilled at shouting.

So I urge that decisions about Government projects would be improved if the ordinary public discussion of public programs were supplemented by more objective estimates of their impacts on different segments of the population. These could take the form, in project reports, of identifying the broad classes of people to whom the various benefits and disbenefits accrue.

Complete objectivity and nonpartisanship are not to be found anywhere, and certainly not in project reports. But at least the informa-

tion contained in those reports conforms to certain procedural standards that enhance their authority and reduce their susceptibility to the influence of bias. Estimates of the income and effect of projects would therefore be of great value in helping the Congress to decide on the merits of various proposals.

It is very easy to see why the agencies are likely to be very diffident about making such estimates or publicizing them. The distributional side of governmental decisions is one that has to be handled with the greatest possible amount of tact and circumspection, and any reasonably discreet official will exhibit a natural reluctance about expressing such matters in the crude form of statistical tables.

Perhaps a more tactful mode of expression can be found, though I do not foresee any. If not, the statistical tables will come. The Congress needs them too urgently, and they are too easy to provide to be long withheld. This being the case, the present occasion, when we are considering improved procedures for project and program analysis, is a good one for placing on the agenda systematic and objective methods for identifying the effects that projects will have on different segments of the population.

Thank you, sir.

Chairman PROXMIRE. Thank you very much, Mr. Dorfman.

Professor Knetsch is our next witness.

We shall be happy to hear from you now, sir, and you may proceed in presenting your statement in whatever way you wish.

STATEMENT OF JACK L. KNETSCH, PROFESSOR OF ECONOMICS AND DIRECTOR, NATURAL RESOURCES POLICY STUDIES CENTER OF THE GEORGE WASHINGTON UNIVERSITY

Mr. KNETSCH. Thank you, Mr. Chairman.

I appreciate this opportunity to share with you my views on procedures in evaluating the economic benefits of public expenditures.

In addition to my statement, I have a longer statement which I would like to submit.

Senator PROXMIRE. Fine. Without objection, that will be placed in the record following your oral statement and prior to questioning. (See p. 109.)

Mr. KNETSCH. In discussing this topic I would like to illustrate what I feel are some general principles for benefit estimation by focusing attention on natural resources development programs, an area where explicit analysis of the consequences of public actions has probably the most successful history in directing resources toward efficient uses and eliminating the most inefficient.

This particular category of programs derives its importance not only by virtue of the large sums of the funds devoted to it, but also because of the large market and nonmarket economic values associated with development activities. Further, the application of analysis and development of techniques and methodology in the natural resources field can provide insight into the issues and policies in other expenditure areas where such techniques have not been as rigorously applied.

There are many demands on public budgets. It is, therefore, of no small consequence to attempt to rationalize the choice of expenditures by more explicit evaluation of their benefits. While procedures can-

not be adapted without constant modification, these modifications should conform to certain principles if we are to achieve the maximum gain from their implementation.

Natural resource expenditures characteristically have productive potentials similar to those of other investments—they absorb inputs and produce outputs. Among the primary "products" which they produce are irrigation water, the reduction of flood hazards, the provision of transportation services, hydroelectric energy, outdoor recreation, and municipal water supply. The inputs which they use are similar to those used in common industrial enterprises: skilled and unskilled labor, steel, land, and complex electrical-generating equipment.

The fact that these projects absorb valuable inputs and produce valuable outputs provides the opportunity of comparing the benefits from such undertakings with their costs. To the extent that meaningful estimates can be made, this can materially aid the judgment of the desirability of such projects.

Interest in procedures to determine the contributions of natural resource projects to the Nation's economic welfare is not a new one. Explicit efforts to account for the expected benefits and costs of projects have been made for over 30 years. The basic criterion for determining the worth of proposed water projects was formally outlined in the Flood Control Act of 1936, which stated that the Federal Government was prepared to undertake such investments "if the benefits to whomsoever they accrue exceed the costs." This criterion still guides evaluation efforts in the natural resources development area.

In both the private and the public sectors, decisionmakers who strive to develop good policy for their organizations evaluate uses of funds to insure that in each case the expected returns exceed the costs. While the basic notion of benefit and cost evaluation is similar for both the private and the public sectors, there is one basic difference. When decisionmakers in the private sector evaluate the benefits of investing in a new production facility, they are concerned only with the gains and losses which accrue to their firm. Because any other gains and losses which may accrue to outside parties do not show up in the revenues and costs of their firm, they are typically ignored. On the other hand, public expenditure decisions cannot be so restricted. Indeed, it is just because market-governed private organizations cannot charge for third-party benefits or be held liable for third-party costs that the public must undertake many resource development activities. It is with respect to such decisions that the current evaluation problem becomes important.

Public provision has usually meant that we lose the restraints and incentives provided by a market, substituting instead public decisions to set policies, to design plans and programs, and to allocate resources. Benefit-cost analysis has, then, usefulness for public decisions as substitutes for market indicators.

Current development activities have been alleged to have built-in biases, as interest groups surrounding proposals to undertake certain types of projects often systematically favor such decisions. These biases stem in large part from present cost-sharing policies which lead to the disassociation of the benefits from the cost and from the fact that the magnitude of the gain to those favoring the project is usually large relative to the size of the loss falling on individual taxpayers.

Proper benefit analysis is an immense aid to the selection of projects that will contribute most to the national economic welfare.

When a public agency undertakes a development or management project, it is necessary for determining its benefits and costs that the "project" be defined so that all of its physical impacts are included in the scope of the analysis. For example, a hydropower project must be defined to include all downstream effects of the dam's storage and release cycle, as well as effects on the quality of water in the reservoir and downstream from the project.

It is also necessary that the "accounting stance" or geographical scope of concern incorporate all of the effects of the project. If, for example, a proposed irrigation project to be located in Nevada is evaluated from that State's point of view, it is likely to have a very large benefit-cost ratio as most of the benefits from the project in the form of increased farm incomes will accrue to residents of that State with but a small proportion of the costs. If the increased agricultural production in that State displaces agricultural output in other regions, the losers are likely to be in other parts of the country. Although possibly of benefit to a single State evaluated from a broader perspective, the project might or might not be in the national interest.

By definition, Federal natural resources development is sponsored and financed by the National Government, which represents all of the people of the United States. For this reason, federally financed investments require a national accounting stance in evaluating the total benefits and the total costs.

While citing this as a basic principle, I am not suggesting that analyses of the benefits and costs accruing to more localized regions should not be estimated. However, Federal natural resource agencies have a *primary* obligation to weigh the costs and benefits of projects from a national point of view and a significantly smaller responsibility to weigh the impacts of projects on regional economies where such local impacts are in fact offset elsewhere.

Our economy generally depends on markets as the mechanism to allocate resources. The minimum cost of production characteristic of a smoothly functioning market economy has implications for public investment policy. It suggests that the outputs of public investments should be evaluated by the actual or simulated market demands of users in terms of their willingness to pay, that is to forego other things, and that the costs must measure the value of the opportunities foregone. It follows that the Federal Government should not consider a proposed project as adding to the Nation's economic well-being unless the observed or simulated willingness to pay for the output exceeds the value of the resources required to produce the output. Were public sector investments to be chosen on other grounds, we could be employing resources which could be producing a greater value in other uses.

Unless there are serious market failures and obstacles to the smooth functioning of the market system, total national economic benefits equal the real outputs of a public project valued at observed or simulated market prices and total national economic costs equal the real inputs employed in a project valued at observed or simulated market prices. These concepts of benefits and costs correspond to what are commonly known as primary benefits and primary costs.

If the conditions of reasonably full employment of labor and cap-

ital, factor mobility, and generally competitive conditions are met to a reasonable degree, which generally prevails in our economy, than any *secondary* beneficial impacts by a project on market-related activities are simply local or regional in nature with *offsetting effects* occurring elsewhere in the economy. If funds are diverted from the private sector for purposes of public investment, not only are primary impacts of the foreclosed private investment foregone, but so are any net secondary impacts. If we wish to credit public investments with their own secondary benefits, we must also take into account the net secondary impacts which would have been experienced through the foregone private spending. There is no more reason to anticipate positive *net* national gains from secondary impacts than to expect negative net changes.

Suppose, for example, that a Federal irrigation scheme producing water for various crops is constructed. Certain regional industries will expand, both to supply fertilizer and machinery to the irrigation scheme, and to process and merchandise the crops. Competition and mobility will provide additional labor and capital to these industries which will eliminate whatever temporarily higher profit rates they experience from the expansion. After the influx of labor and capital stimulated by the temporarily higher profit rates, profitability will fall to a normal rate in short order, and before long this capital will be earning approximately what it previously had earned elsewhere. Therefore, if the conditions for a smoothly functioning market economy prevail, there is no justification from a national point of view for the recording of secondary benefits which would accrue to the region of project location, nor for the recording of secondary costs which are experienced elsewhere in the economy due to the financing of the public project.

This logic also generates the conclusion that where serious market imperfections are present there may be secondary effects which do entail changes in the Nation's net income and which will require either the measurement of secondary benefits and costs or adjustments to the observed values of the primary benefits and costs. For example, when serious regional unemployment exists or when the Nation as a whole is confronted with unemployed resources, or where a region with immobile labor and capital is confronted by a loss of some vital resource base, then a natural resources development project may result in secondary local income gains which are also net national gains.

An example of how an imperfectly working economy may require an adjustment of observed market values of project inputs and outputs can be cited in terms of the impact of, say, a dam-building project whose construction period coincides with substantial unemployment of labor. If the on-site labor used would otherwise have been unemployed, its true social cost will lie below the apparent market cost. If off-site procurement requires production which utilizes otherwise unemployed labor, even in faraway regions, the cost of those off-site procurements must be reduced to properly evaluate the desirability of the investment.

When the economy is characterized by unemployment, resource immobility, decreasing costs, or a lack of competition, it is appropriate to investigate net national benefits and costs which derive from secondary effects. Such benefits, when found and quantified, should enter the benefit-cost analysis. However, the unemployment relevant

to the existence of such actual secondary gains generated by project construction must generally be long-term, structural unemployment, and not just that from a temporary recession. The planning-construction period and the operating life of natural resources projects will each exceed the duration of cyclical unemployment.

Also, labor and capital immobility should not be presumed to be a permanent feature of the social landscape. It is often on the basis of such immobility that rescue operations are proposed to bring water to established agricultural areas to replace exhausted ground water supplies. Because business complexes which specialize in agriculturally related activities as well as agriculture itself would be left idle if the area were forced to revert to dry farming or to abandon farming altogether, the existence of substantial net secondary benefits for such investment has often been claimed. Surely over the period when capital and labor would otherwise have remained idle, the newly generated capital and labor income should be counted as a net national gain, as should any difference in land rent. It must be pointed out, however, that units of capital and labor will be immobile out of agriculture for a far shorter period than the life of the project. For this reason the incomes from avoided unemployment should be attributed as benefits to the water supply project only over the appropriate periods of immobility. The fact that technological and market changes such as those going on in agriculture, would be inducing changes in employment and capital structure independent of matters of water supply makes this a particularly dubious source of project benefit.

And any analysis of project-induced investment should be approached with care in the case of presently depressed areas, since it is reasonable to presume that the conditions which have resulted in a declining area's depressed economic condition will continue to inhibit further investment.

It is unlikely, for example, that the provision of flood-free land or an improved water supply will very often suffice to make private investments profitable and the danger of locking people in economically redundant occupations and regions is ever present. It may be better policy to promote mobility into more efficient regions or occupations than to promote them in present ones.

While there exist, then, conditions under which secondary benefits can legitimately be included in benefit-cost calculations, it must be realized that the knife which cuts on the benefit side also cuts on the cost side. When the necessary conditions for the existence of secondary benefits hold, it is equally likely that project financing or project output will induce secondary costs.

Consider the impact of the reclamation of arid lands on the remainder of agriculture. It has been estimated that the cotton production associated with reclamation programs in the Western States has displaced one out of every 20 farmers in southern agriculture.

The displaced southern farm family not only remains unemployed for some period (a national income loss), but, like other diplaced laborers, migrates to the city. If providing opportunities in the West to permit families to remain in the countryside or to leave the cities is to be attributed as a benefit, then providing the inducement for rural families in other regions to migrate to the cities must be tallied as a cost.

It must be noted that development projects have some real impacts, both beneficial and detrimental, which are of social concern and which are not in practice included in the measurable primary and secondary benefits and costs discussed above nor always described in the typical project report. The most important of these impacts might be:

1. Types of benefits or costs which, while conceptually belonging in the national income accounts, are not at present qualified. Examples might be the benefits from water quality improvement beyond those associated with changed municipal and industrial water costs, the values of preserving a scenic stretch of free-flowing river, or the preservation or destruction of fish and wildlife.
2. Regional income impacts which, while not reflecting net national gains, reflect the regional distribution of project benefits and costs. Such information is clearly of interest with respect to concern with regional progress and matters of equity among regions.
3. Impacts on the interpersonal distribution of income and other effects on human well-being such as the saving of life and the reduction of risk and uncertainty.

Nonmarketed outputs of the first type have economic values to society no less than do irrigated crops or transportation cost savings. Given the absence of markets, attempts should continue to develop methods for simulating values for such outputs. When such values cannot reasonably be computed, full descriptions of these impacts should be included in the project report. The same can be said for the other classes of beneficial and detrimental impacts.

One of the more common means for dealing with the measurement problem is to estimate those effects that lend themselves to quantification and to submit an exhibit of the best definition of other effects, either separately or as a direct portion of project formulation and justification. There is a danger that even though such effects are called to attention, they may receive little weight in comparison to project effects for which more readily calculable values are exhibited.

An opposite danger is, of course, that basically unsound projects may be justified on the grounds of "overriding social benefits." There is considerable opportunity in this procedure to substitute vague opinion for fact. Sufficient examples exist to raise questions regarding such judgments of project formulators on the impact of various projects and activities on distantly related national issues, however well intended. The current response to some of the Nation's concern with urban problems, poverty, and regional development, has provided handy crutches for supporting projects which may be of marginal or no value in dealing with these issues.

It is often proposed that secondary benefits, even if only regional gains, be counted because the goal of national economic efficiency is only one of those to be pursued by programs of resource development. In the interest of dealing with chronically depressed areas, unemployment and other social objectives pressures have increased for resources agencies to propose counting secondary impacts or redevelopment benefits as project justifications. While not denying the relevance of other goals, it appears to be highly questionable whether in fact most natural resource development projects, which are undertaken mainly to overcome inefficient market imperfections, contribute sig-

nificantly to them, or whether they are an efficient means for society to deal with them.

Lacking much meaningful evidence in support of the efficacy of such projects to aid in the attainment of these other goals and the competing demands on public expenditures, it would appear that the possibilities for misallocating resources are large.

There is the distinct danger of an all-to-easy presumption that such projects are of material aid to the poor and disadvantaged. I would suggest that often the facts may be contrary. While some water projects provide a food source for low income people, for example, these are clearly overshadowed by use made by fishermen with the means to travel to the project areas, by other recreationists able to afford expensive equipment including boats and waterskiing gear, by land owners receiving increased returns to flood-free areas, industries and shipping companies reaping transportation savings, and large farmers able to utilize low cost irrigation water to increase yields. Certainly some benefit goes to the poor but the evidence seems to suggest that the proportion may not be that large.

More income may also "trickle down" from the primary or first round beneficiaries but this too can be exaggerated and would be true of most types of expenditure, giving little reason to favor this kind on the grounds of aid to the poor. We may indeed be using efficiency criteria to accomplish redistributional goals, but the redistribution of income should be made far more explicit.

Primary emphasis in the design and selection of natural resource projects should be placed upon the national income impacts. No attempt should be made to allocate any part of the national income costs of the project to the attainment of other social goals, for such a partitioning of costs would leave the national income benefit-cost comparison meaningless.

It might be helpful to note in the project report approximately what portion of the project cost was attributable to "overdesign" as a means of achieving other goals, but provision of such information should not be permitted to obscure the comparison of total national income benefits and costs.

We have witnessed major improvements in the quality of economic analysis of public expenditures. The results to date have been impressive. Much of the criticism we have witnessed can be expected when analysis has been made as explicit as it has, for example, in determining the costs and benefits of water development expenditures.

There is need for improvement in present applications but probably even more desirable is the extension of analysis to other programs and expenditures. Though not all, nor even many, value questions can be completely settled, more careful analysis and dependence on and adherence to fairly rigid investment and allocation guides appears to remain immensely useful in many expenditure areas.

In areas in which I am acquainted, the efforts to increase the capability for benefit estimation has not progressed as rapidly as it could. And in some instances such resources as have been available are not being particularly well used toward this end.

The aim remains to choose the more advantageous use of public funds. If the criteria are compromised sufficiently, all projects can be shown to exhibit favorable benefit-cost comparisons. In such circum-

stances the choice mechanism loses all value. I would suggest that such a cost is too large.

(The following document was submitted by Mr. Knetsch:)

FEDERAL NATURAL RESOURCES DEVELOPMENT: BASIC ISSUES IN BENEFIT AND COST MEASUREMENT

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For well over one hundred and fifty years now, the Federal Government has undertaken expenditures to develop the Nation's natural resources. Federal spending in these areas currently totals over $3.5 billion per year and accounts for some of the Nation's largest physical structures.

Water resource installations have productive potentials similar to those of industrial investments generally. These projects absorb inputs and produce outputs. Among the primary "products" which these installations produce are irrigation water, the reduction of flood hazards, the provision of transportation services, hydroelectric energy, and the provision of municipal water supply. The inputs which they use are similar to those used in common industrial enterprises: skilled and unskilled labor, steel, cement, bulldozers, and complex electrical generating equipment.

The fact that these projects absorb valuable inputs and produce valuable outputs provides the opportunity of measuring the benefits from such Government undertakings as well as the costs which they entail. The comparison of the resulting benefits and costs is necessary if prudent public expenditure policy is to prevail.

Interest in procedures to determine the contributions of natural resource projects to the Nation's economic welfare is not a new one. Indeed, explicit efforts to account for the expected benefits and costs of projects have been made for over 30 years. The basic criterion for determining the worth of proposed projects was formally outlined in the Flood Control Act of 1936, which stated that the Federal Government was prepared to undertake such investments "if the benefits to whomsoever they accrue exceed the costs." This criterion still guides evaluation efforts in the natural resources development area.

Both the Senate Committee on Interior and Insular Affairs and the Senate Public Works Committee have stated that: "The economic analyses of projects should reflect the broadest scope of potential benefits and costs," and that project evaluations "should accurately reflect all primary direct and indirect benefits as well as secondary benefits." We share this concern. It is our *special* concern, however, that current deliberations to broaden the concept of project benefits not take place in isolation from some basic principles pertaining to appropriate economic concepts of social benefits and social costs.

In both the private sector and the public sector, decisionmakers who strive to develop good policy for their organizations evaluate uses of funds to insure that the expected returns exceed the costs. While the basic notion of benefit and cost evaluation is similar for both the private and public sectors, there is one basic difference. When decisionmakers in the private sector, say in a private business, evaluate the benefits of investing in a new production facility and compare those benefits with associated costs, they are concerned only with the gains and losses which accrue to their firm. Because any other gains and losses which may accrue to outside parties do not show up in the revenues and costs of their firm, they are typically ignored in private investment evaluation. On the other hand, a responsible decisionmaker in the public sector cannot adopt so restricted a view. He must conceive of his investment project in a more comprehensive way so that all of the costs and gains associated with the undertaking are accounted for in the investment decision whether or not all appear as receipts of, or disbursements by, his particular agency. Indeed, it is just because market-governed private organizations cannot charge for third-party benefits or be held liable for third-party costs that the public sector must undertake so many resource development activities.

*The authors are writing as individual economists and not as representatives of the organizations of which they are members.

But even when some agency of the public sector undertakes a resource development or management project, it is not clear that all impacts on third parties will be accounted for. First it is necessary that the "project" be defined so that all physical impacts are included in the scope of the "project." For example, a hydropower project must be defined to include all downstream effects of the dam's storage and release cycle, as well as effects on the quality of water in the serservoir and downstream from the project. An irrigation project must be defined to include the downstream effects of quantity and quality diminution as well as all drainage facilities which will be needed to keep the project in operation—even if they will not be needed for some period following initial project construction.

The second difficulty which can stand in the way of a complete evaluation of a project's impacts even when undertaken by a public body is a jurisdictional one, namely the "accounting stance" or geographical scope of concern assumed by the decisionmaking body. The "accounting stance" may or may not incorporate all of the effects of the project (properly defined). As an example, downstream impacts of waste treatment may lie entirely outside the jurisdiction of the city responsible for the treatment plant. If a project induces significant changes in market prices, regions quite remote from and possibly even noncontiguous with the project site may incur significant benefits or costs, especially if there are problems of chronic unemployment or immobility of human and capital resources. If, for example, a proposed Bureau of Reclamation irrigation project located in Nevada is evaluated from the state's point of view, it is likely to have an enormous benefit-cost ratio. Clearly, most of the benefits from the project in the form of increased farm incomes will accrue to residents of Nevada. Because of existing repayment (pricing) policies for Federal irrigation projects, much of the costs are Federal Government costs and only a small proportion of them will fall on people living in Nevada. If the increased agricultural production in Nevada lowers farm product prices and displaces agricultural output in other regions with subsequent temporary or long term income losses (a real national cost), the vast majority of the losers are likely to be in other parts of the country. Thus, if evaluation were made from a broader perspective, the benefit-cost ratio obviously would be reduced. Evaluated from this broader view, the project might or might not be in the national interest. When the project is evaluated from the national point of view, gains to all the beneficiaries and losses sustained by all the cost-bearers will be included in the calculation. It is, therefore, not necessarily true that what is good for Region X is good for the United States.

One elemental principle for benefit-cost measurement of *Federal* natural resource development expenditures derives immediately from this discussion of accounting stance. By definition, Federal natural resources development is sponsored and financed by the national Government, which represents all of the people of the United States. For this reason, we conclude that:

I. Federally-financed investments require a national accounting stance in evaluating social benefits and social costs.

While citing this as a basic principle, we are not arguing that analyses of the benefits and costs accruing to more localized regions should not be estimated. We are arguing, however, that Federal natural resource agencies have a *primary* obligation to weigh the costs and benefits of projects from a national point of view and a significantly smaller responsibility to weigh the impacts of projects on regional economies where such local impacts are in fact offset elsewhere in the economy.

While this definition of an appropriate Federal accounting stance is a primary principle in establishing a correct benefit-cost criterion, it does not provide many clues to the accurate measurement of these national benefits and costs. To address this measurement problem, we require some notion of the basic underlying characteristics of the economy.

In large measure, the U.S. economy relies on the freely-arrived-at decisions of consumers and producers in getting private goods and services produced. Under these market arrangements, the economy has repeatedly shown a fluid response to changed conditions and has demonstrated an enormous potential for growth. Changing demands elicit a changed pattern of supply with little time lag, without the need for some central authority first to recognize the existence of the new demands, and then convey them to the production managers in the form of new production orders. Similarly, changes in technology or in resource availability are usually quickly recorded by the market through altered relative prices.

This mechanism of conveying information about changes in tastes, technologies, and resource availabilities throughout the rest of the economy is a simple one. If parties with altered demands place additional orders for a commodity, producers will be faced with decreasing inventories or a backlog of unfilled orders. Viewing these as opportunities for increasing sales and profits, producers will increase their output. If, in the process of generating these increased outputs, profits rise, and added inducement to producers to increase production will be provided. Resources are thus diverted from producing other things to the production of the commodity with an increased demand. This response is accomplished without central guidance.

Such output responses occur fairly quickly and will usually yield outputs conforming to the patterns of demand at minimum cost. Naturally, the facility with which such responses are made is dependent upon quick communication of market information and the push of effective competition.

It is on the basis of this reasoning that we conclude that an economy which has well-functioning markets as the mechanism to allocate resources produces maximum national output (and income) for the society.

The economic efficiency characteristic of a smoothly functioning market econonly has implications for public investment policy in the natural resource area. It suggests that the outputs of public investments should be evaluated by the actual or simulated market demands of users in terms of their willingness to pay, that is, to forego other products, and that the costs must measure the value of the opportunities foregone by diverting inputs to the public investment from other uses. Were public sector investments to be chosen on other grounds, they would be employing resources which could be producing a greater value in other uses. Such public undertakings, by diverting resources from a higher to a lower valued use, would cause a decrease in society's economic well-being. Indeed, if it is assumed that the market system is operating smoothly, it follows that the Federal Government should not consider a proposed project as adding to the Nation's economic well-being unless the observed or simulated willingness to pay for the output exceeds the social value of the resources required to produce the output. These concepts of benefits and costs correspond to what are commonly known as primary benefits and primary costs. We therefore conclude as a second basic principle that:

> II. Unless there are serious market failures and obstacles to the smooth functioning of the market system, total national economic benefits equal the real outputs of a public project valued at observed or simulated market prices and total national economic costs equal the real inputs employed in a project valued at observed or simulated market prices.

Having set forth a definition of relevant economic benefits and costs for a market economy without serious imperfections, we would do well to state the conditions which must prevail if Proposition II above is to be logically valid. The conditions which must be met in the economy are:

1. Reasonably full employment of labor and capital;
2. Labor and capital mobility, i.e., the ability of units of labor and capital to shift to new jobs and uses;
3. No significant economies from large-scale production of pertinent commodities; and
4. Generally competitive conditions.

If these conditions are met to a reasonable approximation, then any *secondary* beneficial impacts by a project on market-related activities are simply local or regional in nature with *offsetting effects* occurring elsewhere in the economy. If funds are diverted from the private sector for purposes of public investment, not only are primary impacts of the foreclosed private investment foregone, but so are any net secondary impacts. If we wish to credit public investments with their own secondary benefits, we must also take into account the net secondary impacts which would have been experienced through the foregone private spending. There is no more reason to anticipate positive *net* national gains from secondary impacts than to expect negative net changes.

Suppose, for example, that a Federal irrigation scheme producing water for various crops is constructed. Certain regional industries will expand, both to supply fertilizer and machinery to the irrigation scheme, and to process and merchandise the crops. If the economy exhibits efficient operation characterized by the above-stated conditions, competition and mobility will provide additional labor and capital to these industries which will eliminate whatever temporarily higher profit rates they experience from the expansion. After the influx of labor and capital stimulated by the temporarily higher profit rates, profitability will

fall to a normal rate in short order, and before long, this capital will be earning approximately what it had earned elsewhere prior to the project.

The people newly employed in these activities were bid away from other jobs, implying the existence of higher wages and incomes, but again, competition among mobile workers will tend to reduce and ultimately eliminate wage differentials. Therefore, in the absence of significant departures from the four above conditions, secondary gains, if significant at all, will be temporary.

In the context of a national accounting stance and assuming that the economy can be characterized as a smoothly functioning market economy, relevant national secondary impacts will be negligible on both the benefit and cost side. This leads us to a third principle:

III. If the conditions for a smoothly functioning market economy prevail, there is no justification from a national point of view for the recording of secondary benefits which would accrue to the region of project location, nor for the recording of secondary costs which are experienced elsewhere in the economy due to the financing of the public project.

The logic of the two preceding principles also generates the conclusion that where serious market imperfections are present, there may be secondary effects which do entail changes in the Nation's net income and which will require either the measurement of secondary benefits and costs or adjustments to the observed values of primary benefits and costs. For example, when serious and intractable regional unemployment exists or when the Nation as a whole is confronted with unemployed resources, or where a region with immobile labor and capital is confronted by a loss of some vital resource base, then a natural resources development project may result in secondary local income gains which are also net national gains. Adjustments to observed market prices of projects inputs and outputs may also be required.

As an example of how secondary effects which accrue to a region may represent changes in national income, consider the case of immobile labor and capital. If labor and capital cannot (or do not) move quickly out of industries which are forced to contract as a result of the construction of a natural resources project (e.g. the displacement of non-irrigation agriculture by irrigated acreage), they will experience a decrease in their net incomes. This decrease in net incomes represents a reduction in national output over the period of the unemployment of these resources. Because a loss in the Nation's income is experienced as a result of this immobility, Federal planners should legitimately account for the loss in estimating project costs.

A second example of how secondary effects may lead to national increases in income relates to the existence of increasing efficiencies of large-scale production in some pertinent production sectors. Assume that because of a natural resources development project, certain industries expand while others contract. If the expanding industries experience decreasing unit costs while the industries experiencing contraction have constant product costs, and if the degree of expansion and contraction are approximately equal, then a similar volume of output will be produced at a smaller total input cost. The reduction in input cost constitutes a net national benefit and, like the above examples, represents a case in which real *secondary* economic gains occur for the Nation.

An example of how an imperfectly working economy may require an adjustment of observed market values of project inputs and outputs can be cited in terms of the impact of, say, a dam building project whose construction period coincides with substantial unemployment of labor. If the on-site labor used would otherwise have been unemployed, its true social cost will lie below the apparent market cost. If off-site procurement requires production which utilizes otherwise unemployed labor, even in far-away regions ,the cost of those off-site procurements must be reduced. Appropriate techniques for these adjustments have been developed.

From these examples, a further basic principle of benefit-cost measurement is derived. This principle, which is corollary of the previous principle, can be stated as follows:

IV. When the economy is characterized by unemployment, resource immobility, decreasing costs, or a lack of competition, it is appropriate to investigate net national benefits and costs which derive from secondary effects. Such benefits, when found and quantified, should enter the benefit-cost analysis.

Having offered this principle, however, we would also emphasize a few *caveats* which relate to it. First, it should be pointed out that the unemployment relevant

to the existence of real national secondary benefits generated by project construction must be long-term, structural unemployment, and not just that from a temporary recession. The planning-construction period and the operating life of natural resources projects each will exceed the duration of cyclical unemployment.

Second, we would also emphasize that labor and capital immobility should not be presumed to be a permanent feature of the social landscape. It is often on the basis of such immobility that "rescue operations" are proposed to bring water to established agricultural areas to replace exhausted ground water supplies. Because business complexes which specialize in agriculturally related activities as well as agriculture itself would be left idle if the area were forced to revert to dry farming or to abandon farming altogether, the existence of substantial net secondary benefits for such investment has often been claimed. Surely over the period when capital and labor would otherwise have remained idle, the newly generated capital and labor income should be counted as a net national gain, as should any difference in land rent. It must be pointed out, however, that units of capital and labor will be immobile for a far shorter period than the life of the project. For this reason the incomes from avoided unemployment should be attributed as benefits to the water supply project only over the appropriate periods of immobility. The fact that technological and market changes would be inducing changes in employment and capital structure independent of matters of water supply makes it doubly difficult to apply the "with-without" criterion.

A third *caveat* pertains to longer term growth which might be induced by the project and the relationship of this growth to national gains. Clearly, the question of the contribution which such growth makes to national economic gain hinges on the possible advantages which exist for, say, processing primary products in that region relative to other areas. It is not warranted to assume that any particular project will automatically generate such related investments or that the incomes generated by such investments represent net additions to the national income. What is needed is a careful analysis of the extent to which the project creates in the region a comparative advantage relative to other regions in terms of basic raw materials, power, process water, or transportation. Moreover, if it is concluded that project-induced investment is likely to occur in the project area, the portion of the incomes created by this new activity representing net additions to the national income and the portion representing transfers from other areas must be determined. Only the net additions are countable as benefits.

Any such analysis of project-induced investment should be approached with care in the case of presently depressed areas, since it is reasonable to presume that the conditions which have resulted in a declining area's depressed economic condition will continue to inhibit further investment. It is unlikely, for example, that the provision of flood-free land or an improved water supply will suffice to make private investments profitable.

Finally, if the Federal Government is interested in including development in a particular region or set of regions, it should not be restricted in its choice of instruments to water resource or, more generally, natural resource development investments. Indeed, there is no presumption whatsoever that natural resource investments are more likely to be significant employment or investment generators than labor training programs, housing programs, recreation programs funded by the Federal Government, or federally-subsidized private investments in the region, or Federal investment in programs to relocate population groups presently immobilized in low potential regions. In appraising any particular natural resource investment as an instrument for regional development, the analyst should be fully aware of the other alternative policy measures, and should recognize that, while some development impacts derive from the project, the same or even greater effects may be attributable to other types of public (or publicly encouraged private) investments.

While there exist, then, conditions under which secondary benefits can legitimately be included in benefit-cost calculations, or under which project costs may have to be adjusted to reflect deviations from social cost, it must be realized that the knife which cuts on the benefit side also cuts on the cost side. When the necessary conditions for the existence of secondary benefits hold, it is equally likely that project financing or project output will induce secondary costs. Consider the impact of the reclamation of arid lands on the remainder of agriculture. It has been demonstrated that the reclamation program in the western States by encouraging increased western cotton production has displaced a significant

portion of the cotton production previously grown in southern States. Indeed, it has been estimated that the result of the western program has been to displace one out of every twenty farmers remaining in southern agriculture. The displaced southern farm family not only remains unemployed for some period (a national income loss), but, like other displaced laborers, migrates to the city. If providing opportunities in the West to permit rural families to remain in the countryside or to permit urban families to leave the cities is to be attributed as a (non-quantifiable) benefit, then providing the inducement for rural families in other regions to migrate to the cities must be tallied as a cost.

The point of this example, then, is a clear one. Namely:

V. If market imperfections cause projects to generate secondary benefits which coincide with national income gains, they also generate secondary costs. The existence of market imperfections requires that both secondary benefits and costs be accounted for in benefit-cost calculations.

The importance of this principle, then, is that it points up the need for the development of information on both the secondary benefits and the secondary costs of natural resource development projects if market imperfections are present.

Next, it must be noted with emphasis that natural resource development projects have some real impacts, both beneficial and detrimental, which are of social concern and which are not in practice included in the measurable primary and secondary benefits and costs discussed above nor even described in the typical project report. The most important of these impacts might be:

1. Types of benefits or costs which, while conceptually belonging in the national income accounts, are not at present quantified. Examples might be the benefits from water quality improvement beyond those associated with changed municipal and industrial water costs, the values from preserving a scenic stretch of natural river, or the preservation or destruction of fish and wildlife.

2. Regional income impacts which, while not reflecting net national gains, reflect the regional distribution of project benefits and costs. If the gains and losses to all regions were fully accounted for, their sum would equal the project's net national benefits. Such information should clearly be of interest to decision-makers concerned with regional progress and matters of equity among regions.

3. Impacts on the inter-personal distribution of income and other effects on human well-being such as the saving of life and the reduction of risk and uncertainty.

Non-marketed outputs of the first type have economic values to society no less than do irrigated crops or transportation cost savings. Attempts should continue to develop methods for simulating values for such outputs in the absence of markets. When such values cannot reasonably be computed, full descriptions of these impacts should be included in the project report. The same can be said for the other classes of beneficial and detrimental impacts.

Because quantifiable economic benefits still predominate among the outputs of natural resource developments, it is argued here that primary emphasis in the design and selection of natural resource projects should be placed upon the national income impacts. At the very minimum, if projects whose national income costs exceed their national income benefits are to be undertaken in order to serve these other social goals, the corresponding *national income benefits and costs should still be carefully assessed.* No attempt should be made to allocate any part of the national income costs of the project to the attainment of other social goals, for such a partitioning of costs would leave the national income benefit-cost comparison meaningless. It might be helpful to note in the project report approximately what portion of the project cost was attributable to "over-design" as a means of achieving other goals, but provision of such information must not be permitted to obscure the comparison of *total* national income benefits and costs.

On the basis of these considerations we conclude that:

VI. The basic economic rationale justifying public sector responsibility for natural resource development requires that the criterion of national income enhancement serve as the primary criterion for choice among investment alternatives, and that the extent to which natural resource investments contribute to the attainment of other social objectives be expressed in side displays of information and analyses. There should be no allocation of national income costs to the attainment of other objectives.

Within the framework of these basic economic principles, there exists a great deal of room for improvement in the procedures and methods for evaluating benefits and costs. By way of conclusion, we would offer two suggestions consistent with the above principles on which future efforts for improving benefit and cost measurements should be concentrated.

First, it was noted above that there is a need to account more fully for the direct or primary consequences of natural resource investment projects. Mentioned, for example, were scenic amenities, recreational opportunities, and the preservation of fish, wildlife, and free-flowing streams, all "outputs" which have value, even though they are not priced in the market. Surely the fuller evaluation of these direct, identifiable outputs represents a better application of the limited research resources available to agency planning staffs than probing for much less obvious and difficult-to-measure secondary effects.

Reasonably good methods are continually being developed for the evaluation of these important but difficult-to-quantify primary benefits. Examples are the methods now available to estimate recreation benefits and procedures for the measurement of flood damage reduction in the case of flood control installations. We would urge renewed efforts to develop and gain consensus on appropriate methodologies for the estimation of values for these nonmarketed outputs. In our judgment, this is the first order of business.

Second, it is recommended that policies covering the pricing of outputs of national resource projects and other aspects of cost sharing by benefited parties and regions be reconsidered. The objective should be greater efficiency in the design and use of resource projects and their outputs by imposing appropriate costs on the users. Since all costs must be borne by someone, such a policy will probably be not only more efficient than current policies but substantially more equitable.

Chairman PROXMIRE. Thank you, Professor Knetsch.

Our final witness is Professor Margolis.

Professor Margolis, go right ahead. We shall be glad to hear from you at this time.

STATEMENT OF JULIUS MARGOLIS, PROFESSOR OF ECONOMICS, STANFORD UNIVERSITY

Mr. MARGOLIS. I hope I am as successful as Professor Knetsch in shortening my statement.

Eight years ago I was one of a group of four non-Government economists who formed a panel of consultants convened to advise the Director of the Bureau of the Budget on "Standards and Criteria for Formulating and Evaluating Federal Water Resources Development."

Our report was mimeographed in a limited printing, and, though never distributed, it filtered through the Government and academic community. On being invited to present a statement before this committee I reread the report in light of current discussions about revising evaluation criteria. I was impressed with how much of the 1961 panel of consultants report has influenced the current discussions, but unfortunately some of the 1961 arguments and recommendations have not yet reached the point of acceptance by the resources development agencies. In my brief remarks before the committee I will abstract and paraphrase some of the 1961 report; the full text of which I am submitting, and I hope you are prepared to accept it.

Chairman PROXMIRE. We will accept the submission and include it as part of the record. It will be found in the appendix to today's hearing. (See p. 135.)

Fundamentally, the all-embracing objective for the Government is

the greatest possible contribution to national welfare. But since national welfare is compounded of social, economic, and cultural elements, there is no simple, single measure for the total with which to help rate the value of the public outputs and to choose among alternative mixes of public services. We must deal with the national welfare in terms of the major dimensions in which the public programs play a part.

One major dimension is the gain in productivity or increase of national income. If public programs were planned in terms of this objective alone, we would seek to maximize the contribution of the programs to national income.

Another basic dimension of national welfare relates to the distribution of income or product. As a nation, we are not only interested in the size of the social product, but also in its equitable distribution among members of the community.

Dimensions of welfare other than the size, distribution, and means of redistributing income can be justified. The community may, for example, have special concern for the way in which existing rights and arrangements are accommodated in planning a new development. For example, we often devote far greater efforts to relocation of certain community facilities flooded by reservoirs than are justified by the value of relocation in terms of the components of welfare already mentioned.

Still another dimension of welfare of considerable significance, especially in water resources development, is the preservation of esthetic, cultural, and recreational values. Preservation of historic sites and unique or outstanding instances of scenic beauty are cases in point.

One can enumerate a long list of objectives often stated by governments in legislation and reports. A very partial list would include national income, its equitable distribution, environmental amenities, social harmony, national security, and so on. Certainly it is useful to list the objectives but the crucial question is how to value the output in terms of these objectives and how to "aggregate" these multiple objectives.

The first warning we should heed when we go through the exercise of enumeration of objectives is that though the Government has many objectives, not all programs should be analyzed with the full set in mind. It must be recognized that most public services may be cumbersome vehicles to achieve many of them, for instance the equitable distribution of income. There are usually means, more effective than specific public services, to reach this objective. These not only include the progressive income tax and health, education, and welfare programs.

Also, there are, for the disadvantaged groups which suffer from occupation or geographic immobility, retraining and assistance in resettlement as a means of rehabilitating their dignity and productivity. Nevertheless, some programs may be an effective means by which to achieve an income redistribution objective.

For many programs, the side effects on the distribution of income may be purely incidental and thus safely ignored; for others, the side effects may be large and thus require scrutiny; while, for some, the distribution effects may dominate planning and choice.

Given the many stated objectives, how shall we go about assigning values to outputs? There is a consensus that almost every program

should have as part of its evaluation an estimate of its effect on national outputs. That is, how do the users of the services value it?

This criterion is transformable into the question: How much are the users willing to pay for the services? We can judge the utility the individuals derive by the sacrifices they are prepared to make. Later, I will comment on various approaches that have been adopted to estimate this price when actual prices are not charged because the Government distributes its output freely.

At this point I want to contrast the above criterion with another: How much are Congressmen willing to appropriate or administrators willing to allocate?

This criterion is implicit in the argument that the behavior of political or administrative leaders reflect social values. It is likely that both criteria have a valid role, but when is each appropriate and how are we to use both? The contrast of the approaches is measured in the discussion of secondary benefits.

It is often true that many nonnational income objectives are really national income objectives in disguise. For instance, in programs like resources development, transportation, and urban reconstruction environmental objectives loom large. Usually these are contrasted to the national income or efficiency objective. This is not necessarily a tenable distinction. It matters little whether a firm purchases water for cooling or for lawn decoration.

We assign a value to the municipal purchasers whether they consume the water for firefighting or for an architectural fountain. The location of the scenic beauty in the mountains or the middle of the city does not affect its value as an economic good—the utilities it creates for individuals. In principle, most of the objectives pursued by governments can be analyzed in terms of values assigned to them by the users.

Though the concept of user benefits can be extended to a wide variety of "national objectives," two vexing issues persist. Generally the public services operate in areas permeated with external economies and diseconomies, a situation where it is difficult to find or simulate reasonable market prices.

Second, only the most dedicated supporter of consumer sovereignty would deny that there is an appropriate realm for political leadership in public choices even to the extreme of influencing the objectives of individuals. Unfortunately, it is often difficult to separate out the situations of market failures due to a technical condition like externalities from those where political leadership is appropriate.

"External economy" is a technical economic term describing interdependencies in the provision of goods and services. An external economy is said to exist when provision of a good or service for one person or group makes provision of the same or some other good or service possible at reduced cost to another person or group, with little or no reduction in the quality of the good or service to the first person or group. By the same token, an external diseconomy is said to exist when provision provides an adequate basis for registering all of the gains and losses of individuals from an economic undertaking. Failing in this respect, markets cannot be relied upon to translate individual wants into the pattern of resource use which most adequately meets the desires of the community.

The esthetically attractive, beautiful lawn is a classical case of an externality. The homeowner invests in a lawn to please himself; in the process, he creates utilities for others. The value of the lawn is the sum of utilities received by all individuals. This is difficult to estimate but it belongs in the category of national income objectives.

Even when the market functions properly in a technical sense, the community may reject the outcome of the market in various particulars. The market responds to consumer preferences. However, individual preferences for commodities and services may reflect efforts in the private sector to mold and influence individual tastes for new products or particular brands of existing products or in favor of certain uses of resources over others. To the extent that this is done, the community may wish to devote public resources to insure that various special goods and services which are not promoted commercially are adequately represented in the consumption pattern of individuals making up the community.

Policymakers may go so far as to reject the pattern of individual preferences as expressed in their willingness to pay, which reflect responses to the motivation researchers. For example, policymakers may decide that individuals do not appreciate the value of high quality outdoor recreational opportunities; consequently policymakers may include more recreation in development plans than individuals are willing to pay for. Or, policymakers may decide that individuals give insufficient weight to the preservation and enhancement of esthetic and cultural aspects of our environment. A caveat is nonetheless in order. "Merit wants," as these preferences of policymakers are termed, is a very convenient device for justifying favorite projects that fail to qualify in terms of more general, individual preference-oriented objectives. We must therefore give close inspection to arguments for placing particular goods and services on pedestals.

The community also obviously rejects the ultimate pattern of income distribution, which is represented by receipts of wages, salaries, rents, capital gains, et cetera, as remuneration for factor services in the production of goods.

The institution of progressive income taxation is perhaps the most unadulterated evidence of this. In addition, compulsory contribution to old-age and survivors insurance and social security payments and the variety of health, education, and welfare programs are provided, not only as merit wants, but partly as redistributive devices. In the water resources field, the Federal development of hydropower for use in rural electrification programs doubtless reflected, among others, both of these considerations.

Finally, the community may reject the outcomes of market operations, based on its preference for particular patterns of production. For example, universal free education might be provided by subsidy to private institutions, but the public school system as a mechanism is preferred. In the water resources field, the Government is concerned with the use of water resources projects as a device to create special patterns of economic activity. The 160-acre limitation on Federal irrigation projects presents a clear case of the willingness of the Nation to make some sacrifices in productivity gains in order to create a pattern of family farms and small dispersed towns. Another instance is the preference clause in the distribution of public power which has

significant effect on distribution and also services as a device for regulating the rates and investment patterns of public utility systems. Like the acreage limitation laws, power preference requirements often impose losses in productivity which implicitly are accepted as the cost of achieving the public goals associated with the pattern of desired economic activity.

Clearly efficiency criteria are insufficient for public decisions. However, I must repeat, we must give close inspection to arguments for placing particular goods and services on pedestals. Since we know that special interests are striving to satisfy their private gains through the Government we should be alert about assertions about the national interest; usually it is pertinent to ask about the sum of gains and losses which are to accrue to all the individuals in the Nation.

Secondary benefits of water resource development projects provide a useful illustration of the value of pushing the arguments about willingness to pay rather than relying on vague appeals to development, social goals, and employment stabilization.

The primary benefits of a project are defined as the value, in terms of the willingness to pay of the users, of the products or services produced. They are the benefits which go to the immediate users—to the farmers of the irrigation district who use the water of the project, or the public power agencies that buy the power, or the population whose floods costs have been reduced.

On secondary benefits, the usual contention is that the economic gains associated with the products or services are not retricted to such users. The farmers who buy irrigation water, for instance, do not produce all of their inputs, nor are they often final processors of their output.

Firms outside the project area produced many of their inputs and processed their outputs. It is argued by some that net income in those activities induced by, or stemming from, the project should be included in the benefits associated with the project.

It is true that the increase in national income due to a project is not restricted to payments made by direct purchasers of the project's products. The Nation may gain by improvements in productivity at points distant from the project. But it is not true that indirect national income gains are the same as the average net incomes of suppliers of inputs to, or processors of outputs of, the project's immediate users.

Consider an irrigation project, recalling that gross national income gains ordinarily are evaluated in terms of the product users' willingness to pay for the goods and services provided by the project. If the farmers in the irrigation district owned packing plants, textile mills, warehouses, and trucking fleets, would they pay any more for the water than if they did not own them?

The general answer would be that they would always be willing to pay at least as much; sometimes they would be willing to pay more; but they never would pay the sum of the primary and secondary benefits as traditionally defined. Whether or not the integrated farming group would pay a price for water greater than the net return to water from farm operations is based upon whether or not external economies—in particular, economies of scale in processing—obtained in the project area.

Assume that there are constant returns to scale in both agriculture and in further processing and that the final product must be sold at a

competitive market price. If we charged the integrated operation a price for water which was higher than the net return to water on the farm, the integrated operation would not purchase project water since the purchase would result in less than normal profits.

The market price for the final product is determined by processors earning normal profits on raw materials which outside the project area are priced at costs which include only a normal return for water. If the processors of the integrated operation had to use raw materials which contained costs greater than the normal returns to water, and they had to sell the final products at the market prices, the processing operation would be unprofitable.

Since the agricultural operation would only earn normal profits, the entire integrated operation would be unprofitable. In other words, any attempt to include in the price of water a figure representing the profits of processors would result in reduced sales of water.

The inclusion of any increases in normal profits of processors or suppliers as benefits is based upon an implicit assumption that their profits are in the form of a rent which could be taxed away and still allow for the processing. In other words, that the profits earned in these industries are more than necessary to get them to supply their services. But if these ancillary industries were competitively organized and they did not have economies of scale, there would be no such rents.

On the other hand, if the project area offered special advantages for processing as compared to alternative areas, then it is possible that the integrated operation might be prepared to pay a price greater than the net return to water. For instance, if the bulk of a crop's production were undertaken in an area plagued by congested highways, the assembly and shipping of a similar amount of agricultural products might be done more cheaply in a project area free from congestion.

Or consider another possible situation. An integrated processing operation existed on the acreage prior to the project. With the project and the expanded volume of agricultural production, the processing operation could operate at lower unit costs. In other words, excess processing capacity existed or there were possible increasing returns to scale in processing. Since the costs of processing the added production would be falling, the farmers would charge a higher price for the added agricultural production, and it would be worth while for the processing operation to purchase the incremental agricultural output.

In general, the following rule applies. If secondary benefits do exist, primary producers could capture these benefits in the form of price gains if they could act as tough-minded monopolists—i.e., if they could extract from the associated industries the greater than normal profits they could earn. In which case they could have paid the secondary benefits as part of the price for the water. If the primary producers could not get a price greater than the going farm price, then there are no stemming-from secondary benefits.

The same situation would hold in the case of induced-by benefits. Assume that because of a more dense settlement following the introduction of power and water, the Government cost of education falls from $400 to $300 per pupil. Clearly there were some economies of scale in education which the previous community had not been able to reach. Any reduction in per capita education payments would have been advantageous to the existing population. If the new land users

associated with the project activities had insisted on a lower tax rate than the old users, but still allowed some slight reduction in tax payments for education by old users, it would have been to the advantage of the old users to have accepted. In practice, of course, moral inhibitions or legal institutions might prevent the project product users from bargaining in this way. This is not, however, to the point. What is needed here is to identify the presence of some secondary benefits as increases in national income, not to identify the recipients. So long as a monopolistically organized group of project users could extract these payments while not reducing the incomes of the purchasers of the goods and services produced with the project water or power, there are benefits greater than the willingness to pay of the competitively organized project users.

A similar rule could have been phrased in terms of incomes of workers added to the payrolls due to the activities associated with the project. How much of their income would the workers have been willing to sacrifice to make sure that the project would be built?

I speculate the answer will be nothing or little since they could go elsewhere to work at the competitive wage they are receiving. This is not to say that there are no indirect beneficiaries. Landowners will receive higher rents because of the greater activity. They might be willing to pay and they often contribute to political funds to encourage these projects. But from the national perspective these rental gains should not be included since they are offset by rental losses where activity has declined or not grown.

The discussion of secondary benefits highlights the difficulties of discovering what individuals are willing to pay. The indirect beneficiaries are only the extreme cases of those who do not pay and therefore analysis, unfortunately imperfect, rather than direct evidence must be relied upon to estimate the value of the public outputs.

Our ability to measure benefits are still primitive, but then resources devoted to these measurements have been small and the history of efforts has been short. Several approaches have proven promising though they all have defects.

The most common technique used to evaluate public output is to consider the product as an intermediate good and then to estimate the value of the marginal product of the good in further production—i.e., assume the user is a producer and then ask: by how much does the public output increase his income?

Illustrations are found in natural and human resources development. Some goods are easily and naturally treated in this fashion. For example, water supply is used for home consumption, but the great bulk of it is consumed in agriculture, power generation and industrial processing. The estimate of the value of marginal product of water for such uses is simple compared to the estimate of the value of education or health services as intermediate goods. There is a relation between years of schooling and income expectation, between health and expected lifetime income, but certainly the reliability of these estimates are not very great and therefore it is tempting for critics to brush them aside.

Further, it is clear that these services also have consumption aspects and externality benefits as well. The contributions they provide to income enhancement will not be their full social utility.

A second indirect technique used to estimate what individuals are willing to pay is based upon the cost of savings of the public service—i.e., the reduction in the real costs that individuals would have incurred if the public service were not supplied. This approach is most commonly adopted in the fields of transportation and power. Clearly individuals should be willing to pay at least what they save by using the service.

The difficulty here is that these programs generate locational shifts partially in response to servicing those who directly benefit from the improvement. For instance a road may encourage a cannery, but the road will also be used by the firm which maintains the machinery of the cannery and the wholesaler which supplies the expanded local grocery store.

These men may receive no benefit from the road; they are indifferent about which community they service; it is possible that their costs may have increased by traveling a longer distance. It would be an error to attribute any gains to this induced traffic.

A third major technique of shadow price estimation is to estimate directly the users prices by appeal to market information. This is the most difficult task, but it may prove to be the most fruitful. In many cases there are near substitutes for collective consumption. There is usually a private educational, health, or recreational market; the extensive study of this market may provide the needed price information.

The difficulty facing the analyst is that the comparable private commodities are sometimes very different. The characteristics of service of a private medical clinic may be sufficiently similar to a public clinic that the private data may be usable, but the differences between a public park and a private camp are huge and difficult to compare.

Another form of use of market data is more indirect, it relies on the responses of the private sector in gaining access to the free public services. Public services are free, but access to them may be costly. Parks are free, and since they are desirable men will pay higher rents for sites located close to them.

There would be similar shifts in the demand for land because of differential quality of schools, medical facilities, highway systems and so forth. Households will reveal their preferences by their locational decisions, and further, the revelation will be quantitative.

An analysis of the household's costs may provide information about the value they assign to these public services. This form of analysis will require complicated econometric studies, since changes in behavior will be due to many factors and some shifts will be due to the initial changes of the users of the public services rather than to the public services themselves.

The above methods of estimating what individuals will pay are still rudimentary and imperfect. However, they give far more information than impressions or the weighing of mail from pressure groups. It is clear that they are not precise enough to eliminate judgment upon the part of the decisionmaker but the estimates will improve with practice and they will provide a framework within which the decisionmaker can gain insight into the effects of public programs on the national welfare, defined from the perspective of the sum of individual valuations.

We have neglected the treatment of valuable outputs like the redistribution of income, and how to handle multiple objectives. These are treated in some detail in the submitted 1961 Panel of Consultants Report.

Thank you, Mr. Chairman.

Chairman PROXMIRE. Thank you, Professor Margolis, for an excellent job. It is, we know, a very complicated area, an area that I think is really in its infancy.

I would like to ask you primarily about the application of this relatively refined and mature water resource evaluation to other areas, where we hope we can make progress.

Before I do that, Professor Margolis, I just cannot resist calling to your attention the difficulty of measuring in effect the national income objectives reflected in the willingness of beneficiaries to pay. I recall a few years ago the administration recommended a project at Glen Elder, Kans., to build a dam. One of the principal benefits was to irrigate land and bring some 20,000 acres of land to the production of feed grain. It did not make any sense to me at all as far as this benefit was concerned, because the previous week we passed a bill authorizing a billion dollars, to take land out of production of feed grain.

Well, I opposed this bill in the Appropriations Committee and I expected to get complaints from Kansas farmers whose land would be irrigated. Quite the opposite. The only communication I heard from them was that they opposed the project too. So I asked one of the farmers out there to get affidavits. Ninety percent of the farmers whose land would be irrigated, the beneficiaries of this project, opposed it.

Of course, the project went through anyway because the Budget Bureau favored it and the Senators and the Congressmen involved favored it too. But it indicated to me the great difficulty of relying on the willingness of beneficiaries to want the project, even though in this case, of course, the charge on the farmer would be very limited, he would have to pay a little bit for the water—when I say a little bit, I mean a little bit, it was of course far less than the cost.

Does not this raise some question as to trying here in Washington to assess what these people would be likely to really be willing to pay?

Mr. MARGOLIS. For a great many of these projects the simplest way to test the willingness to pay by users is a well-designed pricing system. Now, I do not know whether your Kansas farmers objected to this project on moral grounds or whether in particular they thought it was inefficient. Presumably they were not willing to pay a price sufficiently high to cover the cost of the project. This is what I infer from your remarks. If the Government would assess those charges, then the project presumably would never have been planned, never have been accepted by the Government, and never have been accepted by the farmers. Therefore, I believe that we must go as far as possible not only to try to evaluate by research studies what men are willing to pay, but also try to develop institutional structures so that user charges can be assessed.

Now, this is impossible for a great many public services. But of course it is perfectly feasible for many others.

Chairman PROXMIRE. I think it is very attractive when you can apply user charges. I think we prefer that, if we can do it. Of course, in many areas it is impossible.

Mr. DORFMAN. Sir, my I interpose?

Chairman PROXMIRE. Yes, sir.

Mr. DORFMAN. For my own education.

This is an interesting incident. It appears that the willingness to pay criterion was applied by you, and you measured the willingness to pay and found the project did not conform to the criteria that one would have expected, nonetheless it was adopted. And on what basis? I am very curious.

Chairman PROXMIRE. I am curious too. I spoke 10 hours against it on the floor of the Senate to dramatize what I thought was a very bad investment on the part of the Government. I got exactly 17 votes against the project. The argument was that this is a long-range water project—and of course there were some other benefits, it was not entirely for irrigation, flood control was an important element too.

Mr. MARGOLIS. I assume that flood control probably affected hunting or fishing, and somehow the loss of these recreational amenities to the local groups probably may have turned them against the project.

Senator PROXMIRE. Of course, whether it is Kansas or Wisconsin or any State, when you spend $77 million on a project there are a lot of benefits which are going to accrue in process of expanding that.

Now, in your statement, Professor Dorfman, you said, "The distributional side of governmental decisions is one that has to be handled with the greatest possible amount of tact and circumspection, and any reasonably discreet official will exhibit a natural reluctance about the expressing of such matters in the crude form of statistical tables. Perhaps a more tactful mode of expression can be found, though I don't foresee any."

Then you say, "If not, statistical tables will come."

Well, they have not come in any areas except the water project areas which you have discussed. But if we are going to extend this as the President seems to want to have it extended, the PPB in August of 1965, we have gotten very little in the way of statistic tables, practically nothing. From what we hear the executive agencies are erratic on this, some have gotten some analysis, rather limited, and some have gotten almost none. What can we do to cut the Congress in on this?

We have gotten, as I say, really zero except in the water project area.

Mr. DORFMAN. I hope that this hearing is a step in that direction. My rather firm statement is that this is in the nature of a historical inevitability prediction. These things do not come by themselves.

Chairman PROXMIRE. Would you be willing to make a statement? You seem to be more qualified in your endorsement of this procedure than the other two witnesses. Would you say without question that having Congress informed about these analyses would make for a better evaluation, better judgment, a better decision on the part of Congress?

Mr. DORFMAN. Yes, sir, I would. My colleagues here have both at various places in their statements referred to redistributional effects in the usual informal way. It was pointed out that, for example, outdoor recreation has what many people would call a perverse redistribu-

tional effect, and that it is more accessible in practice to upper income users than to lower income users.

To mention one case in point—not being circumspect nor a Government official—I am one of the beneficiaries of the Cape Cod National Seashore, which is a very desirable improvement. I am not so sure I am as worthy a beneficiary of public subsidy in this regard as those who might benefit from more investment in Fire Island or other resources closer to ghetto areas and large blocks of poor people. It would be my hope and advocacy that in projecting the user days for various facilities of outdoor recreation, in considering the programs of the Office of Education, some of which go to higher and lower levels of education of different types, and so on, that the estimates would be made not only of total forecast use, but would attempt to indicate just what are the classes of the population who will benefit most directly, and those that will benefit least directly.

Chairman PROXMIRE. Along that line, let me ask this. You imply in your statement that in today's affluent society there is no reason for national income to be the primary objective of public investments. You say, for example, that income redistribution effects should receive equal emphasis with national income impacts. I have several questions which relate to this position.

First let me ask, don't you have to distinguish among the different types of public expenditures in order to make this assertion? It seems to me that some expenditures are only undertaken by the Government because for some reason the private sector fails to undertake them. An example is navigation expenditures, that is, the dredging of river channels. Other expenditures are undertaken by the Government solely for income redistribution.

Much of the poverty program provides an example of this kind of expenditure. If you give both the income redistribution objectives and the national income objective equal weight, in evaluating the first type of Government expenditures, that is, the dredging of river channels, aren't you likely to divert funds from programs which are designed to achieve income redistribution objectives into programs whose effects on income redistribution is only incidental to their primary purpose of producing goods and services, so that on balance you would detract from the ability of the Federal Government to achieve redistribution objectives?

Mr. DORFMAN. I think we are up against the usual semantics kind of problem. When I say equal weight, I had it in mind that some projects, such as dredging, would qualify for public investment, because they contribute so much to national income, and have little to do with redistribution. On the other hand, there are other projects which would qualify on other grounds, though they might be quite disadvantageous from the point of view of the national income.

What I guess my objective was in putting them all on an equal footing is to say that a negative benefit-cost ratio computed on the usual grounds ought not to be the first screening that a project has to pass in order that its other claims to adoption might be recognized, that no one of the objectives should be first, with the others in an emendation and modification status.

Chairman PROXMIRE. I think that answers my question.

But let me follow up.

If the income redistribution objective has equal status with the national income objective in program evaluation, won't you tend to be taking very productive dollars out of the private sector—to finance the project—and devoting them to less productive enterprises? How do you justify this? In order to justify it you must be assuming that we do not have a more efficient way of attaining the income redistribution goal, isn't this true?

Mr. DORFMAN. I do assume that that is really often the case, both for practical and sometimes for sociological reasons. I think there are good reasons for us to feel dubious very often about direct explicit redistribution, as, for example, what used to be called the dole and sometimes is nowadays called the negative income tax. Without wanting to take a position today on these questions, I can see reasons for feeling that it is better to redistribute by subsidized education, as we do by subsidizing housing, by having the redistribution implicit rather than very explicit, in order to achieve the goals of redistribution.

In political and social affairs, how you do it is often at least as important as what you do, because it has other moral, social impacts that you have to take into account. I take it that is one of the main kinds of problems that we have the elaborate legislative process for.

Chairman PROXMIRE. My time is up, and I will yield to Senator Jordan.

But I do want to make sure, did you say that the redistributional effects should be implicit rather than explicit?

Mr. DORFMAN. No; they should be stated as I urged here, explicitly in the project document, but the effect itself may be somewhat hidden, as in the case of rent supplement.

Chairman PROXMIRE. But you would make it as explicit as you can?

Mr. DORFMAN. In evaluation; yes. Maybe not in implementation.

Chairman PROXMIRE. Thank you.

Senator Jordan?

Senator JORDAN. Thank you, Mr. Chairman.

Those are very interesting statements, gentlemen. The common denominator of all of them, I think, is when you talk about "in the public interest." Before we can properly quantify this aspect of it, how do we define what the public interest is?

Mr. Margolis, is the public interest a constant objective, or is it variable? How do define the public interest?

Mr. MARGOLIS. I will not be brave enough to make this effort. It is clear, though, that it is not a constant, as you visualize, we cannot now convene a committee on the public interest which would be able to make general philosophic statements about it and then specify just what objectives our society should seek in order to maximize this public interest. We are not at that stage. But it also may be true that such an exercise may be very well worth while, that there is a process of learning about what is feasible and what is desirable which may lead to more intelligent understanding about how our Government should proceed.

It is also equally clear that the Government guides a society which is faced with many groups which are in conflict with each other. We have learned to somewhat resolve or reduce the level of conflict by operating within the context of our political and judicial system. But the groups

resolve their conflicts of political compromises rather than in the interest of society. I do not think there is a clear quantification of what would be an improvement or a decline in the public interest. But there are some dimensions of the public interest which would be agreed upon by a very broad range of groups in our society.

Efficiency objectives are rarely disputed. Further, we find agreement about the fact that there should be some redistribution, though there is no consensus about the amount of redistribution, or about the amount of sacrifice of the national income that we should be prepared to accept in order to have that redistribution. It is very likely that education of the hard-core unemployed may make less of a contribution to national income than education of professionals at universities. Yet we are willing to devote resources to training the hard-core unemployed because of the need to achieve political stability. The next situation when we were willing to make sacrifices in the level of national income in order to achieve political stability is on the future agenda. The public interest will be defined as problems arise in our society, and we become sensitive to them.

Senator JORDAN. And as population increases.

Mr. MARGOLIS. As population increases. Clearly, we are becoming more aware of the consequences of congestion. We were much less sensitive to these problems in the past. Some psychologists have observed neurotic behavior associated with closeness of individuals, and a whole new set of social objectives are arising that we were ignorant of a few years back.

Therefore, there is no static definition of the public interest. And, of course, it is the responsibility of Congressmen to be sensitive to these pressures, and for us academicians; to try to provide research to make you aware of them.

Senator JORDAN. Mr. Knetsch, how would you define public interest?

Mr. KNETSCH. I, too, do not have a ready definition of the public interest. But I am not sure that we need this kind of a definition for the present purpose. I would agree with Professor Margolis that the public interest is multidimensional, it includes things like freedom of choice and income distribution, as well as others. A couple of the dimensions which are important in the present context, I think, are national economic growth, and the distribution of the income provided by this growth.

When we speak of a public expenditure item, be it a dam or be it anything else, what we want to appraise are the effects on the various objectives that we have as a society, or as a public. Most of those here are the economic effects. If we build an irrigational project, what does it do to the economic income of the people, or do to the distribution of it? And does it have any other impact on the poor or the disadvantaged?

These are important ingredients in assessing whether this is a desirable investment or an undesirable investment. And I would certainly also agree with the suggestion of Professor Dorfman that we need far more information. I did not mean to imply in my statement that it was not necessary to provide information on the distributional aspects. I think we need far more knowledge about who it is that bears the cost and who are the recipients of the benefits. I think we are generally in fairly poor shape on this issue now.

Senator JORDAN. Mr. Dorfman, I would like your comments. What is the public interest?

Mr. DORFMAN. Sir, if I may say so, ascertaining the public interest is your job, fortunately for me, and not mine.

Senator JORDAN. It is a variable from where we sit.

Mr. DORFMAN. Observing what it is, however, is partly my job, and partly the job of everyone concerned with public policy. And really it was what I was addressing my paper to, as you detected. I can find out what the public interest is only by watching your choices and your decisions in specific instances, and then only, I think, if the choices confront revealing issues, as when you are given adequate information about who benefits more or less from different projects that you ask to have modified, accepted, rejected or what not. And similarly when you look at the kinds of tables people are talking about in which different consequences, numbers of lives saved, numbers of children out playing and so on, are listed, and select from that menu what you deem to be in the public interest, that helps me learn what the public interest is.

But that is for you, the political leaders, to meditate.

Senator JORDAN. I think from where we sit it is a variable kind of objective, it varies from the region you represent, and it varies from the level of population in the country. What would be the public interest when the population of this Nation doubles from 200 million to 400 million? Would the public interest change correspondingly, or would you expect it would be quite the same?

Mr. DORFMAN. I should think that the public—I do not know about the public interest—but current public needs would reflect that sort of thing. We do not have to look into the future, just consider that we did not mention or consider air pollution, water pollution, or problems of waste disposal a few years ago, because we had ample natural resources for contending with those problems. Now that we are straining our resources, they become valuable things that we must consider in public decisions. And we have learned that, partly through hard experience, and partly through congressional consideration of the problem.

Senator JORDAN. Mr. Knetsch?

Mr. KNETSCH. I think that what we are going to witness is that as the population increases, demands and values that we hold for certain kinds of goods will change. I think the real problem is to enter these changed demands and changed values into our social calculus.

I presume the Pilgrims did not value wilderness terribly highly. But as the country grew in population we now have a very high demand and positive value for wilderness areas. I think the issue is to incorporate these changing values into decisions of how we allocate our resources.

Senator JORDAN. You try to get a proper balance between development and conservation, or between development and preservation.

It seems to me that now, or when the population doubles, or when it quadruples, the essential needs of the people are going to be primarily for food and shelter and recreation, transportation, and a place to set up businesses and plants, and so on. So the emphasis—the criteria must change somewhat as we go forward into a more concentrated population.

Would you agree, Mr. Margolis?

Mr. MARGOLIS. Yes; I would agree with the preceding statements. In the neutral language of the economist: The preferences of individuals are going to shift as the balance between population and facilities changes as a consequence of increased congestion. The problems of the availability of open spaces become greater; the problems of disposition of waste increase; the number of interactions among individuals increase. All of this will lead to a shift in the type of public services which are demanded, and also the type of private services the individuals wish. It will be extremely difficult to forecast what this future set of demands will be.

We are going to have to approach the problems of the future demands with great caution. It should enter into our current decision-making. Obviously we are making many decisions which are going to constrain us in terms of what this future will be like. As we rebuild the cities today we are rebuilding them very much in the light of what the current problems are. But clearly those cities are going to survive 50 years hence when there are very different sets of problems. I think it is incumbent upon us to learn how to plan and make decisions in a flexible fashion, recognizing that there is a great deal of uncertainty as to what the future will be. On the whole, I think we are not very competent in this type analysis and planning at this point.

Senator JORDAN. That is what I wanted to emphasize, the degree of flexibility that is needed as to just what the public interest is as we look down the road ahead. In order to properly evaluate it we should be able to define it.

My time is up, Mr. Chairman.

Chairman PROXMIRE. I would like to ask you gentlemen each to comment briefly on this:

How would you suggest that the information on the impacts of Government expenditures other than national income benefits be handled in project reports?

I would like to give you a quotation from Dr. Jack Carlson of the Bureau of the Budget, who appeared very ably here on Monday. He said:

> There is a problem of combining measures of diverse objectives. The only way I feel comfortable in doing this is to keep the measurement of each objective separate and not try to mix them. Therefore, I would show the national income benefit with national income cost and then show nonmonetized benefits in whatever physical or social units that are useful.

Do you gentlemen agree with this conclusion?

Start with Dr. Dorfman.

Mr. DORFMAN. I should certainly endorse that, as I think I did in my opening statement, wholeheartedly. I do feel also that merely to exhibit the total amount of such benefits falls short, for reasons we have already discussed. I should like to know, and I think you would like to know, to whom they accrue. Very often—let me go a bit beyond—it is of more importance in making decisions to know who benefits than just how he benefits. There are various programs that are of benefit to lower income members of our cities through education, through recreational facilities, through health, through housing, and so on.

What is of most importance, I think, at any time is the total amount of benefit that is given to such a segment of the population.

And perhaps it's only subsidiary under just which of these four or five programs the benefits happen to arise. That only makes your job more difficult, because you have to scan a great many different programs simultaneously, and we do not ordinarily add things up that way. That is not an ordinary budget category, how much we are expending on rural people in such and such an income bracket. But it is important data.

Chairman PROXMIRE. Thank you.

Dr. Knetsch?

Mr. KNETSCH. I would certainly agree with Dr. Carlson. I would perhaps extend it. We do need more information on where the costs and the benefits fall. Also I think that while it is helpful to have a single project report indicating this kind of information, which is better than we now have—we can do still better if we do this for more than one of alternative. We can then make comparisons among alternative means for accomplishing various kinds of goals, or within a type of expenditure program. Using the example of Professor Dorfman on the recreation expenditures, if we had a document on Cape Cod that would show who the recipients are, this would be helpful. But if you also had another document indicating the recipients from an expenditures of this kind of money on recreation in the Boston area, it would be still more helpful. I would endorse Dr. Carlson's statement, and only suggest that perhaps we could do still better if we compared more alternative means of attaining an end.

Chairman PROXMIRE. Dr. Margolis?

Mr. MARGOLIS. I would go along with the preceding two remarks endorsing Dr. Carlson's statement with possibly one additional comment, and that is to distinguish a little more clearly between what we might call marketable benefits and nonmonetized benefits.

There is a tendency to distinguish between the national income objective or efficiency objective and a whole host of other social objectives, where I think many of these social objectives are also national income objectives, though they are not marketable. There is a problem of trying to estimate, to guess, to impute values based upon individual preferences for these other dimensions.

I mentioned environment. Many of our environmental goals really are nonmarketable individual benefits.

Now, I would treat differently those benefits like the distributional benefits which clearly are not and cannot be properly analyzed in terms of individual preferences. I would treat these somewhat differently from those benefits which we may not at the moment be able to quantify, but conceptually belong with the national income objectives. And I would pursue as far as possible efforts to assign some values to them.

The values may be rough, but my own feeling is that rough values are better than no values at all.

Chairman PROXMIRE. Dr. Knetsch, in your statement, you allude to the fact that there are no secondary benefits when the economy is a smoothly functioning one. Dr. Carlson made the same point on Monday. Is this a widely held position among economic experts?

Mr. KNETSCH. Yes, I believe it is.

Chairman PROXMIRE. Do you gentlemen agree with that position, Dr. Dorfman and Dr. Margolis?

You do.

Are there any agencies in the Federal Government which now calculate secondary benefits and add them to primary benefits in project evaluation?

I am thinking of at least two, the Bureau of Reclamation and the Highway Agency. The Bureau of Reclamation I should say does it now, as I understand it, and the Highway Agency is now trying to.

Can you think of others?

Mr. KNETSCH. No, I would not be certain of any. I would say that on that point, though, that there are some reports which while not really project reports in the same sense as, say, those of the Bureau of Reclamation, are reports which purport to be benefits of certain kinds of investment which are in effect simply just secondaries.

And if I might cite one example of this——

Chairman PROXMIRE. Yes, indeed.

Mr. KNETSCH. I made the point in my statement that I did not feel that some of the efforts—or some of the resources we are now devoting to this kind of enterprise are being particularly well used. An example that has recently come to my attention is a report of a study of parks, I believe commissioned by the National Park Service. The general conclusions of this study are that there are $6.4 billion of sales associated with travel to the national parks, and the income from this indicates a capitalized value of the national parks of $143 billion, plus all sorts of other indirect effects. It is also stated that the income gains are 45 times the annual appropriations, suggesting a benefit-cost ratio of 45 to 1, which is fairly good.

National parks are valuable. However, I do not think this kind of study really helps us at all. And I think it is kind of a thing that is bringing discredit on serious efforts to improve the evaluation of benefits. In my view this is a misuse of the funds that could be used for this.

Chairman PROXMIRE. That is a very helpful example.

Incidentally, if you have any more you would like to add when you correct your remarks, any of you gentlemen along this line, go right ahead.

Mr. MARGOLIS. I may just add one other type of case. I do not know whether it is in the official procedures of the Federal Government, but certainly if you look at the analysis being carried on by local governments who are cooperating with Federal programs, they very frequently do add on these secondary benefits. For instance, quite frequently they will add as part of the benefits of an urban renewal project all the buildings that will be located on the new site. The evaluations of the new rapid transit system at San Francisco have assigned as part of the benefits all the office buildings being built in San Francisco. These "benefits" are widely accepted in the community as part of the calculations which should underlie the amount of additional State funds which should be put into the system.

Chairman PROXMIRE. But with the Federal Government putting up most of the money, these obviously have a limited if any national benefit, right?

Mr. MARGOLIS. None at all, nor any local benefits either.

Chairman PROXMIRE. I would like to ask this of all three of you gentlemen:

In recent discussions, some have urged that the total costs of undertaking an expenditure be allocated among a number of objectives in

addition to the production of goods and services for the nation as a whole. These other objectives may be things such as regional gains and income distribution. Through this means, then, only a part of the total costs would appear in the denominator of the national benefit-cost ratio—thus raising the ratio substantially above what it would be under current evaluation practice. How do you appraise the soundness of this "cost-allocation" approach?

Mr. DORFMAN. Well, I have heard of it, but never in very great detail. And I have to say that I find the justification baffling. It has never been explained to me, and I have not been able to figure it out myself. There is an obvious rationale in comparing the total benefits that arise from a project with the total costs, parceling out the costs and then making comparisons is very difficult. If you stick—if I can take another minute—to the framework where generally there are multiple objectives to be served by a Government project, it becomes a case of a classic economic problem, which is joint production, as in the case where you breed cattle and you get both prime ribs and rump steak off the same beast. It is a meaningless undertaking as far as I can see to determine how much of the cost of raising the animal you can charge against the rump steak and how much against the prime ribs. And the attempt to parcel out the costs of public expenditure on projects runs up against the very same difficulties.

Chairman PROXMIRE. Then I would assume that your answer to this question—the question is, are there any principles of cost allocation which can be used in consistently allocating total cost to many incommensurate objectives—is that there are not?

Mr. DORFMAN. You are asking me to embark on one of my 2-hour lectures, and I am not sure I want to get into it.

Chairman PROXMIRE. You can put that in the record if you like.

Mr. DORFMAN. I should not even like to do that.

Let me give you a quick summary. We very often can make marginal evaluations but not total evaluations. And you can even make some guess as to the relative cost of having more prime ribs as against more rump if you notice that there probably are several species of beef cattle, some of which are more productive at the front end, and some at the rear end. And therefore you can get a trade-off as to how much steak you have to sacrifice to get a bit more rump, or the other way around.

And that is useful for decisions.

The same kind of thing applies to public investments. As Mr. Knetsch reminded us, by comparing alternatives which differ in the incremental characteristics, you can see how much of one characteristic you have to give up to get a little bit more of another. Or in my example, get play space and get living space.

Those do give you useful comparative costs for public decisions even though you cannot allocate total costs meaningfully.

Chairman PROXMIRE. Do you gentlemen agree?

Mr. KNETSCH. Yes, generally. I would only add the point that it is generally considered to be improper to add on the benefit side of this comparison the benefits that accrue regionally and those which accrue nationally. But I think that in fact we are doing the same thing when we apportion the cost. Whether we double up on the top part of the

denominator or subtract off the bottom, we are making the same kind of mistake. I would certainly agree with Mr. Dorfman, that there is in my view no sound principle for this.

Mr. MARGOLIS. I completely endorse the preceding remarks.

Chairman PROXMIRE. You know, Mr. Knetsch, I found the comment on page 3 of your statement to be a most interesting one. You state that our present cost sharing arrangement generate biases in the decision process. Could you elaborate on this? In your judgment, for example, how serious is the extent of bias in the evaluation of public expenditure, say, in the water resource area? What would you suggest to eliminate this effect?

Mr. KNETSCH. I think what it really comes down to is the basic principle that you can get a very large demand for almost anything in you zero price it. Consequently, if you make the costs fall to someone else, there is a built-in favoring of the projects by those who stand to gain. I think the kind of bias that we get into, is that with the type of cost sharing arrangements we often use, those things to which we assign essentially a zero price are going to show a larger demand relative to those things for which the beneficiaries are expected to pay.

I think in the case of recreation we find this. We undercharge, for example, in the case of campgrounds. These are very, very expensive items, and take a very large proportion of the total public budget for outdoor recreation. By giving them away, or setting a very nominal charge, we witness a very large demand for them. This causes, not only the users, but the manufacturers of camping gear, to favor more campgrounds. I think the difficulty is that we then do not get the kind of recreation investment that some of us might feel more appropriate.

Chairman PROXMIRE. How do you eliminate this?

Mr. KNETSCH. I would favor far greater use of user charges, for example. I am continually struck when I go to camp shows, where someone is peddling a $5,000 camping rig, that a chief sales pitch is that you can travel across the country for almost nothing because we do not charge for the parks. This contrasts with the situation where kids are trying to get wet in the fountain in front of Union Station.

Chairman PROXMIRE. How do you view the potential of more effective cost sharing arrangements in reducing the biases in the decision process? What is the real potential here?

Mr. KNETSCH. I think it is very significant.

Chairman PROXMIRE. Can you give us an example outside of the water resource area?

Mr. KNETSCH. Transportation, roads, and airport use, and probably the postal service. Effluent charges in the case of pollution would certainly also fall into this category.

Chairman PROXMIRE. I would like to ask Dr. Margolis if he would like to comment on that.

Mr. MARGOLIS. There are two ways of viewing cost sharing. One is the way that we usually think of in terms of water resource development, where the local governments or the local communities expect to participate in the financing.

The second way in which one can take advantage of the cost sharing approach is to increase, not the resource costs imposed upon the local government, but increase the opportunity costs to the local government of adopting certain projects. If the funds were more freely avail-

able to them in terms of what type of programs they would want to pursue, then they may take a much more realistic view about a specific transport system, or a specific water improvement system. They may decide that if they have the funds and could use them in any direction, that it might be more desirable to put them in the area of education, or they may decide to put them in the area of health. They will make a more proper evaluation of what these funds cost them if used in water resources as against another public service if they had the option to use it in some other type of program which may be more beneficial to them.

In the current pattern when the Federal Government comes in with a specific program, all of which is financed elsewhere, the cost to them is zero, and almost any benefit is worth while, and therefore you get local support for it.

But if the opportunity costs to them become great, if they had an option to transform it into some other public service, we may get a very different local response.

So I think that we have to operate in both dimensions, both to encourage the amount of local contributions to resources, and also to consider the set of issues dealing with more open-ended transfers of funds to local governments where they can enter into the determination about how they should be used instead of constraining these transfers of funds in our current system, which says that a given agency has the funds, and they cannot be used for any other sets of purposes.

Chairman PROXMIRE. Mr. Dorfman?

Mr. DORFMAN. I think we are talking about redistribution again, policy with respect to the reimbursement of the costs of Government enterprises is explicitly a case of redistribution. And I have been wondering a good deal about Mr. Knetsch's example of the campers. I presume—in fact it is often stated—that the purpose of making campsites so cheap is to make them available to us less affluent members of the community. And the evidence he cites——

Chairman PROXMIRE. Are you talking about professors?

Mr. DORFMAN. Especially professors. We have to get away from the campus somehow.

And the evidence he cites about the camping rigs that are inaccessible to professors are an indication that that may be a failure, which is important evidence as to how wise we are in providing this kind of facility.

But the fact that the campsites are very heavily used and have a demand far beyond their availability just because they are cheap is not, I think, a strong argument for increasing the charges for them, to the extent that they are successful in providing this kind of income to the people that we like to have receive it.

So again the problem here, I think, with charges is not how important they are in creating political biases, but their adequacy in their income redistributional attempts.

Chairman PROXMIRE. Gentlemen, thank you, very, very much. This has been a most enlightening and helpful hearing. And I think you have made a fine record. And I do appreciate it.

The subcommittee will stand adjourned.

(Whereupon, at 11:45 p.m., the subcommittee adjourned, to reconvene subject to the call of the Chair.)

APPENDIX I

Report of Panel of Consultants to the
Bureau of the Budget
on
STANDARDS AND CRITERIA FOR FORMULATING AND EVALUATING
FEDERAL WATER RESOURCES DEVELOPMENTS

Maynard M. Hufschmidt, Chairman
John Krutilla and Julius Margolis
with assistance of
Stephen A. Marglin

Washington, D.C.
June 30, 1961

This report was prepared at the Bureau of the Budget's request in the spring of 1961. It represents the views of a highly qualified group of experts who were asked to present their independent judgment and is made available to the agencies concerned in their studies of this subject. Needless to say, the report does not necessarily reflect the views of the Bureau of the Budget or its staff.

David E. Bell
Director, Bureau of the Budget

June 30, 1961

Mr. David E. Bell
Director, Bureau of the Budget
Room 252 Executive Office Building
Washington 25, D.C.

Dear Mr. Bell:

Attached is our report on suggested standards and criteria for formulating and evaluating Federal water resource developments, made in response to the request to us of March 15, 1961.

We were asked to address ourselves primarily to a few especially knotty questions, including the interest rate, price levels and period of analysis to be used in economic evaluation, the treatment of secondary benefits and fish and wildlife benefits, the economic evaluation of hydroelectric power, and principles and standards for cost allocation and cost sharing. In the short time available it was not possible to deal with these questions in great detail; in some cases only general principles are set forth. Furthermore, we were able to cover some questions not specifically mentioned in your request, although a number of other important questions were not considered at all.

In presenting our report we have not attempted to give background information on existing Federal water resources policies, programs, planning procedures or standards and criteria, as we have assumed that policy makers and technical and professional staff readers of this report would be familiar with these details.

Because of the above limitations in scope and depth of coverage, the report should be considered as only the first step in a thorough re-evaluation of the process and standards by which the Federal Government makes basic investment decisions in the water resources field. As discussed in the concluding section of this report, further detailed studies are needed; any revised standards and criteria that are adopted by the executive branch at this time should be considered as strictly interim in nature, to be modified on the basis of further studies.

We wish to acknowledge our debt to Stephen A. Marglin, who served as our assistant throughout the study. In reality, he functioned as a fourth member of the panel; and has made extremely valuable contributions

to the substance of the report. We express our appreciation also to the many Budget Bureau staff members who helped us, especially Wesley Sasaki, Robert Teeters, and Fenton Shepard.

In the sections that follow, we discuss (1) the basic framework for water resources development, (2) the interest or discount rate, (3) the question of secondary benefits, (4) the problem of risk and uncertainty in water resource development, (5) the use of alternative costs in formulating and evaluating hydro power projects, (6) the question of valuing recreation and fish and wildlife benefits, (7) problems of financial policy, including cost sharing and cost allocations, and (8) the investment decision process in general. Finally, we present our conclusions and recommendations, including further studies that are needed.

Sincerely,

John V. Krutilla
Julius Margolis

Maynard M. Hufschmidt, Chairman

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I. A FRAMEWORK FOR DEVELOPMENT OF WATER RESOURCES

INTRODUCTION

The continuing effort to improve techniques for analysis of Federal water resources developments has gathered momentum over the past 25 years. This report represents further steps in this continuing effort. Beginning with studies of technical committees of the National Resources Planning Board,[1] work has proceeded through inter-agency committees[2] and special study commissions, including the Cooke Commission, Missouri Basin Survey Commission, and the two Hoover Commissions. From these studies, there has evolved a set of standards and criteria to guide the formulation, evaluation and scheduling of Federal investment in water resources.

To assert that the standards currently in use are deficient in some respects is not to imply that progress has not been great. More difficulties are involved in formulating techniques of economic analysis for public than for private investments. Given the extra difficulties, a high level of analysis--in many ways superior to techniques used by private business firms--has been achieved by the Federal agencies.

This progress in the water resources field is the more remarkable when contrasted with the typical government approach to investment decisions. Governments usually specify certain "requirements" for a highway network, public buildings, and the like and allocate funds to meet these requirements. No systematic effort is made to measure gains and costs on a uniform basis so that fully informed decisions can be made concerning the worthwhileness of undertaking different projects. Economic analysis, in the sophisticated form in which it is applied in the water resources field, is not employed in making investment decisions for other kinds of public works. The pioneering work of the Federal water resources agencies in this area can be fruitful for many other sectors of government.

The need for improvements in economic analysis is increasing. Although the specter of major water shortages in the near future may be exaggerated, the fact of growth in competing demands for water is clear. The problems of allocation among conflicting purposes are becoming both more

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1. See National Resources Planning Board, Development of Resources and Stabilization of Employment in the United States, 1941, "Water Development Policies," pp. 371-400.

2. Subcommittee on Evaluation Standards of the Federal Inter-Agency Committee on Water Resources.

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numerous and more difficult of solution. The tolerance limits within which errors of choice can be accommodated without excessive social costs are narrowing. Given the long-term commitments required in allocating resources associated with major water control structures, it is essential that decisions be based on the best information available, and that the information be used with maximum effectiveness. Wider recognition of the role of sophisticated economic analysis and operations research techniques in problems of this sort is urgent.

This is not to say that substantial gains in planning efficiency cannot be obtained through use of relatively simple techniques of analysis. In fact, given the vast ranges of imponderables and crudeness of data with which the analyst often has to operate, extremely refined techniques, despite their ultimate promise, are often inappropriate. A skillful balancing of the simple and the complex technique, adapted to the nature of the problem at hand, is required.

RATIONALE FOR FEDERAL WATER RESOURCES DEVELOPMENT

The Federal Government's preeminent role in water resources investment stems from a combination of political, economic, and social factors with deep historical roots. Very early, the Government was concerned with the developmental aspects of water resources investment. At first, transportation routes and facilities were opened up by improving river and harbor navigation. Later, arid lands in the public domain were developed through irrigation. As Henry Caulfield has pointed out,[3] this developmental thrust was joined around 1900 by two other movements: The conservation thrust reflected the concern of scientists for preservation and "wise stewardship" of natural resources. And the progressive thrust represented a popular concern for reform of monopolistic practices of "trusts" generally and public utilities in particular.

Following this historical approach, and examining the dynamics of these movements, one can explain the dominance of the Federal Government in the fields of navigation, major irrigation development in the West, major flood control works and hydroelectric power, and, to a lesser extent, water-based recreation and fish and wildlife resources. This historically dominant Federal role in water resources investment has involved constitutional traditions, political convictions, and institutional developments; and all of them, in addition to technical economic considerations,[4] still must be reckoned with.

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3. Henry P. Caulfield, Jr., "The Living Past in Federal Power Policy," in RFF Annual Report, 1959 (Resources for the Future, Inc., Washington, 1959), pp. 24-33.

4. Ibid.

Turning now to the technical economic considerations, two general classes can be identified. First, certain technical deficiencies in the operation of the market mechanism prevent the efficient supply of water products and services by private firms operating in the context of a decentralized market. Second, the community may have values and goals that conflict with the results of the market operation. For example, the community may prefer certain kinds of products and services--outdoor recreation, for example--or certain patterns of production--small farms, perhaps--which would not necessarily result from the unfettered operation of the private market.

TECHNICAL DEFICIENCIES IN MARKET MECHANICS

In this general class there are three major technical factors that lead to Government intervention in the water resources field. These factors are external economies and diseconomies, the collective nature of demand for services from water resources development, and the social overhead nature of investment.

External Economies and Diseconomies

"External economy" is a technical economic term describing interdependencies in the provision of goods and services. An external economy is said to exist when provision of a good or service for one person or group makes provision of the same or some other good or service possible at reduced cost to another person or group, with little or no reduction in the quality of the good or service to the first person or group. By the same token, an external diseconomy is said to exist when provision of a good or service for one person necessarily provides an undesirable commodity or disservice for another. In the presence of external economies and diseconomies, the market mechanism generally does not provide an adequate basis for registering all of the gains and losses of individuals from an economic undertaking. Failing in this respect, markets cannot be relied upon to translate individual wants into the pattern of resource use which most adequately meets the desires of the community.

The very nature of water resources means that external economies and diseconomies are pervasive in their development. It is well known that a storage reservoir, for example, by regulating the pattern of stream flow will affect--either beneficially or adversely--downstream uses. Considered from the view of the reservoir alone, these are external effects--external economies or diseconomies.

Historically, the gradual assumption by the Federal Government of the flood control task on the lower Mississippi River was largely caused by such external factors. Levees built along the river by one district or even by one State made matters worse for those living downstream; the term "one river--one problem" became a reality for the segment of the

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Mississippi from Cairo, Illinois, to the mouth. It was a problem far too large for any lesser jurisdiction than the Federal Government.

Similarly, Federal multiple purpose development of such major streams as the Columbia, Missouri, and Colorado rivers was justified in part by the need for taking account of intrabasin relationships among projects and purposes. The major technical issue in the Hells Canyon case was whether private development of the site could make as great a contribution to basin development, in view of the external economies and diseconomies, as public development which, by planning for the whole basin, could convert external into internal economies.[5]

The examples so far given relate to external economies and diseconomies associated with the interrelationships among uses only of the water resources. Another type of external economy arises from the large-scale nature of water resources development--economies are induced in the use of other resources. These are called market external economies. (They are discussed in some detail in Section III.)

Collective Demand for Services

Some services, such as flood control, provided by water resources development are such that they cannot be provided by conventional market arrangements. Water storage regulating stream flow to protect any occupant of the flood plain automatically protects, although perhaps to some in varying degree, other members of the community who occupy the flood plain. Once provided, the flood protection cannot be parceled out for sale in separate units only to those who are willing to pay. Moreover, the enjoyment of protection by one does not diminish the availability or effectiveness of the protection to others in the flood plain. Since flood management in these particulars is not "packageable," it has the character of a typical "public good" which requires collective action if it is to be provided.

In the larger river systems which cut across many local and State jurisdictions, storage developed in one State may affect the management of flood flows at points outside its borders. For example, the impoundment of waters of the Tennessee River in Kentucky Reservoir reduces the peak flows of the Mississippi in flood stage, affecting the flood stages at points in States not even contiguous to Tennessee. Similarly, the storage operations in the proposed Arrow Lakes Dam and Libby Dam in British Columbia and Montana can effectively control the flood stages at such critical points as densely populated Portland, Oregon, and Vancouver, Washington. It is the "public good" nature of flood management, coupled

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5. John V. Krutilla and Otto Eckstein, Multiple Purpose River Development (The Johns Hopkins Press, Baltimore, 1958), Chapter V.

with the multiplicity of jurisdictions which may be involved, which requires that the matter be approached at the highest governmental level.

Social Overhead in Water Resources Development

In some of this country's regions, water resources play such a central role that river development projects are as necessary for economic development as highways, communication facilities, and other basic undertakings. In an economic development program requiring investment in such social overhead, a great many market external economies are involved. Moreover, while provision of social overhead is a necessary condition to economic development, it is rarely sufficient to insure development. There is always a large element of uncertainty as to the extent of economic development once social overhead is provided. For these reasons, Government has often stepped in to provide at least a part of the social overhead rather than relying upon private enterprise to take the risk alone. The assumption by the Federal Government of responsibility for navigation improvements as early as 1824 can be traced at least in part to their social overhead nature. Major flood control, irrigation, and, since 1933, hydropower developments were also justified, in part, because of their contribution to social overhead.

The market developmental externalities which accompany social overhead investment require little elaboration. Many economic undertakings are decreasing cost activities; that is, their unit costs fall as the number of units produced rises. These activities must be operated at high rates to become economic, and large doses of social overhead are necessary to achieve the agglomeration of a population large enough to generate demands that will justify sufficiently high rates of operation.

Uncertainty is a separate question. Why is it prudent for Government to react differently from private enterprise to the uncertainties of social overhead investment? Acting together, individuals are able to pool the uncertainties of economic undertakings; the greater the number of individuals acting together, the less the share of each in a given uncertain venture. And, even if the number of projects increases in proportion to the number of individuals, the greater the number of independent projects of comparable uncertainty, the smaller is the uncertainty for the group of projects as a whole. By acting through the Federal Government--either to share the uncertainties of one major undertaking among all the Nation's citizens or to reduce the overall uncertainty by undertaking projects in many regions--each individual may find development of water resources forming part of the social overhead desirable collectively, although no one finds it attractive as a private business venture. Lack of success in one region might prove disastrous for a private enterprise engaged only in the one venture. But it need not be so disastrous when divided among 185 million individuals or when balanced for the Nation as a whole by an unusual degree of success in another region.

6

COMMUNITY REJECTION OF THE OUTCOME OF MARKET OPERATIONS

Even when the market functions properly in a technical sense, the community may reject the outcome of the market in various particulars. The market responds to consumer preferences. However, individual preferences for commodities and services may reflect efforts in the private sector to mold and influence individual tastes for new products or particular brands of existing products or in favor of certain uses of resources over others. To the extent that this is done, the community may wish to devote public resources to insure that various special goods and services which are not promoted commercially are adequately represented in the consumption pattern of individuals making up the community.

Policy makers may go so far as to reject the pattern of individual preferences as expressed in their willingness to pay, which reflect responses to the motivation researchers. For example, policy makers may decide that individuals do not appreciate the value of high-quality outdoor recreational opportunities; consequently policy makers may include more recreation in development plans than individuals are willing to pay for. Or, policy makers may decide that individuals give insufficient weight to the preservation and enhancement of aesthetic and cultural aspects of our environment. A caveat is nonetheless in order. "Merit wants," as these preferences of policy makers are termed, is a very convenient device for justifying favorite projects that fail to qualify in terms of more general, individual preference-oriented objectives. We must therefore give close inspection to arguments for placing particular goods and services on pedestals.

The community also obviously rejects the ultimate pattern of income distribution, which is represented by receipts of wages, salaries, rents, capital gains, etc., as remuneration for factor services in the production of goods. The institution of progressive income taxation is perhaps the most unadulterated evidence of this. In addition, compulsory contribution to old-age and survivors insurance and social security payments and the variety of health, education, and welfare programs are provided, not only as merit wants, but partly as redistributive devices. In the water resources field, the Federal development of hydropower for use in rural electrification programs doubtless reflected, among others, both of these considerations.

Finally, the community may reject the outcomes of market operations, based on its preference for particular patterns of production. For example, universal free education might be provided by subsidy to private institutions, but the public school system is preferred. In the water resources field, the Government is concerned with the use of water resources projects as a device to create special patterns of economic activity. The 160-acre limitation on Federal irrigation projects presents a clear case of the willingness of the Nation to make some sacrifices in

productivity gains in order to create a pattern of family farms and small dispersed towns. Another instance is the preference clause in the distribution of public power which has significant effect on distribution and also serves as a device for regulating the rates and investment patterns of public utility systems. Like the acreage limitation laws, power preference requirements often impose losses in productivity which implicitly are accepted as the cost of achieving the public goals associated with the pattern of desired economic activity.

BASIC OBJECTIVES

While there may be general agreement on the necessity and propriety of Federal leadership and participation in water resources development, there may not be an equivalent consensus on the goals of Federal activities in such development. One often-heard formulation of objectives asserts that the purpose of Federal activities in water resources development is to meet the Nation's present and future requirements for water and water-produced goods and services. The difficulty with this formulation is that there are no absolutes in water "requirements"--there are always choices available to the Nation. A broader and more fundamental statement of objectives is a prerequisite for selection of principles and standards for planning Federal water resources developments.

Fundamentally, the all-embracing objective is the greatest possible contribution to national welfare. But since national welfare is compounded of social, economic, and cultural elements, there is no simple, single measure for the total with which to help rate the value of public water resources development and to choose among alternative mixes of products, services, and facilities. We must deal with national welfare in terms of the major dimensions in which water resources developments play a part.

One major dimension is the gain in productivity or increase of national income. If public water resources developments were planned in terms of this objective alone, we would seek to maximize the contribution of the development to national income. This objective leads to the most efficient use of the Nation's water resources.

Another basic dimension of national welfare relates to the distribution of income or product. As a Nation, we are not only interested in the size of the social product, but also in its equitable distribution among members of the community. It must be recognized that water resources development may be a cumbersome vehicle for achieving equitable income distribution. There are more effective means for reaching this objective. These not only include the progressive income tax and health, education, and welfare programs. Also, there are, for the disadvantaged groups which suffer from occupational or geographic immobility, retraining

and assistance in resettlement as a means of rehabilitating their dignity and productivity. Nevertheless, in special cases, water resources development can be an effective means by which to achieve an income redistribution objective. This would be true, for example, under conditions in which geographic and occupational mobility would be destructive of certain cultural values.

Clearly, since considerations of equitable distribution of productivity gains may enter into the deliberations of the Government, they should become one of the criteria of choice for water resources development. For many projects, the side effects on the distribution of income may be purely incidental and thus safely ignored; for others, the side effects may be large and thus require scrutiny; while for some, the distribution effects may dominate planning and choice.

Reference to a concrete situation may serve to illustrate the implications of redistributive objectives for standards and criteria and plan formulation. Assume an objective is to redistribute income toward farmers as a group, or to farmers associated with a particular irrigation project. In this instance, the prices used to value the output of the irrigation enterprise would be the "market prices," despite the fact that they may be supported prices and the output of the enterprise would add to an increase of surplus stocks in storage. Accordingly, the scale of development would reflect benefits computed at such market prices. On the other hand, if there were no such redistributive objective with respect to the group, standards and criteria would require that the output of commodities which would add to surplus stocks in storage would be valued at zero prices for any year in which an increase in the surplus were anticipated. The project, in turn, would likely be smaller in scale and a larger proportion of its potential would be devoted to the supply of water-derived commodities or services other than crops under support programs.

Dimensions of welfare other than the size, distribution, and means of redistributing income can be identified. The community may, for example, have special concern for the way in which existing rights and arrangements are accommodated in planning a new development. For example, we often devote far greater efforts to relocation of certain community facilities flooded by reservoirs than are justified by the value of relocation in terms of the components of welfare already mentioned.

Still another dimension of welfare of considerable significance in water resources development is the preservation of aesthetic and cultural values. Preservation of historic sites and unique or outstanding instances of scenic beauty are cases in point. This may simply reflect individual preferences or it may, as noted earlier, represent a rejection of individual preferences (a merit want).

A final dimension of welfare is merit wants in general. These have already been discussed above.

THE RELATION OF OBJECTIVES TO PLAN FORMULATION

The choice among alternative mixes of objectives is crucially important because of the effects of the combination of objectives on plan formulation. The goal of plan formulation is usually stated as maximization of net benefits. But once we recognize the multiplicity of objectives, it becomes impossible to speak of benefits without identifying the dimensions along which we measure benefits--productivity gains, gains in equity of income distribution, etc. Further, since these do not have a single measure, it is not possible to maximize such a multidimensional function without explicit weights relating the marginal values of one objective to the other, or without explicit constraints on the maximization of one objective alone, which will produce implicit marginal trade-offs.

An approach for handling multiple objectives in plan formulation is presented in Section VIII as a part of the discussion of the investment decision process for Federal water resources development. No claim is made that the process can be applied in its entirety to Federal investment decisions at the present time. A less ambitious alternative, suggested for several situations in the sections that follow, is to develop alternative plans in which objectives occur in several different mixes. For example, different levels of attaining a given nonproductivity objective could be set as constraints and plans formulated accordingly. This would provide policy makers with opportunities for choice among explicit alternatives reflecting the multiple objectives of plan formulation.

In implementing the overall process of investment decision making, Congress and the Executive must make a number of very important value judgments. Resolution of possible conflicts among objectives obviously requires value judgments. In addition, a choice must be made of a social rate of time discount used to compute the present value of the stream of future costs and benefits. This value judgment reflects the relative emphasis placed by the Nation on added future consumption relative to added present consumption, given the present and projected levels of aggregate consumption. Repayment policy, which has important repercussions on the distribution of income associated with water resources development, is a third important value judgment. A fourth is the Government's attitude toward risk and uncertainty--on how much weight it places on highly uncertain benefits relative to more certain benefits.

Such value judgments must be made explicitly at high policy levels by politically responsible officials if they are to be properly reflected in plan formulation procedures. Given such guidance from policy makers,

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the Panel believes that the existing standards and criteria can be readily modified to work effectively as a part of a sound and constructive public investment decision process, in which economic analysis plays an important role. The discussion of specifics which follows is based on this belief.

II. THE INTEREST OR DISCOUNT RATE

PRIVATE AND SOCIAL RATES OF DISCOUNT

Even if the objective of water resources development is taken simply to be the greatest possible contribution to national income, the goal is ambiguous without a means of rendering comparable the contributions to national income made by a project in different years. To express the overall contribution of a project in a single number, we must be able to add the contributions to national income over the project's economic life. This addition requires specification of a weight for each year's contribution which reflects the relative value of income in that year against income in another.

Implicit in the choice of weights is the interest or discount rate. This rate, according to traditional capital theory, balances the productivity of investment (which determines how fast the economy can grow for any given rate of investment) and the reluctance of society to sacrifice current consumption for future consumption.. However, the interest rate which would arise from the free working of the private economy, even were the economy to satisfy the usual conditions of the economist's competitive model, would not necessarily represent an appropriate rate of discount for evaluating investment from the point of view of society as a whole. The private market does not provide as comprehensive a mechanism as is required to register the collective considerations attendant to investment. In selecting an interest rate, we are faced with the problem, all too familiar in the economics of water resources development, of discrepancies between valuation based upon individuals' market calculations and collective calculations weighing third party effects.[1]

In theory, the marginal productivity of investment could be brought into line with the social rate of discount throughout the economy by an appropriate combination of fiscal and monetary policy and direct controls.[2]

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1. For discussion of the differences between private and social evaluation of investment, see William J. Baumol, Welfare Economics and the Theory of the State (Harvard University Press, Cambridge, 1952), p. 92; Amartya K. Sen, "On Optimizing the Rate of Saving," Economic Journal, September 1961; Stephen A. Marglin in Arthur Maass et al., Design of Water-Resource Systems (Harvard University Press, Cambridge, in press), Chapter 4.

2. See Jack Hirschleifer, James DeHaven, Jerome Milliman, Water Supply; Economics, Technology and Policy (University of Chicago Press, Chicago, 1960), Chapter 6, and Hirschleifer, "Comments on a 'Survey of the Theory of Public Expenditure Criteria' by Otto Eckstein" in Public Finances; Needs, Sources and Utilization (Princeton University Press, Princeton, 1961), pp. 495-501.

In practice, however, all market interest rates, even the government bond rate, reflect private rather than social rates of discount. This is caused by imperfections in capital markets and the fact that the U.S. Government does not exercise the degree of control over private investment through fiscal and monetary policy that would be necessary to insure private development of all socially desirable opportunities in the private sector. Thus, no market interest rates are directly applicable as discount rates in the formulation and evaluation of public water resources development plans.

Though we advocate the use of a discount rate based upon an estimated social rate of time preference, its divergence from the private market rate creates special difficulties. To some degree, the resources used by the water development projects will force the displacement of private investments. These investment opportunities have been evaluated at a different and possibly--if not usually--at a higher discount rate. But in order to decide if a shift of productive resources from the private to the public sector is economically efficient, the same rate used to evaluate the time stream of benefits (net of annual operation, maintenance, and replacement costs) in the public sector must also be used to evaluate opportunities in the private sector. The shift of resources is socially desirable only if the present value of benefits per dollar of outlay in the public water resources sector exceeds the present value per dollar in the private sector--both present values being computed at the social rate of interest.[3]

An illustration of the consequences of a social time preference rate departing from private rates may serve to clarify this complication. Assume that a proposed project, which is estimated to have a capital cost of $100 million, produces a stream of benefits over time the present value of which, discounted at the social rate, say 2.5 percent, is $150 million. On this basis, the project has a benefit-cost ratio of 1.5:1. But suppose that each dollar of private investment on the margin yields $.05 of national income benefit per year in perpetuity. This marginal stream of benefits from an investment of $100 million in the private sector, discounted at the assumed social rate of interest of 2.5 percent, gives a present value of $200 million.[4] If investment of $100 million in the

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3. Following Otto Eckstein, Water-Resource Development, the Economics of Project Evaluation (Harvard University Press, Cambridge, 1958) and "A Survey of the Theory of Public Expenditure Criteria" in Public Finances: Needs, Sources and Utilization, op. cit.; Peter O. Steiner, "Choosing Among Alternative Public Investments," American Economic Review, December 1959, and Stephen A. Marglin, op. cit.

4. The formula for the present value of a perpetuity of $r per year discounted at a rate of i percent is r/i. We make extensive use of this formula.

water resources sector forces the Nation to forego other investment which is socially valued at $200 million in the private sector, then the "real," or "opportunity" cost of the $100 million invested in the water resources sector is $200 million--not the "money" or "nominal" cost of $100 million. Each dollar taken from private investment for public water resources development is really worth the $2 of present value of private investment benefits that are lost. Therefore, if public water resources development displaces private investment on a dollar-for-dollar basis, a cutoff benefit-cost ratio of 2:1 rather than 1:1 is required to correct the market's undervaluation of the social desirability of investment.[5]

In the special case in which the benefit streams of all Federal water resources projects are constant over a uniform economic life, we can, if we wish, retain the rule that increments should be included in project plans so long as their benefit-cost ratios exceed unity. For this special case we can create a synthetic discount rate that takes the yield foregone (the opportunity cost) of displaced investment into account as well as the social rate of discount. Use of this synthetic rate along with the benefit-cost ratio of unity is equivalent to use of an appropriately higher benefit-cost cutoff ratio and the social rate of discount.[6]

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5. See also Item 1 in table in Appendix to this section.

6. Thus the criterion that the present value of benefits of an increment must exceed its capital cost can be expressed in two forms. First, if the opportunity cost is $a per dollar of capital outlay and the (constant) annual benefit is $b per dollar of outlay on an increment, the criterion for inclusion of the increment in a project plan is

$$b \frac{1 - (1 + i)^{-n}}{i} \geq a$$

for an n year project and a social discount rate i. Alternatively, since the opportunity cost per dollar is

$$a = \frac{r}{i}$$

if the alternative private investment represents a perpetuity whose annual rate of yield is r, the criterion can be written

$$b \geq \frac{r}{1 - (1 + i)^{-n}}$$

or

$$b \frac{1 - (1 + j)^{-n}}{j} \geq 1,$$

where j is the rate of discount such that

$$\frac{1 - (1 + j)^{-n}}{j} = \frac{1 - (1 + i)^{-n}}{r}$$. (continued)

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It is sometimes proposed that a low social discount rate is required to avoid discrimination against desirable long-lived projects as against those investments with shorter life and quicker payoff. Does the higher opportunity cost in combination with the social discount rate produce undesirable results? It does not follow that investments with time profiles skewed toward the present will be favored by the combination of a comparatively low social discount rate and an opportunity cost in the same manner as if the opportunity cost rate were used directly as a discount rate. The only time the combination of social discount rate and opportunity cost produces results similar to those produced by direct use of an opportunity cost rate is when the time profiles of alternative investments are constant and time horizons identical. But in such cases there is no possibility of discrimination between projects on the basis of their time profiles.

In all other instances, a moderate social discount rate coupled with a higher opportunity cost tends to favor relatively longer payout investments in comparison with using the higher opportunity cost rate to discount time streams directly. It is true, however, that other things being equal, the higher the opportunity cost of capital (the higher the productivity of investment in the private sector) the fewer the projects (or marginal increments) in the public sector that will qualify for construction within the context of a national income objective. The justification of more long-lived public projects lies in demonstrating that the benefits they generate are sufficiently large to warrant the displacement of private investment when both are evaluated at the social rate of discount--not in neglecting the loss of benefits in the private sector.

ESTIMATING THE RELEVANT RATES

As a practical matter, then, there will be two general problems in responding to the question, "What rate or rates should be used in evaluating projects?" The first is a value judgment regarding the correct social rate of time preference, or at least a judgment as to what answer might be obtained if a community consensus were developed in response to

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6. Continued-
The discount rate j is the rate synthesizing opportunity costs and social time preference. In the example given above, taking n = 50,

$$\frac{1 - (1 + j)^{-n}}{j} = \frac{(.70905)}{.05} = 14.181,$$

and j is readily found in any compilation of interest tables to be approximately 6.75 percent.

the question of time preference. The second is the empirical question of what time streams are foregone elsewhere in the economy as a result of investment in the public sector.

Social Rate of Discount

There is no opportunity here to appeal to the market for objective evidence as to the rate of social time preference since the market does not reflect collective preferences with respect to time discounts. One method of ascertaining its value lies in discovering the marginal rate implicit in the Administration's goal of a certain rate of economic growth. This value judgment with respect to growth rate contains an implicit balancing at the margin of the Administration's time discount rate and social productivity of investment. For example, to increase the rate of growth to x percent would require extra investment of y billion dollars this year at full employment.[7]

The marginal rate of discount in this case is the rate which just makes this amount of extra investment, no more and no less, the optimal amount. This is the rate which makes the present value of the consumption stream generated by the last dollar of the extra investment just equal to $1.00; it can also be called the "social rate of return" or "social marginal productivity" of the marginal dollar of investment, and is a datum that can be directly estimated.[8] For purposes of this report, the social rate of discount is assumed to lie between 2.5 and 4 percent, and these two limiting values are used as illustrations throughout the remainder of this section.

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7. The extra investment required to achieve a given rate of growth depends on the mix of investments chosen, because of the divergence in marginal productivities throughout the economy (alluded to in the remainder of this section). On June 28, at his press conference, President Kennedy suggested that output should grow at a rate of 4.5 percent a year (Washington Post, June 29, 1961, pp. A-1 and A-16). The Council of Economic Advisers is the logical group to fill in the second blank, that is, advise the President on rate and mix of investment to achieve this rate of growth.

8. One cannot really expect the Administration to hit upon a rate of growth regarded as optimal without much more knowledge of the economy's investment opportunities than we possess today. Thus the broad-brush targets of growth and investment rates which determine the marginal rate of time discount should themselves be revised in light of the marginal rate of discount implicit in them. In short, optimal rates of investment, growth, and marginal rate of discount are properly determined iteratively.

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Opportunity Costs

The question of opportunity costs, although more manageable, also requires a substantial amount of additional empirical study before it can be answered satisfactorily. Which investments are foregone when the public sector undertakes resource development expenditures will depend, in part, on how the public sector activities are financed, the degree of imperfections in the capital market which prevent returns from being equalized at the margin in the several subsectors of the market, and what can be assumed with respect to the effectiveness of the national stabilization policy.

ASSUMING EFFECTIVE STABILIZATION POLICY

Tax Financing

Under the assumption that the resource development projects are financed by taxation within the context of an effective overall stabilization policy, it is the specific nature of the tax that determines the opportunity cost of funds raised from the private sector. Otto Eckstein has made suggestive estimates of these magnitudes on the assumption of two particular types of tax changes.[9]

Eckstein's estimates have indicated an opportunity cost of funds diverted from the private sector in the neighborhood of 5 to 6 percent for the two specific types of tax changes postulated. The weighted average of yields from investment foregone in the various subsectors in the private sector, as computed by Eckstein can be taken as a perpetuity of 5 to 6 percent per annum. However, the appropriate opportunity cost depends as well on the proportion of the total investment in the water resources project which was financed by foregoing private consumption as well as foregone investment, and the social time preference attaching thereto. For example, assume the following: (1) Private investment is assumed to yield national income benefits of $.055 per year in perpetuity per dollar of present outlay. (2) Private consumption is assumed to be reduced by an amount equal to a half of the project's capital requirement. (3) The social time preference is taken to be 2.5 percent. Under these assumptions, the opportunity cost per dollar of investment in water

9. John V. Krutilla and Otto Eckstein, Multiple Purpose River Development; Studies in Applied Economic Analysis (Johns Hopkins Press, Baltimore, 1958), Chapter IV,

resources development is $1.60.[10] If, on the other hand, we assumed a social time preference of 4 percent, the opportunity cost would be $1.18.[11]

Debt Financing

On the other hand, if the project's costs were financed by borrowing rather than by taxation, again within the context of an effective stabilization policy, we would expect to find the relevant opportunity cost to vary depending on what restrictive monetary policy were employed to offset the investment expansion in the water resources sector.[12] Typical of recent experience,[13] however, the effects of restrictive monetary policy have been confined to a limited number of areas, and they have been affected unevenly. The sectors most influenced appear to be residential housing, State and local government investments, and, to some extent, small business. No discernible effect has been observed on plant and equipment outlays of large business, a fact which can be explained by a variety of factors.[14] The influence of restrictive monetary policy

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10. The present value of 2.5 percent of the alternative employment of $1 of present resources, $[.5(.055) + .5(.025)] / .025 = 1.6$. See also item 2 in Appendix table. A social interest rate of 2.5 percent coupled with an opportunity cost of $1.60 per dollar is equivalent in project evaluation, for a constant benefit stream of 50 years, to an interest rate of 5-3/8 percent and substitution of the nominal cost of $1 for the opportunity cost of capital of $1.60, as long as all projects have constant benefit streams of 50 years.

11. That is, $[.5(.055) + .5(.04)] / .04 = 1.18$. See also item 3 in Appendix table. The 4 percent interest rate and corresponding opportunity cost of $1.18 is for a 50-year life of constant benefits equivalent to an interest rate of 5 percent and evaluation of capital at its nominal cost.

12. See G. L. Reuber and R. J. Wonnacott, The Cost of Capital in Canada with special reference to public development of the Columbia River (Resources for the Future, Washington, 1961), for an elaboration of this model.

13. Staff Report on Employment, Growth and Price Levels, prepared for consideration by the Joint Economic Committee, Congress of the United States, 86th Congress, 1st Session, December 1959, Chapter 9, especially Section III, pp. 362-394. A similar experience for Canada is indicated in William C. Hood, Financing of Economic Activity in Canada, prepared for the Royal Commission on Canada's Economic Prospects (Ottawa, 1958).

14. Staff Report, op. cit., p. 371 ff.

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on public utility investment is inconclusive and negligible at most.[15] Perhaps a small effect on consumption expenditures is felt, although not much evidence exists that increases in the interest rate of general credit controls are effective in curtailing consumer credit.[16] Thus, on the basis of the Staff Report on Employment, Growth and Price Levels, one might infer that the distribution of the curtailment of private activity might be roughly 70 percent for residential housing, 20 percent for State and local governments, 7 percent for small business, and 2 percent for consumption. These are crude estimates admittedly, but may serve as a convenient basis for discussion until systematic studies are made to refine these estimates. Now, we attach perpetuities of 4.0 percent[17] for residential housing; 3.2 percent[18] for State and local government; 18 percent[19] for small business; and 2.5 percent[20] for consumption per year,[21] and discount this precluded composite investment at a social time preference rate of 2.5 percent. From this, we obtain an opportunity cost of about $1.90 per $1 of resource development investment.[22] Accordingly, assuming a social time preference rate of 2.5 percent, and the impact of monetary policy over the past decade, benefit-cost ratios of about 1.9:1 would be required to justify undertakings of project increments assumed to be financed by borrowing.[23]

If, on the other hand, we assume a social time preference on the order of 4 percent, the opportunity cost of a dollar's worth of resources

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15. Ibid., p. 375.

16. Ibid., pp. 389-90.

17. Krutilla and Eckstein, op. cit., pp. 95-96.

18. Following the Treasury-Federal Reserve Accord, the annual average State and local general obligation bond rates. Federal Reserve Bulletin.

19. Krutilla and Eckstein, op. cit., pp. 115-16 and footnote 38.

20. Arbitrarily assuming a social time preference rate of 2.5 percent.

21. These estimates of the benefit stream of investment in various private sectors in some cases reflect private pecuniary benefits rather than social national income benefits. Thus, they are illustrative only.

22. That is, $[.70(.04) + .20(.032) + .07(.18) + .03(.025)] / .025 = 1.90$. See also item 4 in Appendix table.

23. The 2.5 percent rate of interest and $1.90 opportunity cost are interchangeable with an interest rate of 6.4 percent and use of nominal cost for a 50-year economic life of constant benefits.

diverted from the private sector for resource development investments--under assumptions similar to those described in the Staff Report on Employment, Growth and Price Levels--would be approximately $1.19.[24] The resultant cutoff benefit-cost ratio (recalling that the benefit stream from the project would be discounted now also by 4 percent) would have to be 1.19:1.

ASSUMING INEFFECTIVE STABILIZATION POLICY

Slack Economy

Without the convenient assumption that there would be an effective stabilization policy guaranteeing full employment, the problem becomes more difficult. We must estimate the percentage of public investments which takes up slack in the economy--which uses otherwise unemployed resources--instead of displacing private investment or consumption. Unemployed resources can be thought of as an "investment" yielding zero percent per annum, so that $.50 of each dollar spent on water resources development puts otherwise unemployed resources to work. On this basis, and employing the three assumptions given on pages 16 and 17 with regard to the remaining $.50, and also using a social rate of discount of 2.5 percent, the opportunity cost becomes approximately $.95.[25] Thus, the lower cutoff benefit-cost ratio of .95:1 would replace the ratio of 1:1.[26]

Full Employment Economy

Finally, mention should be made of a means of financing inconsistent with our assumption that resource development projects are financed within the context of an effective stabilization policy. The existence of inflationary techniques for financing public activities, whether deliberate or unintended, makes possible the curtailment of activities in the private

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24. That is, [.70(.04) + .20(.035) + .07(.18) + .03(.04)] / .04 = 1.19. See also item 5 in Appendix table. For an economic life of 50 years of constant benefits this is equivalent to a discount rate of 5 percent and evaluation of capital outlay at the nominal cost of $1 per dollar.

25. That is, [.5(0) + .35(.04) + .10(.032) + .035(.18) + .015 (.025)] /.025 = .95. See also item 6 in Appendix table. This procedure for reflecting the divergence between the social and money costs of unemployed resources is described more fully from the point of view of secondary benefits in the following section.

26. The combination of a 2.5 percent interest rate and an opportunity cost of $.95 is equivalent to a 2.25 percent interest rate and a nominal cost of $1 under the assumption that benefits occur in a constant stream over 50 years.

sector in response to the inflationary process. Unfortunately, there is little more than qualitative information on how this method of financing public activities affects the private sector.

Part of the resources utilized in the public sector, financed by inflationary means, would come at the expense of curtailed consumption.[27] In terms of the national income objective, the social rate of time discount should be applied to this component of curtailed resource use in the private sector. However, beneficiaries of programs designed explicitly to implement objectives other than increasing national income, such as old-age and survivors insurance, unemployment compensation, and the like, are required to curtail their consumption.[28] The beneficiaries of such programs are the very individuals for whom a dollar's worth of additional income or consumption may be weighted in excess of a dollar within the context of an income redistributive objective.[29]

Other real effects accompanying process inflation have quantitative effects of relevance to this problem; however, little work has been done as a systematic attempt to evaluate these. For example, inflationary discounts get incorporated into the interest rates and yields on bonds.[30] Accordingly, in evaluation of opportunity costs the entire structure of yields must be examined with substantial care and sophistication to ascertain real rates abstracting from inflationary and other short-term influences.[31] However, up to now the research has not yet been undertaken which will permit obtaining meaningful estimates for the relevant set of rates when financing is undertaken by means which contribute to the inflationary process. This area of investigation should have high priority.

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27. Seymour E. Harris, The Incidence of Inflation: Or Who Gets Hurt, Study Paper No. 7, in the series in the study of Employment, Growth and Price Levels, op. cit.

28. Ibid., pp. 4-7.

29. The choice of interest rate when the distribution as well as the level of national income is an objective of development is discussed in Section VIII.

30. Op. cit., p. 3.

31. Reuber and Wonnacott, op. cit., provide an example of a skillful attempt to come to grips with these issues.

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OPPORTUNITY COST UNDER BUDGET CONSTRAINTS

General Constraint on the Public Sector Budget

Water resources development may displace investment not only in the private sector but also in other subsectors of the public sector. Total budgetary funds may not be sufficient to undertake all socially desirable public investment projects (that is, projects whose benefit-cost ratios are in excess of the opportunity costs of displacement of private investment and consumption). In that case, water resources projects may come at the expense of other programs in the public sector.

The implications for project formulation and planning are conceptually symmetric with the analysis developed above for displacement of private investment. The yields of public investment alternative to water resources development are evaluated at the social rate of discount and weighted into the opportunity cost formula--the weight being the fraction in which such investment is displaced by each dollar of investment in water resources development. To date, however, little has been done to explore the public sector margins in a quantitative way--that is, to measure benefits which are lost as a result of budgetary restraints on public programs such as housing, education, etc. This is an area to which a great deal of attention should be devoted if much guidance is to be expected from approaches seeking to maximize benefits subject to effective budgetary constraints on overall public investment.

It has been emphasized earlier that although the total income of a community is one index of its welfare, it is not the only one. The distribution of the total among the members of a community is another important dimension of welfare. The social discount rate appropriate for the determination of the present value of redistribution benefits need not be the same as the social rate of discount under the objective of increasing national income. While the latter reflects the marginal preferences over time in the consumption of the community for itself as a whole, the former represents the community's (i.e., policy makers') marginal time preferences for the special group to which it is redistributing income.

Constraint on Water Resources Budget

References, so far, to budget constraints have been based on the assumption that the constraints apply to all public investment, rather than to water resources development alone. This is one interpretation of the position adopted by Steiner,[32] but is at odds with the assumption

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32. Op. cit.

made by some economists exploring the problems occasioned by budgetary constraints.[33] Instead of, or in addition to, an overall public investment budget constraint, a budgetary constraint may apply to water resources development alone. Under this assumption, there is not only the external opportunity cost discussed above, but also an internal opportunity cost to be considered in the planning of each project. This internal opportunity cost is the present value of the benefits displaced on other water resources projects, for each dollar spent on the given project. The effective opportunity cost--whether external or internal--is the higher of the two. If the external opportunity cost exceeds the opportunity cost within the water resources sector, opportunities are socially more desirable outside the water resources sector than within, and the water resources budget should not be used in full. Conversely, if the internal exceeds the external opportunity cost, the opportunities within the water resources sector are socially more attractive than those outside, and the external opportunity cost is irrelevant. Optimally, of course, the water resources budget would in this case be expanded until the internal opportunity cost fell to the level of the external cost--that is, until the separate water resources budget was no longer binding.

PRACTICAL COURSES OF ACTION

The foregoing discussion suggests that a fairly wide range of opportunity costs may prevail in connection with water resources development depending on the effectiveness of the economic stabilization program, methods employed to finance the projects, etc. In view of changes in investment opportunities throughout the economy and methods of financing water resources projects, the opportunity cost rate at the time of project design or plan formulation may no longer prevail when the project or program is actually undertaken. Yet it is necessary at the formulation stage to employ rates which are stable with respect to time, for plans involve a great deal of time and effort, and project designs are not amenable to a thoroughgoing redesign in response to continuously fluctuating circumstances. Accordingly, some compromise is required to permit both the requisite stability for design and the desired flexibility in response to changing conditions and circumstances with respect to the level of employment, the prospective means of financing, etc.

Under the circumstances, it is necessary to distinguish between the formulation of the plans on the one hand, and the decisions as to whether or not--or perhaps when--to undertake the construction of the elements of the plan. That is, for purposes of providing the necessary stability to permit the design of interdependent facilities without subjecting the design to continuously changing conditions, the social time discount and

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33. Eckstein, Water Resources Development, op. cit., Chapters III-IV; Marglin, op. cit., Chapter 4.

opportunity cost, which approximate what may be considered as most likely to prevail "on the average," should be used for planning purposes. The design stage can thus be immunized from the degree of instability which would frustrate its completion. The opportunity cost rate relevant to the determination whether or not to undertake a project at any given time, on the other hand, is the one dictated by the specific circumstances governing the period of construction.

Judging from the crude estimates made in the preparation of this report, and the estimates of the equivalent composite rate of interest provided in the Appendix table in this section, it appears to the Panel that an interim rate of 4 to 5 percent, synthesizing a social rate of discount and opportunity costs, should be used, pending the full-scale investigation of the value of social rate of discount and the magnitude of opportunity costs by the President's Council of Economic Advisers.

APPENDIX--SECTION II

TABLE OF EQUIVALENT COMBINATIONS FOR EXAMPLES IN THE TEXT FOR 50-YEAR AND 100-YEAR CONSTANT BENEFIT STREAMS

Text examples	Social discount rate (percent)	Opportunity cost b/c cutoff ratio	=	50 Years: Synthetic social discount - opportunity cost rate (percent)	50 Years: Nominal or money cost b/c cutoff ratio	=	100 Years: Synthetic social discount - opportunity cost rate (percent)	100 Years: Nominal or money cost b/c cutoff ratio
1.	2.5	2.0:1		6.75	1.0:1		5.4	1.0:1
2.	2.5	1.6:1		5.375	1.0:1		4.3	1.0:1
3.	4.0	1.18:1		5.0	1.0:1		4.75	1.0:1
4.	2.5	1.9:1		6.4	1.0:1		5.15	1.0:1
5.	4.0	1.19:1		5.0	1.0:1		4.8	1.0:1
6.	2.5	0.95:1		2.25	1.0:1		2.33	1.0:1

III. SECONDARY BENEFITS

Secondary benefits play two special roles in the analysis of water resources development projects. They are a mechanism by which some agencies hope to evaluate gains in national income not expressed in willingness to pay. And they are a mechanism by which some Government goals, other than that of increased national income, may be evaluated. Much of the debate concerning secondary benefits stems from a confusion of these two roles and from confusion about the range of goals to be achieved by the projects.

Secondary benefits measurements will be taken up here according to the goals sought: within the context of (1) national income gains, (2) regional and group income distribution, (3) other social goals, (4) cyclical employment stabilization, and (5) the rescue of depressed areas.

NATIONAL INCOME GAINS

The primary benefits of a project are defined as the value, in terms of the willingness to pay of the users, of the products or services produced. They are the benefits which go to the immediate users--to the farmers of the irrigation district who use the water of the project, or the public power agencies that buy the power, or the population whose flood costs have been reduced. On secondary benefits, the usual contention is that the economic gains associated with the products or services are not restricted to such users. The farmers who buy irrigation water, for instance, do not produce all of their inputs, nor are they often final processors of their output. Firms outside the project area produced many of their inputs and processed their outputs. It is argued by some that net income in those activities induced by, or stemming from, the project should be included in the benefits associated with the project.

It is true that the increase in national income due to a project is not restricted to payments made by direct purchasers of the project's products. The Nation may gain by improvements in productivity at points distant from the project. But it is not true that indirect national income gains are the same as the average net incomes of suppliers of inputs to, or processors of outputs of, the project's immediate users.

But the "Green Book"[1] goes even beyond this in limiting the use of secondary benefits. It suggests that secondary benefits of all forms of

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1. Proposed Practices for Economic Analysis of River Basin Projects, Report to the Inter-Agency Committee on Water Resources, prepared by the Subcommittee on Evaluation Standards (Government Printing Office, Washington, May 1958).

investment are roughly comparable. If the irrigation project displaces another investment, then it is necessary to subtract the secondary benefits foregone on the displaced investment from the secondary benefits of the project. According to the Green Book the net result of this procedure would be the probable cancellation of any secondary benefits attributable to a project. While this procedure may eliminate the possibility of overstating secondary benefits, it certainly introduces the error of neglecting possible secondary benefits that do add to national income.

Consider an irrigation project, recalling that gross national income gains ordinarily are evaluated in terms of the product users' willingness to pay for the goods and services provided by the project. If the farmers in the irrigation district owned packing plants, textile mills, warehouses, and trucking fleets, would they pay any more for the water than if they did not own them? The general answer would be that they would always be willing to pay at least as much; sometimes they would be willing to pay more; but they never would pay the sum of the primary and secondary benefits as traditionally defined. Whether or not the integrated farming group would pay a price for water greater than the net return to water from farm operations is based upon whether or not external economies--in particular, economies of scale in processing--obtained in the project area.

Assume first that there are constant returns to scale in both agriculture and in further processing and that the final product must be sold at a competitive market price. If we charged the integrated operation a price for water which was higher than the net return to water on the farm, the integrated operation would not purchase project water since the purchase would result in less than normal profits. The market price for the final product is determined by processors earning normal profits on raw materials which outside the project area are priced at costs which include only a normal return for water. If the processors of the integrated operation had to use raw materials which contained costs greater than these normal returns to water, and they had to sell the final products at the market prices, the processing operation would be unprofitable. Since the agricultural operation would only earn normal profits, the entire integrated operation would be unprofitable. In other words, any attempt to include in the price of water a figure representing the profits of processors would result in reduced sales of water.

The inclusion of any increases in normal profits of processors or suppliers as benefits is based upon an implicit assumption that their profits are in the form of a rent which could be taxed away and still allow for the processing. In other words, that the profits earned in these industries are more than necessary to get them to supply their services. But if these ancillary industries were competitively organized and they did not have economies of scale, there would be no such rents.

On the other hand, if the project area offered special advantages for processing as compared to alternative areas, then it is possible that the integrated operation might be prepared to pay a price greater than the net return to water. For instance, if the bulk of a crop's production were undertaken in an area plagued by congested highways, the assembly and shipping of a similar amount of agricultural products might be done more cheaply in a project area free from congestion.

Or consider another possible situation. An integrated processing operation existed on the acreage prior to the project. With the project and the expanded volume of agricultural production, the processing operation could operate at lower unit costs. In other words, excess processing capacity existed or there were possible increasing returns to scale in processing. Since the costs of processing the added production would be falling, the farmers could charge a higher price for the added agricultural production, and it would be worthwhile for the processing operation to purchase the incremental agricultural output.

In general, the following rule applies. If secondary benefits do exist, primary producers could capture these benefits in the form of price gains if they could act as tough-minded monopolists--if they could extract from the associated industries the greater than normal profits they could earn. If the primary producers could not get a price greater than the going farm price, then there are no stemming-from secondary benefits.

The same situation would hold in the case of induced-by benefits. Assume that because of a more dense settlement following the introduction of power and water, the Government cost of education falls from $400 to $300 per pupil. Clearly there were some economies of scale in education which the previous community had not been able to reach. Any reduction in per capita education payments would have been advantageous to the existing population. If the new land users associated with the project activities had insisted on a lower tax rate than the old users, but still allowed some slight reduction in tax payments for education by old users, it would have been to the advantage of the old users to have accepted. In practice, of course, moral inhibitions or legal institutions might prevent the project product users from bargaining in this way. This is not, however, to the point. What is needed here is to identify the presence of some secondary benefits as increases in national income, not to identify the recipients. So long as a monopolistically organized group of project users could extract these payments while not reducing the incomes of the purchasers of the goods and services produced with the project water or power, there are benefits greater than the willingness to pay of the competitively organized project users.

The analysis of external economies has not reached an advanced stage and therefore there are no simple rules for their identification and measurement. We suggest that this is one area where there should be a major research effort. There have been many studies enumerating the stemming-from and induced-by secondary benefits of water resources projects. Similar

research, properly directed, might enable the agencies to speak with more authority about the nature and possible magnitude of the external economies of projects. In the absence of this information, it might seem desirable to resist the incorporation of external economies into a national income calculus. However, it would be unwise to overlook their existence in spite of the crudity of the estimates. For, as we have seen, a major reason for Government intervention in the economy often develops around the existence of external economies.

External economies appear most dramatically in the opening up of new areas for settlement and growth, but they also appear in older settled areas. Transportation has developed with a peculiar imbalance of great speeds for long distances and terrible congestion at terminals. It is possible that many of our major metropolitan areas are operating under conditions of sharply increasing costs. The private market has responded to this phenomenon; certainly the Government, in its project formulation and evaluation, should try to anticipate these developments. Another type of externality--externalities in use--was referred to in Section I. An illustration pointed out that flood protection of the lower Mississippi River Valley inevitably involved protection of the alluvial valley as a whole. Use externalities are as important as the market externalities as reasons for governmental action in water resources development. However, unlike market externalities, use externalities are generally reflected in the willingness-to-pay calculus and thus require no further discussion here in terms of secondary benefits.

REGIONAL AND GROUP INCOME DISTRIBUTION

Secondary benefits not only have a role in the national income calculus, but also enter as a means for evaluating project contributions to the goals of regional and group income redistribution.

Regional Income Effects

It is often argued that, whatever their impact on national income, activities induced by or stemming from the project create local or regional income which should be counted in the evaluation of the project. That is, such activities justify economic sacrifices borne by the entire Nation. Regional benefits can be looked at from two points of view: as benefits to the people of a region or benefits to the region as an areal unit.

Consider the area approach first. This, in turn, can be viewed in two ways. First, we could consider the Government as showing preference for one region as against another, even if all other things were equal. In this stark form, the proposition is manifestly absurd. Although Federal water policy has shown special attention to different areas of the country, this can be properly explained in terms other than preference for one region over another. In other words, all things are never equal.

This brings us to the second way of viewing the Government's special concern for particular regions. For instance, special responsibilities on navigable rivers have involved the Federal Government in investment for their control. Similarly, the pattern of historical development of the Nation has involved the Federal Government in heavier investment in some functions in the western States and in other functions in the eastern States. The disproportionately heavier resources investments in the West have centered around two causes: the availability of large expanses of federally-owned land and the aridity of the areas. Ownership of land involves management responsibility, and this has necessitated investment. Aridity has resulted in sparse settlement. Highly seasonal rainfall and river flow do not make settlement impossible, but they do mean that efficient settlement requires large-scale risky investments. The Federal Government's responsibility for undertaking some of these development activities stems from a desire to increase the opportunities for the Nation at large, not simply to make the deserts bloom.

The special concern of the Federal Government for investment in particular regions grows out of the large external economies and the riskiness especially associated with the opening of new areas. Both factors, indicated in Section I, result in inadequate private development, though the national income gains resulting from investment in the area may be great. The presence of external economies and the special problems associated with risk complicate the evaluation tasks, but they do not justify the inclusion of local benefits as desirable from the perspective of the Nation.

Group Benefits

Aside from national income goals, the Nation has special interests in assessing regional and local benefits in terms of the people of a region Often the Nation may show preference for certain groups, including a willingness to impose costs on the rest of the Nation in order to increase income of the disadvantaged groups. A more equal distribution of income is a goal that has been nationally accepted; all other things being equal, the Nation would prefer that an additional dollar of income be made available to a poor man than a rich man. Sometimes these disadvantaged groups can be regionally identified so that an argument for local benefits seems sensible. For instance, a project which would bring irrigation water and power to an Indian reservation would seem to fall into that category. The Nation might place a higher valuation on the net return to water on an Indian reservation than elsewhere. It might judge that it is better for a person to be employed in a processing plant on a reservation than elsewhere. These local benefits--though they may not reflect national income gains--are also benefits from the national point of view, and they should be included in the calculation of the worth of a project.

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The secondary benefits in terms of higher evaluation of income for certain groups pose a special problem of analysis. Analytically, it is not part of the problem of secondary benefits, but instead belongs in the specification of the objectives of the program, their measurement, and the weights to be assigned. These will be discussed in Section VIII below.

OTHER SOCIAL GOALS

The attempt to identify regional benefits as secondary benefits is usually based on objectives other than the support of disadvantaged groups. It is often claimed that water resources projects have the goals of creating specific patterns of social and economic life. There are many ways that communities and economic activities can be organized. Water resources policies have been oriented to favor some of these over others.

For instance, preference clauses in the disposition of public power are an attempt to alter the pricing and investment practices of private utilities. Similarly, some Government programs have deliberately encouraged the development of family-sized farms and small viable communities. This latter policy has been used as the basis of including in national income benefits sums for each farm settled and in secondary benefits the increases in net income resulting from local growth. Undoubtedly, this is a worthy goal, but it is doubtful that the secondary benefits measurements will properly reflect the achievement of the goal. There is no reason to assume that a dollar of income earned in activities associated with project users is equal to a dollar of income arising from increased productivity. The national value of the growth of local communities is not measured one for one by net incomes earned in these communities.

One form of treatment of such benefits as community organization is to develop an index which measures the accomplishment of the goal and then assign a value weight to the index. The Panel does not have a formula by which this weighting can be done, but believes that efforts to develop indices and weights will result in reasonable values. Certainly many phenomena which defied measurement a century ago are today subjected to quantitative analysis. In the interim, rather than allowing poorly defined concepts to represent the goal, it would be better to follow the procedures outlined elsewhere in this report. Where such objectives as family-sized farms and power preference clauses enter into the design of the project some loss in national income may be entailed. These losses are the costs of achieving the goals. In the case of preference clauses, the losses may be in terms of a less efficiently designed power grid; in the case of family-sized farms the losses may be in terms of agricultural productivity and possible industrial development in the area. These losses are costs to the Nation as a whole and they should be compared, as well as one can, with a description of the gains in nonnational income objectives. At this stage of analysis, the inclusion of a poorly designed concept of secondary benefits into a single benefit-cost measure will only discredit the use of the numbers.

SECONDARY BENEFITS ASSOCIATED WITH UNEMPLOYMENT

Up to now, secondary benefits have been treated in terms of the positive contribution they make to different objectives--national income and regional or group distribution. But there is another sense in which secondary benefits can be used--as "cost offsets." Employment of otherwise idle resources, directly and indirectly, does not involve costs to the economy. Therefore, payments made to otherwise unemployed resources, used directly in construction and indirectly in production of materials and machines used in construction, should not enter as costs. Thus, in planning water resources developments, costs should be offset by a factor which reflects the degree of unemployment. Section II contains an outline of a method of doing this through the cutoff benefit-cost ratio which reflects opportunity costs.

Persuasive as this argument seems, its validity depends upon the type of unemployment encountered. The argument is more valid when applied to secular unemployment in depressed areas than to cyclical national unemployment.

Cyclical Unemployment

Consider, first, cyclical unemployment. Of course, in the presence of an effective stabilization program, recessions would be short-lived, unemployment would be relatively mild, and cost offsets accordingly would have no place in plan formulation. The very existence of cost offsets, therefore, presupposes an ineffective stabilization program. In this event, the key problem is timing. Most water resources projects have a long design and construction period. The acquisition of land, preparation of site, drawing of detailed plans and specifications, letting of contracts, and actual "pouring of concrete" are all lengthy processes. Given the uncertainty of the onset of a recession, these processes ordinarily must be put into motion after a recession has started. Even with a relatively ineffective stabilization policy, few recessions would span a significant part of the design-construction period. Thus, while supposedly taking advantage of cost offsets, much of the construction would take place when, prosperity having returned, cost offsets are no longer appropriate. With recessions of this length the greatest payoff for the economy lies, not so much in the initiation of projects, as in the acceleration of projects already under construction.

This means that cost offsets really come into play only in protracted recessions. The first requirement in this case is that we be able to identify the unemployed resources in terms of their use in project construction. This requires investigation not only of aggregate unemployment but also of the breakdown of unemployment into classes, skills, and areas; for cost offsets apply only to otherwise unemployed resources which are in fact employed as the result of project construction.

The second consequence of the use of cost offsets is that the optimal development plan assuming cost offsets probably will differ substantially from the optimal plan formulated on assumptions of full employment. The lower cost of unemployed resources should be reflected in new larger-scale development plans which use disproportionately more of these resources. This is obviously good policy for depressions of long duration.

Even depressions normally considered severe have lives too short to make it desirable to prepare totally new plans, in view of the cost and time required. Here, the best strategy lies in reevaluating development plans which have been formulated without regard to cost offsets for possible construction in normal times.

The Panel does not wish to leave the impression that water resources development is the only tool, or even a very good tool, in combating cyclical unemployment. As this analysis has indicated, there is a fairly limited role for cost offsets with regard to cyclical unemployment.

Secular Unemployment in Depressed Areas

Cost offsets are more appropriate for use in plan formulation and economic evaluation of water resources projects in depressed areas stricken with long-run unemployment. For in this case timing of construction is not so crucial.

Note that in a declining area we are especially likely to find the external economies discussed above in connection with secondary benefits and national income. In a declining area there is unused capacity in warehouses, transportation, and possibly in processing facilities--indeed in most enterprises. In the extreme case, these extra national income benefits may be as high as the total regional incomes generated through the multiplier.

Thus, projects in depressed areas show up better on two accounts: real costs of construction are less, and the income resulting from the project is greater, than in an area enjoying long-run full employment.

A warning is in order. The very projection of secular unemployment indicates serious structural maladjustments. Water resources projects, to be desirable, should be part of an overall integrated plan to overcome the maladjustments and restore prosperity to the area. And water resources projects often are not flexible enough to fit well into dynamic area plans. Institutions developing around the initial allocation of water may be highly resistant to the changes in allocations that the overall plan would require as it unfolds. Moreover, the excess capacity that exists today should not exist in the future if the overall plan is successful. Thus, unless the water resources development forms a very significant part of the overall plan, its contribution to the utilization of excess capacity must be considered as marginal. Therefore, the project would itself produce no secondary benefits.

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Secondary benefits, as indicated in this section, are a confusing conglomerate. Though there is an "official" definition of the term, the pressures to introduce all sorts of nonnational income objectives under this rubric have led to the discredit of the term and confusion as to its role. This definition should be abandoned in favor of the specific components discussed in this section.

In terms of the national income objective, we should identify and measure the external economies in use and the developmental external economies. The first set of external economies are often and properly included in so-called primary benefits. But given their importance for project formulation it would be desirable that they be given distinct identification to encourage a more complete analysis. The nonnational income benefits, such as the social policy benefits of public power preference, acreage limitations, merit wants, and equitable distribution of income should be separately evaluated and listed.

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IV. RISK AND UNCERTAINTY

Some of the prescriptions for sound plan formulation of water resources developments, as we have seen, can be stated in terms of specific standards or criteria. Among these are the level of the interest or discount rate and the concept of benefits under the national income objective. There are other prescriptions, however, that cannot readily be framed in terms of specific criteria, but must be stated in more general terms. Among the most important of these are the guides to be used to take account of risk and uncertainty in water resources planning.

The estimates of benefits and costs which enter into the economic analysis of water resources developments extend far into the future--sometimes up to 50 or 100 years. During this time, dramatic changes in technology, tastes, and geographic distribution of population are sure to occur. Cyclical and random fluctuations of weather may cause marked shifts in water inputs to the system. Estimates of future benefits and costs are bound to be hazardous; yet estimates must be made. Despite any hesitancy that the forecaster may feel about the reliability of his estimates, the advantages of relatively durable construction are often so great that no one proposes the design of systems which will survive only into the very near and reliably predictable future. But as we increase the durability of the project the expected gains of the more distant years appear to be so clouded with uncertainty that at some point the advantages of further extending the planning horizon seem no longer to warrant the extra sacrifices involved in more capital-intensive investment. To reflect this antipathy towards uncertainty it is often proposed that an extra cost, which varies with the degree of uncertainty, should be imposed on the project. Is this approach, which pervades almost all of private industrial, and most public works, planning, the most sensible one to be adopted by Government? If uncertainty is to affect the design and choice of projects, how should it be handled?

There are two principal classifications of uncertainty: First, is risk. We may not know the exact value that a specific event will take in a given year, but we may be able to speak with confidence about the probability of its occurrence. The flow of streams takes this form. In most areas of the country data are sufficient to allow us reasonably to predict the average amount of precipitation and runoff over a period, or the likelihood that the precipitation and runoff in a given period will be greater or less than some specific value. These statistically predictable events are referred to as risky events.

Second is uncertainty. The second type of unknown refers to an event for which no basis other than subjective judgment exists for assigning probabilities. In this case there is no firm method by which we can forecast the most probable event or its average value. These nonstatistically

predictable events are referred to as uncertain events. Illustrations of uncertainty are variations caused by technological change, market shifts, and international developments.

This distinction between risk and uncertainty has obvious implications for the quality of information. Do we estimate future events on the basis of past statistical observations (risk) or must the estimates be based upon a combination of hunch, insight, sensitized observations and logic (uncertainty)? While uncertain events have seasonal and cyclical variations comparable to the hydrologic variations associated with risky events in water resources, a more important element of uncertainty is also the variability of the secular levels of occurrences.

The "Green Book"[1] reflects the conventional reaction to risk and uncertainty. According to this prescription, a risky or uncertain situation should be converted to, or treated as, a reasonably certain situation, with an increase in costs or reduction in benefits to reflect the disadvantages of operating under risky or uncertain situations. This adjustment is too simple. Conservatism is not necessarily an optimal behavior rule for individuals or governments. Furthermore, this prescription makes no distinction between risky and uncertain situations although they present quite different analytical problems.

RISK

Under conditions of risk, at least one of the factors of the analysis will be unknown at a specific moment of time. Its path over time will not be known, but we will know the frequency with which the unknown will assume different values. In other words, we cannot specify in advance the time profile of stream flow, but we do know the number of years or months or days that flows will be equal to or greater or less than a specific number. How should the planner take this risk into account? As a first step, we must distinguish between risk for water resources programs in the aggregate and risk for an individual project.

Consider first the individual project. If one project plan has the same expected value in terms of quantities of outputs as another but with a higher variance, will the value of services of the plan with higher quantity variances have a lower value? In terms of prices that project users are willing to pay, the answer would be yes. A firm supply of power, or of water for irrigation or municipal purposes, can command a higher

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1. Proposed Practices for Economic Analysis of River Basin Projects, Report to the Inter-Agency Committee on Water Resources prepared by the Subcommittee on Evaluation Standards (Government Printing Office, Washington, May 1958).

price. Does this higher price reflect a socially more desirable product or is it merely a reflection of the purchasers' aversion to risk? That is, are purchasers more reluctant to contract for a more variable output at a given price because it provides them with a smaller gross average annual income, or simply because they are averse to variations in income? Is the problem from the point of view of the individual beneficiary (1) that the greater the variance in the quantity of output the lower is his gross average annual income, or is it (2) that he places a lower value on an expected gross income with higher income variances?

Both kinds of variance enter into the problem. Variance in project outputs affects production adversely; thus, units using the project services have to adopt more flexible production processes, which most likely have higher costs. If the users with varying project outputs are to compete successfully with those users having access to constant quantities of these outputs from other sources, they must have lower costs for these project outputs than the price for constant quantities; the lower prices of these project outputs reflects the lowered income attributable to the project.

Thus, it is proper to reflect the reduction in income resulting from the variance in project outputs in the design of systems. This is no surprise. Indeed, a chief purpose of water resources development is to regulate stream flow--which largely consists of reducing variance in stream flow. But there is no need to attach special risk discounts to plans with different variances. These differences are reflected fully in the long-run willingness to pay of the project users.

The second point, the variance in income itself, is not so clear-cut. For even assuming beneficiaries are averse to variance in incomes, this aversion can be compensated for by measures other than modification of project design. Incomes generated by projects in excess of average annual income can be pooled in an insurance fund used to supplement incomes below the annual average. To a limited extent we already do this when we "bail out" project users in disastrous years, even though we do not collect from project users their extra gains in above-average years. In the absence of pooling or some other effective insurance scheme, risk-avoiding beneficiaries will be willing to pay somewhat less for the project outputs. Once again, no risk discount or other special standard need be introduced, as the impact of differences in variances to the project users are reflected in their willingness to pay.

So much for the individual project; what about variance in the aggregate? The significance of variance in the contribution to national income of the water resources development program as a whole depends on the size of this contribution to total national income. In terms of the U.S. water resources program, this contribution is small; thus there is no basis for choosing among alternative programs in terms of differences in their variance, since this variance will in any event be of similar orders of magnitude.

UNCERTAINTY

Uncertainty poses a far more difficult analytical and measurement problem. The nature of risky situations in water resources projects warrants placing higher values on lower variances, that is, less risky situations are preferred. It is not clear that the same conservative attitude is advisable in the case of uncertainty. The weight of the "Green Book" formulation of uncertainty is to introduce extra safety factors into costs, conservative estimates of benefits, and shorter expected life for projects. This attitude of conservatism when confronted by uncertainty is only one possible response, and in the case of many Federal programs may not be a wise one.

Water resources projects serve many roles in the economy. In some cases, they provide services to old and well-established metropolitan centers. In other cases, they provide a complex of services in an arid and sparsely settled area. The project's effects on the development of the new area are far less certain than those on the provision of a service for which there is a clear market. It is not obvious that the uncertain project should be penalized on that account.

A reasonable argument could be developed that the Government plays the role of a gambler in resources development projects. Its evaluation of possible outcomes is optimistic. This optimism is not necessarily to its discredit, since it is difficult to visualize how most major areas of growth would have been developed without the gambler's optimism.

But whatever the merits of the gambling preference in past history, it is unlikely that it will be a dominating factor in future water projects. The country no longer has large untapped areas which require massive dosages of social overhead capital. The water resources projects of the future do not promise the same possibilities of large payoffs as the projects which helped "open the West" to settlement or that improved the rivers for navigation. Now, the water resources gambles are investments in saline water treatment and pollution abatement. The Federal program in saline water treatment clearly indicates this gambling propensity. Heavy investments have been made in several projects with the hope that one of them will give rise to an efficient processing procedure. Everyone expects that most of the plants will prove disappointing. In fact, if only one of the plants is successful in generating an economic process, the project will have proven worthwhile.

A defense of risk-taking can too easily fall into a rejection of deliberation and calculation. Certainly the Panel has no such intentions. Rather, it is urged that explicit treatment of attitudes towards uncertainty should be made part of the analysis. Projects should not be systematically penalized for uncertainty by such means as higher discount rates, conservative estimates of benefits, and inflated estimates of costs. For instance, in the case of saline water treatment plants, such adjustments might stop the entire program of pilot tests.

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There are no accepted procedures by which to handle decision-making in uncertain situations. Within the brief confines of this study, it seems inadvisable even to indicate which approach should be taken. The Panel believes that a model which explicitly treats of uncertainty could be devised and could be incorporated into procedures of evaluation and design.

To this point, the analysis has dealt with what ought not to be done to allow for risk and uncertainty in general, rather than producing prescriptions for specific problems. The sections that follow are addressed to the particular problems of the period of analysis and price projections.

PERIOD OF ANALYSIS

A common practice in investment planning is to limit the number of years included in the analysis. In private industry analysis rarely extends beyond 20 years and many investments are expected to pay out within five years. The principal reason for limiting the planning horizon is the uncertainty of future years. Should the Federal Government adopt rules that limit the planning horizon, or should it attempt to consider all the benefits and costs that might arise during a project's physical life?

Any arbitrary limitation of the planning horizon to a fixed period of analysis is incorrect. For, any information about years beyond the terminal date, no matter how imperfect, is more useful than a blanket assumption that all benefits and costs beyond the period of analysis are equal to zero. But as we extend our analysis in time, the costs per unit of reliable information increase. This planning cost does not increase so much because we expend greater effort to gather information of the same quality. Rather, it is because the quality of information for the same effort rapidly deteriorates with the extension of the planning horizon. In theory, the planning horizon should be limited by the rule that we extend it up to the point that the gains from additional information no longer exceed the research cost of acquiring the information.

No planning agency known to the Panel explicitly determines the planning horizon in accordance with this rule. But the reliability and significance of information do enter, in some way or another, into every decision to adopt a finite planning horizon. In the absence of research on the cost of information, we must rely upon cruder and more intuitive rules to establish the period of analysis. The period suggested by Budget Circular A-47 is 50 years. This seems to be too short for structures which not only will survive well beyond this time in good physical condition but also can be used for purposes other than those originally intended. For instance, storage reservoirs can fulfill many functions. If, perchance, our forecast of irrigation demand proves to be in error, the reservoir might be used for recreation or for improvement of water quality through low flow control. The expected economic life of more

specialized facilities, on the other hand, is properly limited by one's confidence in the emergence of a specific pattern of economic activity and use. For example, generators or diversion canals for irrigation--in contrast with a storage reservoir--are not very adaptable.

In short, the more adaptable the structure, the longer the appropriate period of analysis. Therefore, for multiple purpose structures, a planning horizon of 100 years or the projected economic life, whichever is shorter, should be used.[2] The Panel feels less sanguine about the economic life of more specialized structures. While no arbitrary limit should be placed on the planning horizon for specialized facilities, in the case of many the economic life will prove to be considerably less than 100 years.

PRICE PROJECTIONS AND SCHEDULING OF DEVELOPMENT

If the values of goods and services associated with a project are expected to rise relative to the general price level,[3] the schedule of development maximizing the contribution of a program to the present value of national income may include provisions in the plan for addition of future units and for flexibility in increasing the scale of first-stage units even though some of these additions might have positive net present values (national income benefit-cost ratios greater than one to one) for immediate construction. If the positive net present value for immediate construction is the result of large projected gains in national income from the unit in distant years and projected gains in nearby years are small, then the optimal course of action may be to postpone the addition until the projected increase in demand materializes.[4] That is, although the net present value of a unit may be positive for immediate construction, postponement of construction may increase its present value. And even if it does not, if the resources required to construct a water

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2. For any discount rate greater than 2.5 percent, the benefits beyond 100 years add little to the present value of benefits. For example, even at 2.5 percent constant annual benefits from year 101 to infinity at the same rate as from year 1 to 100 add less than 8.5 percent to the present value of benefits. In view of the unreliability of information about such benefits, there seems hardly any point in including them.

3. In no case should trends in the general price level be incorporated into the economic analysis of projects.

4. For a discussion of the dynamics of investment planning, see Joe Bain, "Criteria for Undertaking Water Resources Developments," American Economic Review, May 1960, and Stephen A. Marglin, Approaches to Dynamic Investment Planning, to be published by North Holland Publishing Company.

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resources development unit could be put to use in alternative investment (either in other water resources developments or elsewhere in the economy) with returns more skewed towards the present, postponement of the unit may be desirable in terms of the overall contribution to national income of the investment.

If projections indicate shifts in the values of project goods and services relative to one another, then provision should be made in present plans for altering the method of operations in the future to reflect these shifts. Suppose, for example, that in a particular river basin the demand for industrial and municipal water--though small relative to irrigation demand today--is expected to increase much more rapidly than irrigation demand, and eventually is expected to exceed irrigation demand. Then provision should be made in the river basin plan for altering system operations in the future to divert water from irrigation to the then higher valued industrial and municipal water supply uses.

Uncertainty in projection simply compounds the desirability of structural flexibility and convertibility. As the uncertainty of expected shifts in value increase, so do both the desirability of postponing additions to river basin plans addressed principally to meeting the demands of the relatively distant future and the desirability of providing for future alterations in system operations in response to expected relative shifts in values. For example, if there is doubt as to the time at which the increase in demand will make addition of a unit optimal, it becomes all the more desirable to postpone construction of the unit until the extra demand materializes.

What guide rules--apart from a general injunction to take special care in determining an optimal schedule for development--do the above considerations indicate for plan formulation in terms of the national income objective? The aim is to insure that units and increments are not planned for immediate construction to meet large but distant demands for project goods and services. To this end, prices and formulation of plans for immediate construction should reflect no upward shift in values relative to the general price level over a period longer than 10 years. If this rule is followed in future as well as present planning, units and increments will be postponed to within 10 years of the time that demands actually justify the commitment of resources to the project. In this connection, a warning is required. This rule is not appropriate if there is a danger that sites where development would be postponed will be permanently preempted by developments for other programs. For example, if this rule were applied to preservation and development of open spaces for recreational purposes, the goal of the rule--optimal scheduling of development--might well be frustrated. Although recreation demands might not be sufficient to justify the use of open spaces for recreation for many years, competing demands for the site might permanently preempt recreational use if price projections were restricted to 10 years hence.

V. ALTERNATIVE COSTS IN THE EVALUATION OF FEDERAL HYDRO PROJECTS

INTRODUCTION

In general, correct principles of project formulation require that we determine: (1) whether addition of a particular increment of structure or purpose is worth doing, and (2) whether the proposed addition represents the least-cost means of providing the product or service. "Worth doing" is, of course, a function of the objective. In a multiple purpose project, whatever the objective may be, the cost of a proposed addition must be computed not only in terms of the value of the resources committed to its development, but also in terms of any other purposes foregone as a consequence of developing the proposed addition.

For many project purposes, these determinations, while difficult to make, raise no important conceptual problems. For electric power, however, serious problems have arisen in connection with both of these determinations from two distinct sets of issues: First, the alternative to public power is usually supplied by private firms, and in consequence the debate over efficiency becomes highly political and oftentimes ideological. Since the scope of private activity is in some ways more limited and in other ways more extensive, the relevant benefits from the point of view of public and private suppliers may be quite different. Secondly, repayment policy is often tied to benefit calculations; the analysis which may be correct for marginal efficiency calculations may be inappropriate for repayment purposes; i.e., benefits from the perspective of national income gains, not to mention benefits in terms of other objectives, may be quite different from benefits which could be recaptured.

The Panel has little to say about the ideological conflicts between public and private power. Obviously these conflicts are and will remain important in actual policy, but for purposes of efficiency analysis the evaluation of projects must be based upon the assumption that a kilowatt-hour of electric energy is no more valuable if it is produced under public or private auspicies. By the same token, if a private thermal plant is identical to a public thermal plant, it is equally costly in terms of resources used, unless different methods of financing lead to different opportunity costs.

The differences in range of alternatives open to public and private agencies are of major significance. Often the Federal Government does not have as an alternative in the design of a project the construction of thermal plants. Although a thermal plant, if constructed by the Federal Government, may be less costly in terms of resources than a Federal hydro

project, private construction of the identical thermal plant may appear more "costly." In addition, the Federal Government, because of constraints imposed by law, is limited in the priorities it must give to different customers. Private firms are constrained in their behavior by regulatory agencies who supervise their prices, investment activities and operating characteristics. As a result, the characteristics of public and private energy are different in such dimensions as base vs. peaking capacity, the classes of purchasers served, and the like. Finally, not having taxing powers private utilities are not able to recapture all the benefits that can be created by hydro development from such purposes as flood control, recreation, etc.; hence private utilities are not likely to give nonreimbursable purposes the attention they ought to receive under even the most narrow conception of the social objective of development, maximization of national income gains.

Though a single rule for the evaluation of Federal hydro benefits is suggested, it will be discussed first in the context of a single purpose project and then of a multi-purpose project. This will be followed by a brief comment on the relevance of benefit analysis for repayment policy and finally on certain issues raised by the preference clause.

DETERMINING THE LEAST-COST MEANS OF PRODUCTION

It is clear that, if the Federal planning agency had authority to develop any means--hydro or thermal--(as for example, TVA), all alternatives would be valued at public economic costs. The relevant costs would include the public interest rates, but no taxes, except imputed in-lieu payments to cover local costs directly traceable to the power development.

On the other hand, if (as in most cases) the Federal planning agency has authority only to develop hydro power, how should the cost of the least-cost external alternative be measured? As indicated above in comparisons in terms of the national income objective we must evaluate the costs of alternatives under the same set of assumptions. Thus, if the external alternative is a privately supplied source, the computation of "costs" should not include corporate income taxes and private financing charges since these are not costs from the social point of view and are not included in the calculation of the cost of the public alternative. Federal corporate profits taxes are regarded as transfers rather than real costs. (However, local taxes correspond more or less closely to the cost of local services which large facilities demand of the local units of government and thus should be included. To make the comparison meaningful, equivalent in-lieu-of-tax payments should be imputed to the Federal hydro facility. This is to facilitate making the comparison in real terms rather than permitting "pecuniary" savings to bias the results only because a Federal facility is immune from the kinds and level of taxation to which private alternatives are subject.)

While pecuniary differences are to be avoided in any comparisons of costs of a Federal hydro and an external alternate source of power supply, it is likely that real differences may appear in financing in the case of the two alternatives. These real differences in opportunity cost might be encountered owing to imperfections in the capital market which permit yields to vary from sector to sector. Also, they might result from the likelihood that different sectors would supply the capital in varying proportions in the cases of the private, non-Federal public, and Federal projects.

For example, a Federal project financed by taxation might result in more curtailed consumption in the private sector than a privately financed project. To the extent that more of the public investment would be accomplished by means which tend to curtail private consumption than would the privately built and operated alternative source of supply, the opportunity cost of public power would tend to be lower than the opportunity cost of the private alternative. Evaluation of both alternatives by the combination of opportunity costs and social rate of discount, as proposed in Section II, with due allowance for differences in opportunity costs, insures that real differences in the costs are reflected in the choice among alternatives.

THE GENERAL RULE

The general rule implicit in the above is that one should choose the mix of public and private alternatives which maximizes the difference between overall benefits and costs. Under the following conditions, this general statement can be converted into a simpler rule. If (1) the private alternative is relevant, that is, if it will be undertaken because the demand for power is sufficient to generate a private supply, and (2) if the public and private power are qualitatively identical and go to the same purchasers so that the willingness to pay for the power of the two sources are equal; then for purposes of economic evaluation the benefits of the public power can be identified with the social costs of the private alternative power. For purposes of design of the project the marginal rule is to add increments of public power until the marginal benefit so defined falls to the marginal social cost. The net benefit in this case represents the difference between the value of resources required for private development of power and the resources required for public development.[1]

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1. For further discussion of the alternative cost measurement of benefit, see Otto Eckstein, Water-Resource Development, The Economics of Project Evaluation (Harvard University Press, Cambridge, 1958), pp. 239-245. For discussion of alternatives in a wider context, see Peter Steiner, "Choosing Among Alternatives in the Water Resources Field," American Economic Review, December 1959 and Stephen A. Marglin in Arthur Maass, et al, Design of Water-Resource Systems (Harvard University Press, Cambridge, in press), Chapter 4.

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In the event the power supplied by the two alternatives would not be of identical quality or would not go to the same purchaser, the alternatives do not do the same job, and simple comparisons of resource costs do not suffice. And if the private alternative is not forthcoming--because its output could not be marketed at prices which would bring the private firm its normal rate of return--then once again the social cost of the private alternative does not provide a measure of benefits. If there is no private alternative or if the alternative is not relevant, we must fall back upon the more general rule of choosing the combination of alternatives, regardless of source, that maximizes the difference between benefits and costs in terms of the chosen mix of objectives. In national income calculations, this is the difference between willingness to pay, which measures benefits, and the costs of the projects.

Multi-Purpose Projects

In computing the costs of a hydro increment, account must be taken of any benefits flowing from other purposes that are foregone or added as a consequence of developing the hydro increment. An illustration may help to clarify this point. Suppose the development of the hydroelectric feature will provide an increment of power at lower cost than the most economical alternative means (thermal) only if a substantial amount of flood control storage--and with it, flood benefits--is sacrificed. To compensate for flood control storage lost (assuming flood benefits justify the cost), added supplemental facilities for flood control must be undertaken. Under the circumstances, the extra cost in flood control measures, associated with the use of the reservoir for power, represents an economic cost of the power. If the increment displaces another purpose, it does not follow that public power development is efficient merely because the development meets the simple alternate cost test.

A numerical example illustrates this point. Assume a flood control benefit potential of $150 million and a power benefit potential of $125 million at a given site. Power can be developed at the site for $100 million in separable costs; the least-cost alternate means (thermal) is available at $125 million. Flood control can be developed at the site for $100 million of separable costs assuming no storage is sacrificed to power. But with power developed at the site, supplemental measures involving an outlay of $50 million are required to provide equivalent protection. The relevant benefits and costs under the circumstances are as follows:

	(In millions)	
	Power included at the project	Power excluded at the project
Benefits		
Power	$125	$125
Flood control	150	150
Total	$275	$275
Costs		
Power	$100	$125
Flood control	150	100
Total	$250	$225

Thus, power as a project feature is obtained directly for $25 million less in actual outlays than from the least-cost alternative source. Despite this fact, the displacement of flood control storage and requirement for supplementary measures amounting to $50 million result in a total cost for both services which is $25 million greater when power is included in the development. Under the circumstances, the flood control benefit displacement and attendant increased costs is properly chargeable to the power feature for evaluation purposes.

The above example focussed on the competition among functions of a multi-purpose project. But often there are complementarities among purposes, and precisely because of these complementarities, the economic merits of the public versus private power question more often lie on the public side when the private alternative is not a thermal plant but a single purpose hydro development that is mutually exclusive with the public project. For, whereas public project plans,if formulated in terms of the national income objective, weigh benefits from all purposes equally and without regard to recapturability, proper plan formulation from the point of view of a private power company limits the analysis to the purposes from which it can recapture the benefits from project users. This often limits the attention of the private power company to on-site energy production, ignoring other purposes such as flood control and low flow control, and ignoring even downstream energy production. Thus, a public project designed to maximize national income gains would provide flood protection (for example) to the point at which incremental benefits fall to the level of incremental costs; the project designed by a private power company for the same site, on the other hand, would provide only incidental flood control benefits.

The rule for choosing among alternatives, however, remains the same whether competition or complementarity among purposes is at issue. The choice among alternative plans should always be based upon the difference in aggregate benefits and costs, not upon the benefits and costs of providing a single purpose such as power.

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Though care must be taken to consider the benefits of complementary and competitive functions, the existence of multiple purposes does not affect the rule that public power benefits should be valued for efficiency purposes at the social cost of alternative power. We must always keep in mind, however, that, when the private alternative is nonexistent, we must (within the national income calculus) fall back on direct estimation of willingness to pay. And even when the alternative does exist, the measure of benefits embodying the social cost of alternative power is appropriate only when the benefits from the public and private sources of power are equal.

THE WILLINGNESS TO PAY AS THE BASIS FOR BENEFITS IN DETERMINATION OF FINANCIAL POLICY

As a measure of national income benefits to society of public development over private development for purposes of economic evaluation, we propose using the social cost of the private alternative, so long as the alternative is relevant, but the willingness of individuals to pay for power may be much greater, and this "willingness to pay" is the appropriate basis for calculating benefits in terms of financial policy.

The alternative cost of power to the purchaser represents an upper limit on his willingness to pay for the power produced by the Federal Government.

This upper limit is attained only if the non-Federal alternative would in fact be built in the absence of the Federal power increment. In this case alone is the alternative cost relevant as an index of demand. But note the difference between alternative cost in this context and alternative cost in the context of economic evaluation. Here it is cost to the purchaser that is relevant; there it was cost to society. Thus, as an index of demand, the cost of the alternative must include all charges paid by the purchaser. In this connection, there are three cases to be distinguished:

(1) Assume that the exclusive objective is maximizing the contribution to national income, with no preference shown to public bodies. Under this assumption, the power is sold to the highest bidder, and let us suppose that this would be a private utility which both generates power and distributes it. Here the utility's alternate source of supply would be the construction of its own facilities. And all costs incurred by the utility in the provision of the increment of supply, including pecuniary elements such as Federal corporate profits taxes, would be relevant in determining its maximum willingness to pay for the increment of Federal power. Here, as an index of the demand, one could consider the average cost of providing the same quantity by alternative means at private interest and tax liabilities.

(2) Assume that under the national income objective, the highest bidder would be a public utility district, or municipality, or rural electric cooperative, which was able to build its own generating facilities

as an alternative means of meeting its requirements. This alternative source would not include private interest costs and tax liabilities. An estimate of the maximum willingness to pay would reflect only the actual costs which would have to be incurred by the purchaser of the Federal power were the public power agency to develop an alternative source.

(3) Finally, assume that the purchaser is a non-Federal public body which is not in a position to build its own generating capacity. Accordingly, the alternative to the Federal hydro source is the private utility servicing the surrounding or contiguous territory. Can the average cost of new generating capacity, including private interest and corporate profits taxes, be used as an index of the maximum willingness to pay of the public distributor? In such a case it is likely that the public distributor's requirements would represent only a small portion of the capacity developed to meet emerging power demands in the private utility's marketing territory. These demands would be represented by (1) wholesale industrial customers in addition to the public distributor's demand for wholesale power, and (2) retail household, commercial, and industrial demands. In a decreasing-cost industry such as the utility industry, various classes of customers have different rate schedules, and the average revenue obtained from sales to any class of customer might be above or below the average cost of providing the total increment of supply. It is, therefore, not self-evident that the wholesale price which a public body can negotiate for its supply from a private utility is necessarily equal to the average cost of power from the private utility's increment of capacity, including private interest and taxes. To use this as a surrogate index of demand would represent a dubious substitute for direct investigation.

Note that a potential preference customer may be offered an especially low rate by a private utility, sometimes even below costs, if by doing so the private utility can discourage public power development. Therefore, it is possible that the willingness to pay would be below the social cost of the private alternative. The private utility may be able to manage the special rates by adjusting rates to nonpreference customers so that it continues to earn a "normal" return.

Returning to the general problem, if the non-Federal alternative would actually be built, the alternative cost concept plays two roles (under two separate definitions), one in economic evaluation, the other in financial policy. Suppose, however, that the non-Federal alternative would not in fact be constructed; that is, suppose the alternative would cost more to the purchaser than the purchaser would be willing to pay--costs here being defined as those faced by the purchaser rather than social costs. It is still possible, however, because of differences in taxes and interest between the increment and its external alternative, that social costs of the alternative are less than the costs of the Federal power increment, and that both are less than the willingness to pay. If this turns out to be the case, the optimal course of action, in terms of the national income objective, is to propose construction of

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the alternative either by direct Federal construction or by subsidizing non-Federal construction. If institutional constraints preclude both of these courses of action, the alternative is irrelevant.

THE PREFERENCE OBJECTIVE--PLAN FORMULATION PRINCIPLES

Public intervention in the water resources field takes place, as observed in Section II, for purposes other than increasing national income. One of these objectives traditionally has been embodied in the public power preference clause. Of course, it still behooves all concerned to carry out such a social policy with the smallest practicable sacrifice in national income. Thus, when the social costs of thermal power are less than the social costs of hydro, Federal subsidization of thermal generation by public bodies and cooperatives should be resorted to in preference to Federal construction of hydro.

But a more important case may be the following: Suppose that the optimal development of hydro is as a peaking supplement to a thermal base-load system to serve the needs of a private utility. Suppose also that there are preference customers whose needs are for power to meet base loads. The question is whether the facility should be developed by a water resource development agency in such manner as to fit into a regional power system for peaking or to meet the base-load requirements of preference customers.

Several possible alternatives can be suggested. Institutional arrangements may be sufficiently flexible to permit exchange agreements between the Federal marketing authority and private utilities. Under such an agreement, the private utilities' peaking requirements can be supplied by the Federal hydro in exchange for an equivalent value of base-load power supplied by the private utility to the preference customer for which the marketing authority has responsibility. In such a case, the hydro facility, without question, should be designed to perform its more efficient role in the regional power system. There is some recent evidence that such arrangements are possible, and these should be encouraged to the fullest extent.

If no possibility for such an exchange agreement is in prospect, because of local conditions or other impediments of conceivable sorts, should a base-load facility be designed to provide power to the preference customers? This still might not meet the preference objective in the most economical manner. It might be best to construct the hydro facility to meet the peak-load needs of the private utility and subsidize construction of thermal base-load facilities required by the public bodies and cooperatives--perhaps using the revenues from the sale of hydro for this purpose. Alternatively, the Federal agency might build the peaking system and purchase base-load energy from the private utility for resale at subsidized rates to the public bodies and cooperatives. This alternative

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is likely to be more efficient, as the supply could be drawn from an integrated system rather than from an isolated thermal plant. Regardless of the specific alternative adopted, the goal in meeting the preference objective should be to sacrifice as little national income gains as possible.

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VI. RECREATION AND FISH AND WILDLIFE VALUES

How to handle recreation and fish and wildlife opportunities in plan formulation has long been a vexing problem. As the importance of these purposes has increased the problem has become of ever greater significance in planning for Federal water resources development. A good part of the difficulty stems from the extremely diverse nature of activities comprehended under the terms "recreation" and "fish and wildlife."

Under recreation there are included, at one extreme, such water-based activities as camping, swimming, picknicking, fishing and boating, all of which may call for intensive use of the water resource. At the other extreme is enjoyment of unique scenic, wilderness, or natural values that can accommodate only low-intensity use. With this latter view, the preservation of these unique values often appears to become the dominant goal, and actual recreational use a distinctly secondary purpose.

Similarly, the term fish and wildlife as related to water resources developments covers a wide range: from commercial hunting and fishing at one extreme, to recreational hunting and fishing, and again to the preservation and enhancement of fish and wildlife values for the general enjoyment of this and future generations.[1] At this latter extreme, as above, preservation of rare or declining species of wildlife, for example, becomes an end in itself.

It is clear that the values for some types of uses, such as commercial fishing, can readily be obtained from analysis of the willingness of users to pay within the context of the national income objective. Other types of uses--the preservation category, for example--cannot be so valued. Thus it will be helpful to consider valuation problems in terms of both the national income objectives and other objectives.

THE NATIONAL INCOME OBJECTIVE

In terms of national income, benefits from recreation and fish and wildlife projects, like those from any others, are the willingness of project users to pay for the products and services. Conceptually, therefore, in national income terms, there is no difference between recreation

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1. The terms recreation and fish and wildlife have meanings that overlap. Thus recreational hunting and fishing and preservation of fish and wildlife values could be subsumed in recreation as defined here; but commercial hunting and fishing obviously could not. Thus, it is necessary to use both terms in spite of the overlap.

and fish and wildlife benefits and benefits from navigation, flood control, irrigation, and electric power. From the measurement standpoint, however, there are significant differences. Aside from commercial hunting and fishing opportunities, whose benefits can be measured in market terms, there can be little or no recourse to the market for recreation and fish and wildlife. To a limited extent, there are private market data for some areas on certain kinds of recreational opportunities that are provided through water resource projects. Thus, for example, data on private rates and use of beaches, picknicking areas, and boating facilities are relevant. But these data are generally unavailable in systematic form and, in any event, are far too scattered to permit reliance on them.

Thus, there is no recourse but to make approximations that will come as close as possible to simulating the market. There are many markets for water-based recreation (including fish and wildlife aspects) in the United States--for example, one in California, another in the northeast. Therefore, no single unit price--such as dollars per recreation visitor-day--can be used to assess recreation benefits from all water resources facilities throughout the Nation, just as no single price per kilowatt-hour of electricity can be expected to represent hydro power benefits from all water resources projects. Unit values must be set with regard to the specific situation.

Although such detailed evaluations are difficult, and attempts at such analyses have not been conspicuously successful to date, certain guides can be set up for making the necessary evaluations. On the demand side, national and regional projections of population, economic activity, length of workweek, per capita real income, and the like can serve as a basis for estimating recreation demand in gross terms. The Outdoor Recreation Resources Review Commission is now undertaking studies of this nature for the Nation as a whole and for selected areas. These gross demands can then be related specifically to the recreational opportunities to be provided by the water resources development. A number of factors enter into the analysis. On the supply side, the various kinds of recreational opportunities to be provided by the development must be identified and each kind graded as to quality and distance from the major sources of demand. The same kind of classification of opportunities also must be made for existing alternatives. The entire listing and classification of existing and proposed recreational facilities would constitute the data on potential supply.

The refined demand analysis would seek to determine the projected magnitude of demand for each class and grade of recreation opportunity under various assumptions as to price. Existing data on private recreation facilities by class and grade would be used as benchmarks, and unit values would be derived for willingness to pay for each class and grade of recreational opportunity being considered in the water resources development.

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Perhaps the best way of accomplishing this kind of analysis is through an overall regional or areal recreation survey. In this, all relevant alternative means of providing outdoor recreation (including recreation from water resources projects) would be analyzed in terms of their costs and benefits. From such a survey there would emerge a framework plan in which recreational opportunities to be provided through water resources development would be properly related to opportunities to be developed through other means.

Of course, in terms of water resources plan formulation the only reason for attempting to estimate recreation benefits is to allow formulation of optimal development plans in which total benefits, including those from recreation, are maximized. Much of the interest in workable methods of estimating recreation benefits has come from those who are concerned that recreation, as a purpose, bear its share of joint water project costs under the separable costs--remaining benefits theory of cost allocation. This role for recreation benefits is not a concern here; cost allocation is treated in Section VIII. But it is necessary that good estimates of recreation benefits be developed to help guide correct formulation of water development plans. For this reason, the Panel believes that a vigorous research effort is urgently needed to develop in detail an acceptable methodology for obtaining estimates of recreation and fish and wildlife benefits. Pending development of such methodology, we shall have to rely on estimates prepared largely on a judgment basis.

OBJECTIVES OTHER THAN NATIONAL INCOME

As discussed in Section I, one class of nonnational income objective has been called "merit wants." The term merit wants relates to purposes that the Government may wish to honor even though they do not qualify in terms of consumer willingness to pay. In effect, the Government substitutes for consumer preferences its judgment of what is appropriate.

This concept of merit wants applies most directly to the preservation and enhancement of scenic, historic, cultural, and natural opportunities for the use and enjoyment of future generations. The very notion of preservation includes limited use. And, unless the individual willingness to pay of the few users is very high, it is easy to see that the gross national income gains from preservation would not exceed the costs.

There are numerous examples of this application by the Federal Government of merit wants to recreation--the national parks and monuments, wilderness areas, and historic sites. In water resources development, they arise most frequently in terms of preservation of existing values from encroachment by other uses--the Echo Park-Dinosaur National Monument case is a striking example; another is the current dispute on preservation versus damming of the Potomac River Gorge above Washington.

Resolution of issues of this type is a matter of high policy to be decided at the political level by the Congress and the President. They can be greatly helped in making decisions by the preparation of several alternative plans in which the preservation-type values are included at different levels and the estimated national income benefits foregone in each of these instances computed.

The idea of merit wants may also apply, to a more limited degree, to the types of recreation for which willingness to pay is relevant--hiking, picknicking, swimming, and boating. The argument here is that, even when consumers would not choose these types of recreation, the Government nonetheless should provide the facilities on the basis that consumers ought to choose these forms of recreation. Note that this argument goes well beyond the often-made assertion that, although demand for recreation facilities cannot be foreseen on the basis of the best projections, demand will nonetheless appear once the facilities are built. The argument goes on to say that the opportunities should be provided because people ought to (and may possibly be taught to) want the recreation facilities. While we may be willing to accept this prescription for services such as education and health, the argument is less clear for consumer-type recreation.

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VII. FINANCIAL POLICY

"...ask not what your country can do for you:
Ask what you can do for your country."

---President Kennedy

Up to now, the discussion has been primarily that of economists addressing themselves to technical questions. As the Panel has encountered value judgments it has tried to be careful to indicate their nature and to claim no more for economic analysis than is appropriate. In dealing with cost-sharing and repayment, however, value judgments become more important. There is a place for economic analysis, to be sure. Though the analytical aspects of cost-sharing and repayment are comparatively well understood, existing institutional arrangements are so diverse that it was impossible to examine them in the limited time set for this study. The area where the Panel feels it can make the most contribution is in clarifying the value judgments which surround cost-sharing and repayment policy.

PRINCIPLES OF REPAYMENT POLICY

The very term cost-recovery represents a value judgment with regard to governmental policy towards project users. It implies that the only goal of financial policy is to recover the costs of projects from project users. A broader view of the relationship of the Federal Government--representing the Nation at large--to the beneficiaries of an individual project--representing a small interest group--puts the essence of cost-recovery in perspective. Neglecting for the moment the operational problems of implementing various policies, that is, neglecting the collection difficulties, at least four benchmarks or reference points which might serve as the foci of governmental policies towards project users can be identified.

(1) The Government might price project services to recover all the income gain of project users resulting from the project, less a small amount for an incentive to prospective purchasers to buy project outputs. That is, the Government might seek to recover not just the costs, but the surplus as well, so that the Nation at large rather than a particular group--the project users--would enjoy the gain from the project.

(2) The Government might recover, in addition to costs, only that portion of the surplus of income gains over costs which represents an increase in the net gains due to Federal development as against State, local, or private development. The judgment underlying this policy is that the Nation at large is entitled only to the portion of the net gains over and above those that the local group could have appropriated on its own.

(3) Next on the list is cost-recovery.[1] The thought here is that, so long as costs are recovered by the Government, the Nation at large is not made worse off by the project. A policy of cost-recovery alone appears rather generous to the project users in comparison with the previous two policies.

(4) In pursuit of objectives such as increasing the income of disadvantaged groups, Federal policy with regard to payments by project users is of obvious importance. Many projects planned in accordance with objectives other than maximization of the gains in national income will not yield sufficient gross income gains to permit the project to pay the costs. And, even if a project does yield gross gains greater than costs, the higher the charges to the disadvantaged group, the lower is its net income. Thus, cost-recovery (not to mention the other two benchmarks), even when theoretically feasible, may tend to defeat the very objective of the development. In such a case, cost-recovery would not be a desirable goal.

The same is true if the Government's objective is to satisfy the merit wants mentioned in Section I for particular groups of individuals. If, for example, it is Government policy to provide more recreation for low-income groups than is justified by their willingness to pay, it might charge nothing for recreational opportunities provided by the project. And this might be done even though it would discourage the participation of high-income individuals who would prefer less company in using the recreational opportunities and would pay well for the privilege. Such a policy would conceptually be much like the public preference policy in hydroelectric development.

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1. Cost-recovery in economic terms means recovery of opportunity costs. Thus if the opportunity cost is $1.60 per dollar (see Section II) and the project costs $100 million, recovery of opportunity costs would require payments by project users over the life of the project adding up to $160 million, plus interest compounded at the social rate of discount. Recovery of economic costs can also be formulated in terms of recovery of money costs with interest compounded at a synthetic rate of discount, incorporating both the social rate of discount and opportunity costs, as outlined in Section II. This meaning of cost-recovery is not the one generally given to the term as related to Federal public works. Cost-recovery by the Federal Government is generally taken to mean recovery of Federal outlays with interest, where required, at a rate corresponding to the cost of money to the Government.

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The "subsidies" involved in repayment policies designed to recover less than costs may be explicit or implicit.[2] The use of artificially low or even zero interest rates (such as in repayment contracts for reclamation projects), means in effect that the beneficiaries do not pay the full costs (or in the case of multiple purpose projects, the costs allocated to the purpose for which the low or zero interest rate is employed). If such a policy is in the pursuit of social objectives other than maximization of the gains in national income--for example, encouragement of the family-sized farm--then these subsidies are proper. It would be desirable, however, to identify and measure the subsidies rather than to obscure them in the interest rate employed in repayment.

A policy emanating from this fourth benchmark is in a class by itself. It represents a specific value judgment in favor of project users as against the Nation at large. In not requiring cost-recovery as a minimum, it reduces the income of the rest of the Nation below its level without the project.

A difference among the three other benchmarks lies in the division of the net gains of the project between the project users and the Nation at large. A project that qualifies in terms of the national income objective represents a special opportunity to add to the present value of national income. A value judgment as to division of these gains between the project users and the rest of the Nation simply reflects the arbiter's judgment as to how much of the special opportunity belongs to the project users rather than to the Nation as a whole.

The approach to the financial policy problem in terms of these benchmarks leads to the following conclusions. Apart from collection difficulties (and these may be formidable), only a value judgment embodying a specific objective of redistribution of income to a particular group or region justifies a policy of anything less than cost recovery. And, except for specific income redistribution objectives, a reasonable rule is that project users, insofar as administratively feasible, should pay equal proportions of the benefits derived from the joint use of facilities. Thus, if a value judgment is made in favor of the minimal benchmark of cost-recovery, then recovery of costs allocated on the basis of the "separable costs--remaining benefits"method of allocation appears to be a desirable method.

This discussion of benchmarks for cost-sharing and repayment has an unreal ring in terms of current policies, problems, and proposals. The relevant problem in flood control cost-sharing, for example, is not to

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2. The quotation marks around the word "subsidies" are there because the choice of cost-recovery as the benchmark from which to measure a subsidy is somewhat arbitrary. One could with equal plausibility argue that any deviation from benchmark 1--full recovery of all gains--involves a subsidy to the project user.

choose among benchmarks 1, 2, or 3. The question seems rather to be whether flood control beneficiaries are to share to the extent of 0, 30, or 50 percent of the costs of flood control projects--although few would claim that flood control is a merit want or that flood control beneficiaries as a class qualify as a disadvantaged group. The first two benchmarks are not immediately relevant to policy formulation because their application would require not only new legislation but a radically new approach to the distribution of the gains of Government investment. Although both a new approach and new legislation in accord with the President's statement quoted at the beginning of this section are desirable, there remains the problem of defining interim policy within the framework of existing legislation. To this end, the following suggestions are offered.

Insofar as benefits from water resources development are widely dispersed and accrue only over a long period of time, beneficiary repayments in general should be set at levels that will cover opportunity costs with interest compounded at the social rate of discount in accordance with the separable costs--remaining benefits method of cost allocation. Or, if cost recovery is defined in terms of money costs, the interest rate governing repayment should synthesize social discount and opportunity cost considerations, as outlined in Section II. In contrast, special care should be taken to recapture windfall gains to a few or gains that are capitalized by beneficiaries and enjoyed at once.

MECHANICS OF REPAYMENT POLICY

The preceding recommendations, even for so conservative a goal as cost-recovery, were hedged by the requirement of administrative feasibility. The direct income gains from some project outputs and the indirect gains from most external economies are so widely dispersed that it is not feasible to try to recapture them. Moreover, in many cases, there is no way within our existing legal and institutional framework to prevent individuals from benefiting from the project whether they pay or not. As a result, there is no way of compelling them to pay, even if this were thought desirable. A large incidence of widely dispersed benefits or of benefits which cannot be recaptured for institutional reasons, not only interferes with recovery of a significant amount of the surplus created by a project in addition to its cost, but may even interfere with cost-recovery.

The traditional labels for classifying project services in terms of collection difficulties are "vendible" and "nonvendible." Irrigation, municipal and industrial water supplies, electric energy, and navigation services are vendible; the user is easily identified. His supply can be turned off or access can be withdrawn if he doesn't pay his bill. Flood control is an example of a project service which, by its nature and by institutional arrangement, lies in the nonvendible category. Once structures are in place, it is difficult to deny flood control to affected

areas. Like national defense, it cannot be sold on the market because of its collective nature. Instead, it must be paid for by taxation--for example, by property taxes reflecting the land enhancement from flood protection. In theory, it is possible to set the taxes so as to recover some of the surplus as well as the costs of flood control. In fact, however, policy choices center around a much lower level of local participation. The Federal Government is handicapped in its dealings with local groups by its inability to levy property taxes directly. Local governments are the only agencies which can assess the project beneficiaries. Finally, project services that are widely dispersed, such as water quality control and most external economies, are clearly nonvendible.

Even for vendible services, cost-recovery or cost-and-surplus recovery is not always a simple matter. It may be necessary to employ two-part pricing or some other form of price discrimination. And care must be taken to insure that price discrimination does not conflict with the objectives of development. For example, if maximization of national income gains is the goal, price discrimination must not prevent any potential user of an output from purchasing the output until the marginal price he pays (his marginal willingness to pay) falls to the marginal cost of the output.

A second problem of the mechanics of repayment policy derives from uncertainty. Once the project structures are in place, pricing of project services should reflect the greater of the opportunity costs of putting the water to alternative uses or the additional resource costs to maintain the flow. The sunk costs of the resources employed in the construction of the project, even if repayment plans are originally based on cost-recovery, are not relevant. The policies dictated by opportunity costs and resource costs are the same only in the event that benefit projections turn out to be accurate. And it is virtually certain that actual benefits, 50, 40, or even 20 years hence will prove to be different from those projected. For instance, an unexpected increase in the role of industry and the size of cities in a service area may lead to a marked increase in the willingness to pay for low flow control to improve water quality relative to the willingness to pay for seasonal diversions for irrigation. If the objective of the development is maximization of national income gains, system operation should be modified to reflect the change in relative values of the two purposes. Accordingly, repayments originally allocated to the purposes will no longer reflect benefits and should be modified.

The appropriate response to departures from benefit projections for a project's services as a group is implicit in the response to unexpected shifts in benefits of services relative to one another. If maximization of national income gains is the goal, opportunity costs in terms of alternative uses of the water properly govern pricing policy. Increases or decreases in originally anticipated charges for project outputs, that

reflect the degree to which demands exceed or fall short of those forecast, are an effective means of distributing the water to maximize income gains.

In short, flexibility in repayment contracts as well as in operation of projects is required if the objective of maximization of national income gains is to be met in a world changing in ways only dimly perceived at the time of plan formulation. There is a legitimate need to create certainty for users, but the current policy of long-term fixed contracts introduces excessive rigidity into the operations of project facilities and in water use.

One final point. Throughout this report the need for consistency in application of uniform standards and criteria by agencies has been emphasized. This injunction is especially relevant in the formulation of cost-sharing and repayment policies. There is room for policy differences according to the objectives sought by particular developments; but differences in policies should not be used as incentives in competition for the support of local interests for one agency's plan against another's.

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VIII. THE INVESTMENT DECISION PROCESS

The aim throughout this report has been to relate specific standards and criteria to the objectives of Federal water resources development. It has been to distinguish, for example, between secondary benefits in the context of national income gains and secondary benefits in the context of income gains to a disadvantaged group or region. Standards and criteria, in short, have significance only in terms of the objectives they are designed to implement; and, then, only when brought to bear on plan formulation at the proper places in the investment decision process that implements this objective. Economic standards make comparatively little contribution if applied to a plan formulated in a framework of objectives different from the one reflected in the standards. The standards must be employed to guide the formulation of the plan from the beginning.

THE PROCESS IN IDEALIZED FORM

To set standards and criteria in the perspective of objectives and the implementation of objectives, the following idealized form of overall investment decision process as it might apply to Federal water resources development has been drawn up.

(1) The broad objectives to be attained through water resources development would be laid out by Congress and the President. These objectives should be framed in terms of gains in national income, of progress toward a more equitable distribution of income by increasing the income of disadvantaged groups, and of other economic and social objectives--rather than in physical terms relating to water "requirements."

(2) The executive branch, in consultation with Congress, would determine the emphasis to be given the various objectives relative to one another, and make the other value judgments (for example, the social rate of discount) required for plan formulation. As an aid to the resolution of conflicts among objectives, policy makers could examine the contribution to different objectives of alternative long-range investment programs in water resources development prepared in broad-brush form. (Similarly, examination of the alternative patterns over time of the returns from the programs would guide the choice of the social rate of discount.) The choice among the broad-brush programs would determine the tentative relative emphasis on objectives appropriate to each regional or river basin development plan. Standards and criteria in accordance with the emphasis placed on the various objectives could then be prepared for use by planners in the field in preparing more detailed development plans.

(3) Planning according to these standards and criteria, field planners would prepare development plans that would reflect the policy of the executive branch with regard to emphasis placed on the various objectives.

(4) These plans would be reviewed by policy makers in the executive branch to discover if, in view of the additional information generated by more detailed planning, the initial relative emphasis on objectives is justified by the opportunities available. Plans could be revised by field planners to reflect modification in the relative emphasis on objectives by policy makers.

(5) Annual water resources investment programs in accordance with the long-range programs would be recommended by the executive branch to the Congress.

IMPLEMENTING MULTIPLE OBJECTIVES

The stickiest aspect of this idealization of the investment decision process is the implementation of partially conflicting multiple objectives. Straight addition of the benefits from projects with respect to different objectives represents an arbitrary determination of the emphasis to be accorded each. It leaves out the careful consideration of the opportunities for, and merits of, accomplishing each objective called for by the importance of the problem.

The "Green Book"[1] and Budget Circular A-47 take a different tack. They couch formulation and review of development proposals in terms of maximizing national income gains. Benefits in terms of other objectives are considered as additional evidence for judging the worth of proposed developments. But, according to the rules of the "Green Book" and A-47, development plans are not to be formulated to reflect benefits other than national income benefits, nor are such benefits to be accorded primary consideration in the review of proposals.

Although the Panel affirms the general importance of the national income objective, it questions the appropriateness of pursuing maximization of national income in the planning of Federal water resources development activities to the exclusion of all other objectives. The other dimensions--improvement of the distribution of income, regard for existing arrangements, merit wants, and social objectives-- not only ought to enter plan formulation, but at times may be more important than national income gains.

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1. Proposed Practices for Economic Analysis of River Basin Projects, Report to the Inter-Agency Committee on Water Resources prepared by the Subcommittee on Evaluation Standards (Government Printing Office, Washington, May 1958).

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A Method for Harmonizing Objectives

There are alternative--and, in the Panel's view, superior--means of resolving conflicts among objectives. The methods presented here are not fully developed; further, if developed, they probably could not be integrated into the Federal investment decision process in the immediate future. But these methods suggest ways of attacking the problem of implementing multiple objectives that can serve as springboards for more intensive investigation of this crucial problem.

One means of harmonizing conflicts among objectives lies in explicitly weighting the contribution to various objectives for each development program in accordance with the relative importance that public policy attaches to each objective for the river basin. These weights, of course, will vary from river basin to river basin. For example, consider the problem of harmonizing the objectives of increasing national income gains and redistributing income to a particular disadvantaged group. Suppose, on the basis of the broad-brush studies outlined in step 2, policy makers decide that each dollar of income generated to the disadvantaged group in question has the same value to the Nation as two dollars of income generated to the Nation at large. Then, to take a simplified example,[2] the goal of plan formulation for a program that can contribute to both objectives is to maximize the sum of gains in national income and double the gains in income to the disadvantaged group. Symbolically, the planning goal is

$$\text{Max } [(\text{National Income Benefits} - \text{National Income Costs}) + 2\ (\text{Group Income Benefits})] \qquad (1)$$

However, policy makers may be unable to decide on the basis of preliminary studies whether the weight appropriate to group income gains relative to national income gains ought to be two, five, or some other number. Accordingly, they may prefer to resolve the conflict between the national and group income objectives by specifying a constraint on system performance in terms of one objective. The goal of plan formulation then becomes maximization of system performance in terms of the other (unconstrained) objective consistent with meeting the constraint. For example, the planning goal may be to maximize the national income gains from the river basin program subject to the constraint that the system provide an increase in group income of at least $20 million. More concisely,

$$\text{Max (National Income Benefits - National Income Costs)}$$

subject to the constraint,

$$\text{Group Income Benefits} \geq \$20 \text{ million.} \qquad (2)$$

Alternatively, the goal might be stated as maximization of the gains in

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2. For instance, the problem of discounting future benefits is ignored in placing benefits occurring in different years on a comparable basis.

income to the disadvantaged group subject to the restriction that the "benefits to whomsoever they accrue exceed the costs," that is, subject to the constraint that the contribution to national income of the river basin program is not negative. Symbolically, the goal is

Max (Group Income Benefits)

subject to the constraint,

(National Income Benefits - National Income Costs) ≥ 0. (3)

For some objectives, other than the national income objective, one of the above expressions obviously may be more appropriate than another. All three expressions are satisfactory when we can measure these objectives; expression (2) is most useful when such objective enters as a qualitative constraint on the system, as in the case of preference clauses, acreage limitations, or intangible values such as preservation of cultural, scenic, and historic resources. In any event, these three methods of harmonizing conflicting objectives are not as dissimilar as they might seem at first glance. There is a fundamental unity underlying them. Moreover, this unity is not only of theoretical interest; it has important planning consequences. Specification of constraint levels, at first glance a different kind of decision from choice of a weight, implicitly specifies the weight attaching to group income relative to national income. For example, a small reduction in the level of the group income constraint of expression (2) would allow a small increase in the national income benefits through marginal adjustments of the plan. The amount of income to the Nation at large which would have to be sacrificed to obtain an extra dollar of income to the disadvantaged group can be computed. And it represents an implicit weight on group income in relation to national income, under the assumption that the level of the constraint on group income accurately reflects the Nation's concern for the group relative to its concern for national income gains.

However, constraint levels cannot always be set with more confidence on the basis of broad-brush studies than can the group income weights. For example, suppose expression (2) originally guides plan formulation. If redistribution were inexpensive in terms of the national income losses, it would pay us to increase the gains of the disadvantaged group--this would be indicated by a low value of the implicit weight. In this event, policy makers might be tempted to increase the minimum acceptable level of group income from $20 million to $25 million, which would require reformulation of plans. On the other hand, if redistribution were extremely costly in terms of national income, policy makers might reduce the level of the group income constraint to $15 million (also requiring a reformulation of plans), and look a bit harder at generating the extra $5 million to the group by means other than water resources development. By the same token, a constraint on national income performance, as in expression (3), might be revised in accordance with the marginal cost of group income in terms of national income foregone. And, similarly, if expression (1) guides plan formulation, the weight on group income might be revised in the light of levels of national income and group income generated by the initial value of the weight.

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Each of these procedures--maximization of a weighted combination of objectives, or maximization of system performance relative to one objective subject to constraints on the relevant remaining dimensions of welfare--is thus iterative. Plans formulated in the field must be transmitted to the center for review by policy makers in terms of their contribution to the various objectives and the marginal trade-offs of contributions to different objectives. Then, policy makers revise weights or constraints in the light of performance and marginal trade-offs revealed by the initial plans, if this seems to be warranted; and plans must be revised in the field in accordance with the revised weights or constraints. This interaction between field planning and revision of weights or constraints continues until plans are formulated which reflect a balance among objectives (that is, performance and marginal trade-offs) that policy makers hold to be optimal in view of the conflicts among them.

Given the iterative nature of the procedure for resolving conflicts among objectives, refinement of plans should be attuned to the refinement of the weights or constraints. It would be unsound to develop detailed plans in response to the first tentative levels of weights or constraints. Plans should be prepared in detail only when the weights or constraint levels become sufficiently in harmony with performance and marginal trade-offs that an end to the iterative process is at hand.

Feasibility of the Method

There are three key questions in assessing the feasibility of these procedures: first is the potential capacity of field planners to prepare for more plans than they are accustomed to prepare. Second is the potential capacity of policy makers to reach initial decisions on the levels of weights or constraints and to revise these decisions with sufficient alacrity. And third is the potential ability of the investment decision process to transmit plans from the field to policy levels and to return weights or constraints from policy levels to the field for revision of plans in a reasonably quick time.

In the absence of these three conditions, the procedures outlined here are too ambitious. In the event that the capacities of field planning, policy making, and the investment decision process, even if properly utilized, do not prove equal to the task, we must fall back upon the procedure suggested in Section I for interim use: Simultaneous preparation at the field level of alternative plans emphasizing objectives in varying proportion, from which policy makers would choose the plan which most nearly--however imperfectly--embodies the relative emphasis on objectives they hold to be optimal.

In any event, an informed judgment on the desirability of a particular plan to meet a combined objective also requires knowledge of the plans which would best meet relevant single objectives, if the single objective were

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unencumbered by consideration of other goals. For example, to make an informed judgment on a development proposal to meet the combined objective of national and group income gains discussed above, the decision maker should have before him several different statements. He should have a statement of the plan, at least in rough-and-ready form, which would meet the national income objective alone in the highest degree, together with an estimate of the national income benefits of this plan (and its incidental group income benefits, too). He also would need a description of the proposal to meet the combined objective and the statement of its national and group income benefits and the marginal trade-off between them. And, in order to make the impact of project proposals on different objectives as clear as possible, project reports should list the contributions to different objectives separately,[3] together with a statement of the weights employed to guide plan formulation or a statement of the marginal trade-offs associated with the plan.

THE INVESTMENT DECISION PROCESS IN ACTION

In actual practice, of course, the investment decision process does not work so simply as visualized in this idealization. First, Congress does not set objectives in clear and definitive terms but often states them only in very general form and sometimes even in contradictory terms. And conflicts among objectives are in fact not resolved by Congress or in high councils of the executive branch. No clear-cut policy attaching relative weights or constraints to the various objectives is sent down to staff personnel responsible for determination of standards and criteria. Accordingly, conflicts among objectives are resolved by default at the staff level--in the process of setting standards and criteria. Instead of setting standards and criteria in accord with clear-cut, well-defined and harmonized objectives, staff personnel must set them in terms that cover all eventualities, or they must frame them in terms that emphasize one objective over others. As observed earlier, the authors of the "Green Book" and Budget Circular A-47 chose the second path. Because of the absence of harmony among all objectives of public policy, and the consequent absence of standards and criteria formulated in accordance therewith, planning agencies often do not take account of the standards set forth by the Executive Office as "guides." Rather, they impose their own understanding of congressional intent as to basic public policy objectives. As might be expected, when development plans formulated on this basis are reviewed in the Executive Office they are found wanting in terms of their guides. Policy makers in Congress and the President's Office

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3. Roland McKean has emphasized the desirability of presenting project analysis in many-faceted form. See McKean, Efficiency in Government Through Systems Analysis (John Wiley & Sons, Inc., New York, 1958), Chapter 6, pp. 96-100.

are then faced with an unsatisfactory situation where a choice must be made between approving such development plans or adhering to the established standards. As a result, some water resources developments that fail to measure up to the established standards are nonetheless approved by Congress on the basis of other (unarticulated) criteria.

What can be done to improve the situation, to bring actual practice closer to the ideal? The conclusions and recommendations in the following section are intended to answer this question.

IX. CONCLUSIONS AND RECOMMENDATIONS

The Panel's assignment was limited to a study of standards and criteria, with emphasis upon a few important problem issues. The assignment was approached in a broad framework, in which standards and criteria were viewed as a part of a larger investment decision process for Federal public works. The position reflecting this approach is given below, beginning with specific recommendations relating to standards and criteria.

STANDARDS AND CRITERIA

(1) Revised standards and criteria. An interim set of revised standards and criteria, in summary form and covering only the most essential points, should be issued as soon as possible. It should be followed, within a year at the most, by a more detailed set of standards and criteria placed in the context of the overall investment-decision process and developed in the form of an overall guide on plan formulation for use by planners in the field. Both sets of standards should be worked out cooperatively with the agencies concerned and discussed with the interested congressional committees before issuance.

(2) Implementing objectives. Standards and criteria should be framed in terms of all relevant objectives of public policy, such as equity in the distribution of income, merit wants, and national income--rather than in terms of the single objective of national income.

(3) Interest rate. The interest or discount rate to be used in economic analysis should reflect the Administration's social rate of time discount. As this is an important policy decision, it is important the Congress have a full understanding of the basis for selection of this rate. In applying this rate in plan formulation and economic evaluation, it should be used in conjunction with a cutoff benefit-cost ratio that reflects opportunities foregone from investments displaced by the water resources development. As a temporary expedient, in place of a social rate of time discount plus cutoff benefit-cost ratio, the Panel recommends that a rate synthesizing social time discount and opportunity cost be used. Pending a full-scale investigation by the Council of Economic Advisers of the value of the social rate of discount and the magnitude of opportunity costs, an interim rate of 4 to 5 percent would appear to be appropriate.

(4) External economies and diseconomies. In calculating national income gains from a development, the income gains and losses from external economies and diseconomies should be added to, or subtracted from, the

benefits from the immediate products and services of the development to arrive at total national income gains. Beyond this, regional or local income gains from the development should be excluded from national income gains.

(5) Benefits for objectives other than national income. In terms of objectives other than national income gains, such as income distribution to groups, the public power preference clause, and the 160-acre limitation, gains to these groups should be identified as concretely as possible, and costs in terms of national income foregone should be shown.

(6) Cost offsets for unemployment. Cost offsets should not be used in plan formulation to reflect unemployment of a cyclical nature. Cost offsets should be used in plan formulation, however, in situations of secular unemployment, as in declining areas. Here, however, their use should be conditioned by the requirement that water resources developments be compatible with an overall long-range plan for improving the economy of the area.

(7) Risk and uncertainty. Adjustments for riskiness of individual projects (arising largely from variance of physical outputs) should properly be reflected in benefit estimates rather than in the interest rate or period of analysis. As for economic uncertainty, the Government should not apply special uncertainty discounts to all projects as a matter of fixed policy. Some projects, admittedly uncertain, may well be desirable because of the large gains that may be possible.

(8) Period of analysis. The period for which benefits and costs should be computed should be the economic life of the project features or 100 years, whichever is less.

(9) Price levels and optimal scheduling of development under the national income objective. If long-range projections indicate upward shifts in the value of project's goods and services relative to the general price level, plans should be formulated so that provision is made for future expansion in the scale of development over that of the initial stage, according to a schedule that maximizes the contribution to the chosen mix of objectives. If shifts are indicated in the value of project's goods and services relative to one another, provisions should be made for altering the pattern of project operations in the future in response to these shifts. If preemption of site or function is not a problem, values to be used in formulating plans for immediate construction should reflect no upward shifts in prices over a period longer than 10 years.

(10) Agricultural prices under the national income objective. Zero prices should be used to evaluate national income gains arising from the use of a water resources development in the production of any crop under

a subsidy program in any year in which a net increase in Government stocks of the crop from all sources taken together is foreseen.

(11) Use of alternative costs for evaluating hydro. The general rule in the presence of private alternatives is to formulate plans so that the mix of public and private developments undertaken maximize net benefits in terms of the chosen mix of objectives. In the special case where private and public power alternatives would provide the same quantity and quality of energy to the same purchasers, so that benefits from the two alternatives are the same, a simpler rule suffices: The benefits of the public power project can be equated with the social costs of the private alternative. Social costs are calculated in terms of opportunity costs, the social rate of discount and only those taxes that are applicable "in lieu" charges for local public services to the project. In the more general case where the private alternative does not do the same job or does not even exist, a more general procedure is required of comparing various combinations of public and private development to choose the difference between benefits (willingness to pay in the national income calculus) and costs. For purposes of determining financial policy, benefits of power should be evaluated in terms of the willingness to pay of the actual purchasers of the power; this is limited by the alternative cost to the purchaser, including all interest and tax charges actually faced by him.

(12) Recreation and fish and wildlife values. These values fall into two classes: those that can be handled under the national income objectives and those that can only be handled as intangibles or merit wants. Conceptually, additions to national income through recreation and fish and wildlife programs are of the same type as national income benefits from irrigation, power, or flood control. Although measurement problems are more difficult, measurement principles are the same. No single benefit value should be used for the Nation as a whole. Intangible values should be identified as specifically as possible, and several alternative plans should be developed in which these values are included at different levels, along with the national income gains foregone. Policy makers would thus be provided a choice among alternative plans with different combinations of intangibles and national income gains.

(13) Financial policy. Where the Government has specific income redistribution objectives in mind, cost-sharing and repayment policy should be related to the objective. In the absence of such objectives, however, for a policy of full recovery of costs, the separable costs--remaining benefits method of cost-sharing is recommended. For policies of more, or less, than full recovery of costs, project users ought, insofar as administratively feasible, to pay equal proportions of benefits derived from joint use of facilities. Special care should be taken to recapture windfall gains to a few or gains that are capitalized by beneficiaries and obtained at once. Insofar as benefits are widely

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dispersed and accrue only over a long period of time, full repayment of opportunity costs should be made, insofar as administratively feasible, with interest compounded at the social rate of discount. Or, if repayment is defined in terms of money costs, the interest rate should synthesize social discount and opportunity cost considerations, as does the rate of 4 to 5 percent recommended for plan formulation and evaluation in paragraph (3) above.

THE INVESTMENT DECISION PROCESS

(1) In recognizing the key role that standards and criteria play in the investment decision process, the Panel believes that there must be a clearer understanding of this process as it now exists and as it ought to be, by all concerned with decisions on water resources investments--the Congress, the planning agencies, and the Executive Office. Without attempting to specify details, we assert that a sensible decision process moves from broad objectives set at the highest policy-making levels--Congress and the President--through uniform standards and criteria fashioned in accord with the objectives, to actual field-level planning that applies the standards and criteria to actual cases. Standards and criteria should be developed to fit into a process with these characteristics.

(2) It follows that there must be a clearer distinction between the objectives to be achieved through water resources development and the standards and criteria used to guide detailed planning in carrying out the objectives. The instrument of standards and criteria should not be used to correct distortions or inadequacies in overall objectives. We should not use this essentially administrative device to cure policy deficiencies.

(3) We need, rather, a critical review of existing national water resources policies and programs to determine if they are the most effective means of carrying out the apparent objectives. This may appear surprising in view of the many water policy studies made in the recent past, including the recent study by the Senate Select Committee on National Water Resources. But these studies, good as they are, have not gone deeply enough into the question of the relevance of traditional water policies to today's problems--for example, the effectiveness of irrigation and navigation as stimulants to regional economic development. Such review should lead to formulation of a clear, consistent, and unified water resources policy in which basic objectives are clearly set forth, and, insofar as necessary, to recommendations for new legislation or changes in existing legislation.

(4) The development of standards and criteria related to a set of consistent objectives geared to up-to-date policies, should be accompanied by effective organizational and administrative arrangements so that actual planning of water resources developments could proceed in step with the standards, criteria, and objectives. In this context, the standards and

criteria serve the primary purpose of guiding plan formulation, rather than principally as a set of specifications for reviewing development plans.

(5) Improvements are needed in decision making at the field level, where development plans are actually formulated. There is considerable evidence that field application of the concepts, guides, rules, and specifications as set forth in the "Green Book," in the current standards and criteria, and in agency planning manuals, is extremely variable in quality. Even the best applications can be improved; great gains can be made in general performance. The Panel suggests the following means: (a) increasing the emphasis upon economic analysis in plan formulation and improving the quality of economic expertise applied to the task, (b) focusing attention in the planning agencies on current planning techniques and facilitating exchange of information among agency planners and other professionals in this field through publication, conferences and the like.

(6) The Federal Government should institute a major research program on all phases of the investment decision process as related to water resources. This should include: research on the overall planning procedure, including the manner in which multiple objectives can be handled in plan formulation; research on measurement techniques for estimating values of water resources products and services; and research on methods of obtaining consistent estimates of future demands for these products and services for the Nation as a whole taking account of the interrelationships among the individual river basins or regions. Results of such research on water resources would have major relevance to problems of investment decisions for public works generally. In setting up such a research program, the experience of Federal agencies in the defense and health fields in using Government-sponsored research agencies and outside research organizations should be studied and similar practices considered.

(7) The stage has been reached where it should now be possible to move beyond the application of standards and criteria to individual projects and to river basin developments to the development and evaluation of overall water resources investment programs for the Nation as a whole. Thus, alternative water resources investment programs ought to be formulated and analyzed in terms of the alternative income growth patterns for various levels of investment rather than in terms of alternative levels of future physical requirements. That is, alternative programs should be developed for several levels of overall expenditure, discount rate, and mix of objectives. Of course, for most projects not under construction only very broad, preliminary development plans would be in order for this stage of the planning process. But these would indicate to policy makers the contribution to different objectives, and the magnitude, distribution, composition, and shape over time of the overall and marginal returns available for different levels of investment in water resources development. The choice of a particular plan from among the alternatives would provide guidelines for the formulation of more detailed plans at the field level.

APPENDIX II

Senator William Proxmire, chairman of the Subcommittee on Economy in Government, invited a number of economists to submit answers to a few questions pertaining to the evaluation of the benefits of Government investments. As Chairman Proxmire stated in his letter of invitation, the purpose for soliciting additional comment on the concepts and procedures of benefit estimation was to present a "comprehensive * * * picture of the judgment of the economics profession on these matters."

The letter of invitation, the questions submitted and the responses of the economists follow:

CONGRESS OF THE UNITED STATES,
JOINT ECONOMIC COMMITTEE.

Dear _____: As you are aware, the Subcommittee on Economy in Government of the Joint Economic Committee has been concerned with the paucity of economic analysis which has been applied to public expenditure decisions. The committee has held hearings on the PPB system and on discounting procedures for public investment analysis, and has issued reports on both of these matters.

Within the next month, the subcommittee will be holding a set of hearings entitled "Guidelines for Estimating the Benefits of Public Expenditures." The purpose of these hearings will be to focus the attention of Congress and analytic staffs in the Bureau of the Budget and the executive agencies on the need to improve benefit estimation practice throughout the Federal Government. Currently, the application of benefit estimation procedures to public outputs is both haphazard and of poor quality. It is my hope that the hearings will clarify a number of crucial issues in this area and assist the Bureau of the Budget in developing a guideline document which would increase the quality and consistency of benefit estimates throughout the Federal Government.

Although we have scheduled only 2 days of hearings on benefit estimation, I would like to present as comprehensive a picture of the judgment of the economics profession on these matters as is possible. Consequently, I am inviting you and a number of your colleagues who have been working in this area to answer a few rather basic questions. These questions deal with the basic concepts appropriate for benefit estimation from a national point of view, the procedures for valuing public outputs which have no observed prices, and the means of handling impacts of public expenditures other than national output effects.

Attached you will find the list of questions. I am sure that your answers to them will be of substantial assistance to the subcommittee. It would be helpful if you could restrict your response to each of these questions to a paragraph or two. Your answers and those of other economists will be published along with the oral testimony presented

in the hearings which I described above. I am certain that the collective judgment of the economics profession which will be reflected in the answers to these questions will be of great help in formulating improved benefit estimation policy.

Because we hope to publish the hearings and comments shortly after the testimony is presented, we must set a deadline on receiving your answers to the questions. That deadline is May 31, 1969.

I would like to thank you for your willingness to cooperate in this effort by the Joint Economic Committee to improve the procedures for evaluating alternative public expenditures. If you have any questions of interpretation or procedure, please feel free to call (collect) Dr. Robert Haveman who is working with the subcommittee in its study of public expenditure economics. His number is area code 202—225–5171. I look forward to seeing your response.

Sincerely,

WILLIAM PROXMIRE,
Chairman, Subcommittee on Economy in Government.

QUESTIONS SUBMITTED TO ECONOMISTS ON "GUIDELINES FOR ESTIMATING THE BENEFITS OF GOVERNMENT EXPENDITURES"

1. How would you describe the concept of benefits which should be applied by the National Government in evaluating the economic worth of an expenditure project or program? Does your description hold even if there are market imperfections, such as immobilities, externalities, or unemployment?

2. Is the concept of "secondary benefits" a legitimate economic concept? Should it be used in ascertaining the economic value to the Nation of a particular expenditure?

3. As a practical matter, how would you suggest that the effects of public expenditures on the distribution of income or regional growth be handled in benefit evaluation procedures? Should these effects be lumped together with those project benefits which you describe in 1? Should they be described in a separate display? Should the objective for which an expenditure program is designed influence how these noneconomic efficiency effects are handled?

4. In response to hearings and a report issued by the Subcommittee on Economy in Government of the Joint Economic Committee (copy attached), the Bureau of the Budget has agreed to issue a circular to all agencies dealing with application of discounting analysis and the choice of an appropriate public discount rate. Hopefully, this guideline document will improve the quality of discounting analysis in the Federal Government and insure its consistency. In your judgment, is the parallel between the concept of expenditure benefits (from a national point of view) and the public discount rate sufficient to warrant a BOB guideline document on this matter? Are the methods for quantitatively estimating the benefits of public expenditures sufficiently developed to warrant increased efforts to apply them to a wider range of expenditure areas?

5. Obviously not all of the "outputs" of public expenditures can be measured and valued. For this reason, any guideline document would have to distinguish between those kinds of expenditures for which

benefit estimation should be required and those expenditures whose outputs cannot be so valued. Is there, in your judgment, a set of characteristics which could serve to identify those public sector "outputs" to which quantitative benefit estimation procedures should be applied?

6. Are you aware of any specific "outputs" produced by Federal expenditures which could be (but which are not now being) quantitatively measured and valued? What are they?

RESPONSE OF JAMES T. BONNEN, DEPARTMENT OF AGRICULTURAL ECONOMICS, MICHIGAN STATE UNIVERSITY

1. As I see it, one of the main flaws in the implementation of the concept of benefits is the present failure to treat the concept consistently from a national point of view. If benefits are to be viewed from a regional stance, then they should be financed by that region and not from the Federal Treasury.

Secondly, the concept of benefits should be one of total social benefits rather than just the direct market valued benefits. By this I mean to imply simply that when the assumptions behind the classical benefit computation are not present there is a divergence between the benefits as measured by market values and the true social benefits to society. Thus, as your question suggests, the concept of benefits must be altered or qualified if there are divergencies from competitive market conditions. The classic concept of benefits assumes no immobility of major factors such as labor or capital, no important externalities and no significant unemployment of either labor or capital. In fact, even the existence of economies to scale constitutes a departure from the conditions necessary for social and market measured benefits to coincide. In short, for the classical concept of benefits to remain valid the conditions of the competitive economic model must hold.

Thirdly, the concept of benefits should include some consideration of the distributional consequences of the program being evaluated. In practically all cases in computing benefits today the distributional consequences are ignored. Yet, an objective measure of the distributional consequences is necessary for responsible and consistent equity decisions in both the executive and legislative processes of government.

2. Secondary benefit are not a legitimate economic concept. If the competitive economy conditions listed above are met, then there is no place for secondary benefits (or costs) in the benefit (or cost) calculation. If the conditions described above hold, secondary benefits are simply local or regional in effect and have compensating consequences elsewhere in the economy. To introduce secondary benefits into the benefit computation under these conditions is illegitimate.

Even where there are departures from a perfectly competitive market, the validity of secondary benefit measurement faces unresolved conceptual and empirical difficulties. Thus, even in this case secondary benefits are of dubious value. I could not myself give you any consistent conceptual framework within which to handle the measurement of secondary benefits in the case of imperfect market conditions. Since it is almost impossible to distinguish between what is and what is not a legitimate secondary benefit in such situations, we would be much water politically and practically to eliminate secondary benefits considerations entirely from the concept of benefits.

3. I cannot give you a simple answer to this question. In the case of certain types of projects there do exist procedures for introducing the distributional effects into the benefit-cost computation (see Robert H. Haveman's volume, "Water Resource Investment and the Public Interest," 1965). In general, I would prefer to see the distributional impact of public expenditures introduced into the benefit-cost statistic. But I do not believe this alone is adequate. Some distributional consequences defy measurement and many of the subtleties of equity will be missed if they are presented simply in a single statistic. Thus, it would be most advisable: (1) to introduce them into the benefit-cost computation; and (2) to present as well a separate display of the distributional impacts identifying the separate groups involved and demonstrating the welfare impact on these various groups.

I am not entirely sure what you mean when you ask whether the objective for which an expenditure program is designed should influence the manner in which the noneconomic efficiency effects are handled. The objectives of any expenditure program provide the primary criteria for evaluation. Thus, if the program has a major income redistribution objective or some primary equity concern, then it is an absolute necessity that decisionmakers know what these "noneconomic efficiency effects" or distributional impacts are. If the purpose of the program is to transfer income from one group to another or from the general population to a very low income group then the design of the evaluation of the program effects must focus very clearly these relevant groups. However, we still have a long way to go in the development of theoretic constructs before we have a truly adequate general framework for the evaluation and measurement of distributional or noneconomic efficiency effects. Economists must get on with this.

4. It has been some time since I worked with discount problems. However, my own experience suggests that a BOB guideline document is justified. While there are some problems, the parallel between the concept of expenditure benefits and the social rate of discount is sufficient to justify this. One major qualification I would add is that there is no single time rate of social discount that we can discover for all time. We need to establish some current rate of discount for evaluation of public expenditure projects but we must also provide for a periodic reevaluation of that rate. The appropriate time rate of discount will vary depending on the conditions in the economy at the time of the expenditure decision; for example, it makes a great deal of difference whether we have a full employment economy or not.

I have some reservations about the extension of benefit-cost estimation procedures beyond the investment area into the full range of public expenditure programs. While most program benefits can ultimately be measured some are not very susceptible of quantification. I would also argue that we never will learn how to quantify many of these benefits that can ultimately be quantified if we do not plunge ahead and make the attempt to evaluate them. Thus, my preference is for proceeding to evaluate all programs at least on an experimental basis with great care exercised in how the results are used or valued. As you go from the public investment type of program to welfare and education expenditures to a research program, the meaning and value

of a benefit computation changes, partly because we do not yet know how to measure some benefits and partly because it is just not possible conceptually to include some of the benefits of certain types of programs.

5. I have not thought about this problem enough to give you a very thoughtful answer. It does seem to me, however, that if we put our minds to it, a set of characteristics could be developed that would help identify certain of the public sector outputs to which quantitative benefit estimation procedures should certainly apply and those to which they should not apply or be applied only with special qualifications and care. Certainly as we extend the PPB-type analysis across the Government we are going to have to face up to this issue.

6. The one output that stands out which we are not now measuring in government expenditure programs are the distributional impacts. In my mind, this is the largest single oversight in systematic analysis of Federal expenditure programs. Every expenditure program should be evaluated for its distributional impacts. Even the most limited knowledge of distributional impacts, if introduced into the legislative process, would force a great clarification of equity issues.

RESPONSE OF S. V. CIRIACY-WANTRUP, DEPARTMENT OF AGRICULTURAL ECONOMICS, UNIVERSITY OF CALIFORNIA, BERKELEY

MY DEAR SENATOR PROXMIRE: This is in response to your letter of May 5 requesting me to answer six basic questions relating to the problems of economic analysis as applied to public expenditure decisions. All of your questions are relevant, and some of them go to the roots of economic theory. I cannot attempt to answer them in detail in the farm of a letter. However, since I have written on some of these problems in our professional journals. I refer to these questions in explaining my position.

1. The concept of benefits depends on the formulation of the objectives of Government decisionmaking. Apparently, the objective which is implicit in question 1 is quantitative maximization of net benefits or a similar goal of economic optimizing. Such a formulation of decisionmaking in my view is far too simple. My reasoning on this point was recently explained in an invited paper before the 1966 annual meeting of the American Economic Association. The title of this paper is "Water Policy and Economic Optimizing: Some Conceptual Problems in Water Research," *American Economic Review*, May 1967, pages 179–189.

In my formulation of the objectives of Government decisionmaking, the conceptual and operational problems of defining benefits and of measuring them quantitatively are much less significant than in the formulation implicit in question 1. Furthermore, the problems of market imperfections, of immobilities, of externalities, and of unemployment are fully considered.

2. Whether or not the concept of secondary benefits is a legitimate economic concept depends on the usefulness of any classification of benefits that is employed. The terminology used is much less important than the necessity of including all items—both positive and negative—which effect welfare. This is the reason why I have suggested that secondary benefits should be evaluated just as carefully as the so-called primary ones and, in fact, be included with them. In the past, as you know, the evaluation of secondary benefits was frequently done in a perfunctory manner as a percentage of primary benefits; in many cases, this has involved double counting. My reasoning is explained in greater detail in a paper entitled "Benefit-Cost Analysis and Public Resource Development," *Journal of Farm Economics*, November 1955, pages 676–689.

3. As a practical matter, I would suggest that the problem of regional growth be handled as a part of benefit-cost evaluation. On the other hand, the problems of distribution of income are better handled in a separate analysis and separate display. I would not call these two important effects of a public expenditure program "noneconomic efficiency effects."

4. This question can be divided logically into two parts. Both of them I should like to answer in the affirmative, provided that the guideline document referred to is done carefully and that the application to a wider range of expenditure areas is undertaken with judgment and wisdom.

5 and 6. These questions refer to the basic problems of formulating decision rules for Government decisionmaking and especially how far such rules can be formulated in terms of quantitative economic optima. As suggested in my reply to question 1, I believe that the usual optimizing calculus proposed by most economists involves too many oversimplifications and, therefore, is neither conceptually sound nor operationally applicable. One the other hand, in my proposal for the formulation of decision rules, numerical quantification is far less significant, and the problems of questions 5 and 6 can be handled far more adequately. My views on these points were spelled out in more detail in two papers entitled "Philosophy and Objectives of Watershed Policy," in *Economics of Watershed Planning*, edited by G. S. Tolley and F. E. Riggs, Iowa State University Press, and "Projections of Water Requirements in the Economics of Water Policy," *Journal of Farm Economics*, May 1961, pages 197–214.

Please do not hesitate to contact me again if I can be of any further help to you in these important matters.

Sincerely yours,

S. V. Ciriacy-Wantrup,
Professor of Agricultural Economics.

Response of Otto Eckstein, Department of Economics, Harvard University

1. In the case of public investments which are not primarily a device to eliminate poverty, the normal concept of benefits would be the gain in real national income, viewed from a national point of view. This means reliance on market prices except where the market can be shown to be imperfect. My views on this range of topics are set forth in greater detail in my book, *Water Resource Development: The Economics of Project Evaluation.*

2. As actually employed by the Federal Government, the concept of secondary benefits is invalid. There are genuine repercussion effects in some situations, but these are far removed from what travels under the name of secondary benefits in Federal evaluation practice.

3. The effects of public expenditures on a distribution of income or regional growth should be reflected in evaluation procedures in a fashion designed to give policymakers usable information. This rules out lumping together of efficiency and redistributive benefits in one composite number. In some instances, distributions of benefits by region or income class can be presented. It is also a legitimate analytical activity to perform experiments with objective functions which attach different weights to benefits depending upon the income level of the recipient class. Such exercises can be useful, provided the policymaker who receives them understands what he is getting. In project choice within executive departments, such criteria might play a more useful role, particularly in preliminary screening of investment opportunities.

4. I have set forth my views on discount rates in my testimony earlier this year. On the whole, I endorse the report of the Joint Economic Committee subcommittee. There should be a Bureau of the Budget guideline document on public discount rates. There cannot be an efficient allocation of resources within the Federal Government so long as there is no standardization of practice on discount rates.

5. The work on cost effectiveness, both in the Defense Department and the experiments on the civilian side, indicates that it is possible to do some sort of quantitative analysis of benefits of virtually all public expenditures. It is not possible to reduce all these benefits to a common monetary yardstick, and therefore it is not possible to develop benefit-cost criteria which cover all fields of expenditure. But I do not believe that there is any field of public expenditure which could not be improved by having high-quality quantitative analysis applied to it. This does not mean that quantitative analysis can be decisive for expenditure decisions. Probably there is no field in which one can be so precise in the definition of objectives and the measurement of benefits and costs that judgment can be eliminated.

31-159 O—69——15

Response of Paul Feldman, Staff Economist, Institute for Defense Analyses

How to define the benefits of Government activities has been a subject of debate among economists since the beginning of political economy as a discipline. Such debates usually end with a general agreement that increases in efficiency or national income cannot be used to measure the benefits of Government activities because every Government action also affects the distribution of wealth and redistributional effects are not considered in efficiency or national income calculations. Measurement of the benefits of any program therefore requires the imposition of some ethical standard; that is, some basis for judging the distributive justice of the program. In my responses to the questions posed by the subcommittee, I will presume that Government actively seeks to assure that no individual can be deprived of his property without receiving equal value in return, and that whatever is produced is considered to be the property of the producer. These rules are considered to apply to the Government as well as individuals. A thorough exposition of my basic argument can be found in my IDA Research Paper No. P–477, "Efficiency, Distribution, and the Role of Government in a Market Economy."

1. The rules constraining Government and individual behavior lead directly to the concept that the benefits of Government expenditure must be evaluated in terms of goods and services provided to individuals in return for taxes that they pay. Two general types of problems must be recognized. The first arises from the existence of market imperfections such as immobilities, lack of competition, and lack of knowledge. These imperfections all lead to conditions in which some individuals are improperly deprived of what they produce. Under these conditions, distributive justice is the issue and should be sought as the benefit without regard to increases in efficiency. The second type of problem, arising from the existence of "externalties" can only be resolved by collective action. Examples of this important type of problem are found in defense, pollution reduction, education, public health, and many other activities in which individual action imposes costs or confers benefits upon others. In such cases, representing the bulk of the existing Federal Government budget, the concept of evaluating benefits in relation to the individual who pays leads to two prescriptions for the National Government: (1) it should confine itself to spending only on truly national problems; and (2) it should evaluate benefits as they accrue to taxpayers, not as they accrue to a subsidized group. The implications of the foregoing discussion will be drawn more fully in response to the other questions posed by the subcommittee. In questions 2 to 5, I shall restrict my discussion to problems of collective expenditure.

2. The concept of secondary benefits is not a legitimate economic concept. Government should focus its concern upon supplying those

goods which are desired by taxpayers but which will not be supplied privately because of the collective nature of their consumption. In satisfying their desires for collective expenditure, it would be as improper for the Government to count secondary benefits as it would be for a private individual to calculate the "secondary benefits" when he buys a loaf of bread or a pair of shoes.

3. In calculating the benefits to society of any Government expenditure, I would not consider the regional effects. Income distributional effects should be considered as benefits only to the extent that they reduce other expenditure requirements such as welfare payments, costs of controlling crime, and generally any transfers. For the sake of convenience and increased understanding of the calculations involved, these benefits should be identified but, under the assumption that transfers are carried on for the benefit of taxpayers and are indicative of their current desires for spending, the different forms of benefits are properly added together. Since all programs should be designed to purchase collectively consumed goods in response to collective desires for their consumption, the good the particular program is buying should not influence the calculation of additional benefits from reduction of transfers, that is, they should always be calculated.

4. Unless what has generally been recognized as the separate distributive and efficiency effects of Government spending can be reconciled (I have suggested one ethical basis for this reconciliation, there may be others), discounting will never be fully satisfactory as a tool in evaluating programs. It is simply not true that *individuals* who have to pay for something are indifferent about *when* they have to pay through taxes, even if the present value of their payments is the same. Nonetheless, if discounting is to be used, its abuse by the use of unrealistically low rates should at least be prevented. While I disagree basically with the notion that programs can be justified on grounds of "efficiency," I doubly disagree when efficiency is calculated using an interest rate lower than the before tax rate of return on resources in use in the private sector.

Methods for quantiative assessment of the benefits of Government expenditure are not perfect nor will they ever be. But it has been the specification of the wrong objectives rather than a lack of measurement tools which has prevented benefit-cost analysis from realizing its potential in improving the allocation of Government expenditures. If Government's objectives are clearly understood in any area, analysis can usefully be applied.

5. The difficulty in estimating benefits arises from the fact that where collective goods are concerned individuals who desire to purchase those goods do not freely expose their desires. Thus, evaluation of *all* Government expenditure programs must include an estimation, rather than strict measurements, of the value that taxpayers place upon the goods. Conversely, however, there are *no* Government programs for which some kind of estimation from empirical data will be impossible. To me it appears clear that taxpayers' desires can at least be estimated for such collective goods as income redistribution, pollution reduction, preservation of natural beauty, defense and even particular items such as the antiballistic missile in the defense budget.

6. If the proper "output" of Federal expenditures on collective goods is recognized to be satisfaction of taxpayer desires, then clearly

that is the single measure which applies ultimately for every analysis. But in specific cases, we must determine what it is that the taxpayer does desire. For example, the evaluation of farm price supports requires that we determine whether taxpayers want to preserve family farms, efficient farms, agricultural production capacity as a hedge against war, or if they want as an alternative the transfer of income to the poor, to poor farmers as a special group, or to farmers in particular areas such as Appalachia. Obviously, the choice of the output measure will affect the outcome of analysis and the choice among alternative methods of achieving the objective. Analysts can elicit information on taxpayer preferences, although it is my feeling that they have not made any serious efforts in this direction in the past. Until such work is done, or until the Congress and the President make clear what their estimate is of taxpayers' objectives, analysis is unlikely to prove useful.

With respect to impefect market operation other than external effects, the measure of benefit should be the extent to which the divergence is reduced between what a resource produces and what it is paid. This is a painful area for Government, for every time an underpayment is eliminated, an overpayment will also be eliminated, and it is difficult to dislodge an entrenched interest. Nonetheless, the issue should be recognized as one of distributive justice. Evaluation on grounds of efficiency or poverty relief or on any other grounds should be avoided as it will only produce confusing and irrelevant recommendations.

My conclusion is that the benefits of every government program can be estimated: from antitrust activities to defense, from minimum wage legislation to tax revision. The output measure to be used should be in itself, the product of analysis whether performed by politicans or economists or operations researchers.

Response of Harvey A. Garn, Senior Project Manager, the Urban Institute

June 13, 1969.

Dear Mr. Chairman: In response to your request of May 5, 1969, I am enclosing a paper of mine entitled "Multiple Objectives Joint Products and Incidence of Effects in Public Expenditure Decisions." While the paper does not separately address the individual questions posed in your letter, it does discuss some of the critical issues.

I would be pleased to answer any questions you may have on the paper.

Sincerely,

Harvey A. Garn,
Senior Project Manager.

Multiple Objectives, Joint Products and Incidence of Effects in Public Expenditure Decisions

HARVEY A. GARN*

In this paper, I will comment on a number of issues related to uses of benefit/cost analysis in decisionmaking in the public sector. It is helpful to start by reminding ourselves of the different purposes which might be served by benefit/cost analysis of public expenditures because the problems of benefit estimation vary across these purposes.

The most important general purpose of benefit/cost analysis is to provide public decisionmakers with structured information which helps in making sound choices. A second important purpose is to help provide a basis for informed discussion of possible policy and program choices as well as allocation decisions within programs.

A central point of this paper is that these major purposes of benefit/cost analysis can be achieved in a significant way even in choice situations in which it is not possible to state all benefits in terms of a single common unit, all objectives in an unambiguous preference function, or ignore distributional objectives. Advantages of using analytic inputs in the decision process should not be given up because of the difficulty of reducing such processes to unambiguous decision rules.

The particular kinds of choices which might seem amenable to benefit/cost analysis are:

(1) Choices about the size of the public share of national output relative to the private share;

(2) Choices about the relative share of the public (e.g., Federal) budget which will be spent on broad functional areas like transportation, housing, and defense;

(3) Choices among alternative policies and programs within functional areas, for example, alternative housing programs;

(4) Choices among alternative programs, defined in output

*Senior project manager, the Urban Institute.

terms, regardless of functional area administering the programs, for example, programs which aim at income improvement for target groups like job creation and manpower training;

(5) Choices among alternative program tools, for example, low interest loans and loan guarantees for job creation or rent supplements and low-cost housing support to improve housing for low-income people;

(6) Choices among alternative project proposals in the allocation of program funds.

This list of choice situations is arranged in what is roughly decreasing order of difficulty with respeot to the direct applicaton of benefit/cost analysis and problems in benefit estimation. In fact, problems relating to external effects, multiplier effects, intangible benefits and difficulty with social accounts are so pronounced for items (1) and (2) particularly that one should not be optimistic about using the analysis at that level. At the other end, however, at the level of project choice, several factors help make the analytical task easier than in the other kinds of choice situation. These include—

(1) A greater likelihood that a single objective can be specified;

(2) The possibility of using an output measure related to the objective for benefits without necessarily translating it into dollar terms in making choices; and

(3) Individual projects tend to be small enough (although there are exceptions to this) that spillovers (external effects) and indirect benefits are either small enough to be ignored in project choice or tend to be about the same for all projects.

Even given these "normal" advantages at the level of project choice, however, most of the conceptual problems are similar enough at choice levels (3) through (6) to justify ignoring differences among them in this paper and carrying the remainder of the discussion through in terms of project choice situations.

The particular conceptual problems, that will be discussed here, are those of multiple objectives and joint products, and treatment of distributional objectives in project choice.

MULTIPLE OBJECTIVES AND JOINT PRODUCTS

In this section a number of problems will be explored which arise frequently in using benefit/cost analysis in public programs. Many programs have multiple objectives which are difficult to combine into a single measure of value. I will discuss several methods of dealing with this situation systematically. It is true, also, that many individual public projects produce more than one valued output which are difficult to combine into a single measure of project worth so that the decisionmaker can select the best set for a given expenditure of funds. Methods for dealing with this situation will be discussed also.

To illustrate some of the major points let us consider, for example, a job-creation program which has multiple objectives and in which individual projects make a contribution to each objective. Such a program may have as its objectives—

(1) Improvement in national income (including both direct and indirect effects) by the employment of idle resources, particularly the labor force;

(2) Improvement in the individual incomes of those directly employed as a result of the project; and

(3) Provision of work experience to those employed as a result of the project.

Any single project will have an effect on national income, individual income, and work experience. For each of these outputs taken singly there is a reasonably straightforward benefit measure. In the first case, the benefit stream is defined in terms of the appropriately discounted difference in national income which results from the project. Although for many projects the aggregative national income effects may be so small that they are difficult to measure, this provides no conceptual difficulty.

In the second case, the benefit measure is the appropriately discounted difference between the income the individuals directly employed as a result of the project receive after its introduction and that which they would have received in its absence. Again, the income effect may be difficult to estimate but it does not pose conceptual difficulties. In the third case, an appropriate measure of benefits could be the number of new jobs provided as the direct result of the project, regardless of the national or individual income effects.

The conceptual difficulty arises in trying to reconcile these three benefit measures to create a single valued objective function. A scatter diagram showing a project array with two of the three outputs will help illustrate the point.

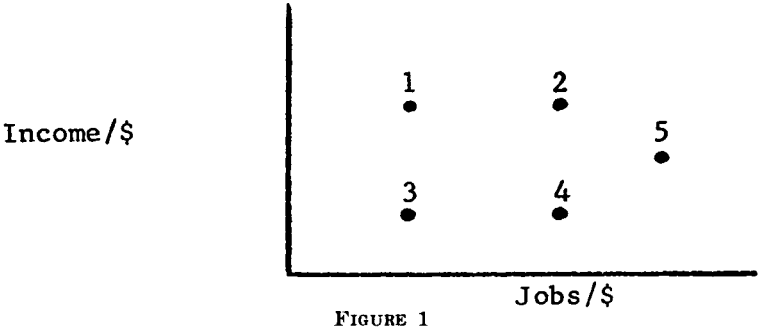

FIGURE 1

If we assume that all projects cannot be funded, it is clear that 1 is preferred to 3 (1 gives more income/$ and the same number of jobs/$ as 3). It is equally clear that 2 is preferred to 1 and 4 for similar reasons. But what can we make of the choice between 1 and 4 and 2 and 5, particularly when (as the figure shows) the alternative outcomes vary considerably? There are three alternative approaches to resolving this issue:

(1) Develop a systematic function which can be used to combine the payoffs in terms of the disparate objectives;

(2) Array the alternatives to the decisionmaker without aggregation; and

(3) Make the decisionmaker aware that there are multiple objectives, that his choices have implications with respect to these objectives, and ask him to resolve the issue subjectively.

These alternatives are listed in the order which I would prefer in most cases. The systematic function relating payoffs can take either of two basic forms. On one hand, an attempt can be made to reduce the alternative payoffs to a common measure. It is this approach that usually requires statement of all outputs in dollar terms with market prices or proxies. Any common measure would do the job, but dollar value is the neatest, conceptually, and is often the one most easily developed, primarily because we do have a functioning market system. Unfortunately, the pressure to count payoffs in terms of multiple objectives most frequently arises in those cases where it is very difficult to collapse multiple outputs into a single dollar value. In these cases, it seems preferable to develop both a single measure of project value defined in functional terms and a preference function which leaves the components of the function separately stated so the decisionmaker can look behind the overall index of worth and see the components, if he wishes.[1] The primary advantage of this approach is that the judgments about relative worth of alternative outputs can be made in a context which is more free of the pressures associated with funding or failing to fund individual projects than is deciding on individual projects as they come up.

Some may argue that even this approach does not go far enough in taking into account "intangible" or "inherently unmeasurable" benefits. It does go a considerable way in that it enables one to deal systematically with disparate payoffs which are not necessarily in the same units; therefore it avoids part of the problem associated with trying to put dollar tags on everything. In fact, it may go as far as one can afford to go.

As everyone knows, estimation of payoffs is not an exact science. Some benefits are more easily measured than others. Estimates may vary in terms of the degree of uncertainty in achieving them even when an acceptable benefit measure is defined. If payoffs are either so intangible that an acceptable measure cannot be developed or the uncertainty of achieving a given level is very large, the conclusion should be that such effects cannot be treated systematically (i.e., one man's guess is as good as another's). Some people become concerned with what to do about benefits which are "inherently unmeasurable." The short response is nothing. If some claimed benefit is "inherently unmeasurable" (as opposed to being difficult to measure) on any criteria, choices with respect to that benefit are purely random. It is not a fault of the analysis that these problems arise. The analysis would be faulty, however, if attention were not paid to dealing with valued outputs of choices which can be defined and estimated even when such outputs cannot be reduced to a single measure like dollars.

The second major approach to treatment of benefits relative to multiple objectives and joint products, therefore, is to make no attempt to combine benefits, either in terms of a common dollar value or a systematic tradeoff between accomplishment of objectives; but, rather, to display for the decisionmaker the array of expected outcomes in terms of all of the valued outputs. This approach has an advantage

[1] An argument for this approach and an example of its application can be found in Martin C. McGuire and Harvey A. Garn, "Problems in the Cooperative Allocation of Public Expenditures," the *Quarterly Journal of Economics*, vol. LXXXIII, February 1969, pp. 44–59, and "An Experiment in the Integration of Equity and Efficiency Criteria in Public Project Selection" (to be published, *Economic Journal*).

over the first approach in the sense that the analyst (except insofar as he fails to estimate outputs which he could and which he has reason to believe are important to the decisionmaker) does not bury information inside his assumptions about values or functional forms. The major disadvantage is that the decisionmaker must make each judgment on the basis of a whole array of expected outputs from each project which can become unmanageable if there are either a large number of projects or a large number of outputs.

Another example may help to illustrate this point. Imagine a set of health-related projects which can be expected to prolong life, prevent disability, and relieve pain and suffering in varying degrees. The decisionmaker may be unwilling to place dollar values on any of these outputs or, alternatively, may wish to place such large dollar values on some or all of the outputs that comparisons would make little sense. Similarly, he may be unprepared to state, in a way that the analyst can reduce to a functional form, tradeoffs among these outputs. In technical terms, he may be unwilling to provide sufficient information to develop a preference or indifference map. This situation can be expected to be especially pronounced when the outputs are closely related to fundamental values, like the life of a human being. This case should be distinguished, however, from the case of "inherently unmeasurable" effects discussed above. I am assuming that it is possible to measure the output variables in this example. The conceptual difficulty in this example is not measurement but rather putting agreed upon values on measured outputs. In this case, it is most appropriate to display the full array of expected outputs without attempting to force them into a single value index.

The array can take the form of a straightforward tabular presentation with the choice possibilities and expected benefits all shown. For some purposes a different type of array conveys more information. To illustrate, assume a set of possible projects of which not all can be selected and in which the projects each have two outputs. The possibilities can be arrayed as in figure 2.

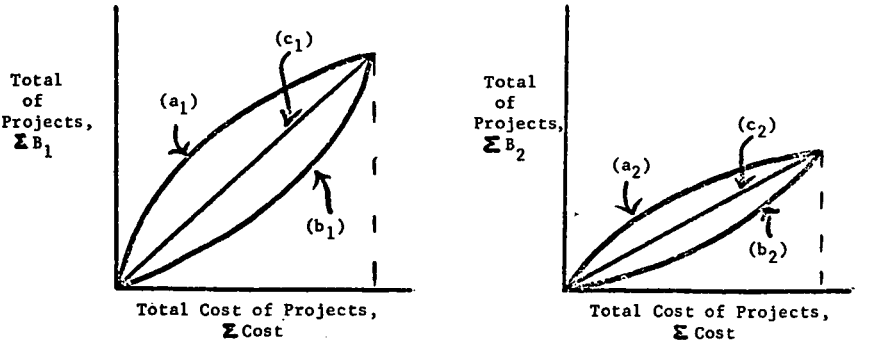

FIGURE 2

The curves labeled (a) in figure 2 represent the maximum benefits (projects arranged from highest benefit/cost ratio to lowest) achievable for a given cost on criteria B_1 and B_2, respectively. In this set of projects; that is, they represent the best order of choosing on each criterion taken singly. If we imagine a set of choices which start from

the worst projects (lowest benefit/cost ratio) to the best, we derive the curves labeled (b), minimum benefits achievable in this situation for any cost. The curves labeled (c) represent the average benefit/cost ratio over the whole available distribution and, in the sense of representing the expected benefit/cost ratio from a random choice, provide a reference point against which to compare possible or actual choices. The area bounded by (a) and (b) contains all possible choices among the given set of projects and thus provides additional reference points.

To illustrate, further, let us look more closely at a possible situation in figure 3.

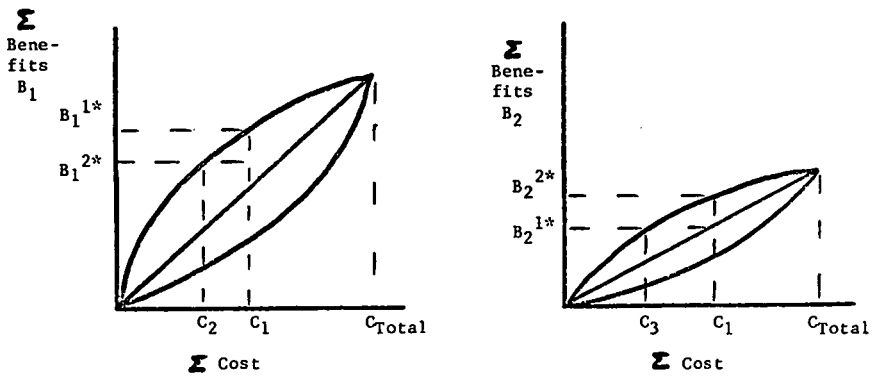

FIGURE 3

Assume that a decision has been made to spend $\$C_1$ on this set of projects. This array shows the consequences of maximizing on each criterion taken singly. B_1^{1*} is the level of B_1 benefits achieved by maximizing B_1. B_2^{1*} is the sum of B_2 benefits produced by the set of projects which maximize B_1 for a cost of $\$C_1$. Similarly, B_2^{2*} is the maximum level of B_2 benefits for $\$C_1$ and B_1^{2*} is the sum of B_1 benefits produced concurrently with B_2^{2*}. The analyst can array this information in terms of the benefit losses in terms of the other criterion associated with maximizing a given criterion. That is $B_1^{1*}-B_1^{2*}=B_1$ benefits lost by maximizing B_2 and $B_2^{2*}-B_2^{1*}=B_2$ benefits lost by maximizing B_1. It is clear, also, that figure 3 shows the additional cost to achieve a given level of benefits that is necessary when maximizing on the benefit criterion. That is, $C_1-C_2=$the additional cost of achieving B_1^{2*} in benefits by maximizing B_2 rather than B_1 and $C-C_3=$the additional cost of achieving B_2^{1*} in benefits by maximizing B_1 rather than B_2.

By showing the whole distribution (the envelopes contain all possible choices) any planned or actual choice from the distribution can be compared to maximum, average, and minimum benefits on all of the criteria. Although this type of array does not yield a single decision rule, it does portray the options available in a way that the decisionmaker can use.

In particular, a set of appropriate decision rules can be developed as described below. Imagine a set of projects which have the following characteristics:

	Choosing Max B_1		Choosing Max B_2	
Cost	ΣB_1	ΣB_2	ΣB_1	ΣB_2
$0	$0	$0	$0	$0
10	25	10	20	15
20	40	15	30	23
30	45	20	40	30
40	50	35	50	35

FIGURE 4

The figures for an expenditure of $30 have been plotted in figure 5. Point 1 represents the combination of B_1 and B_2 which results from maximizing B_1 at $30. Point 2 results from maximizing B_2 for the same cost.

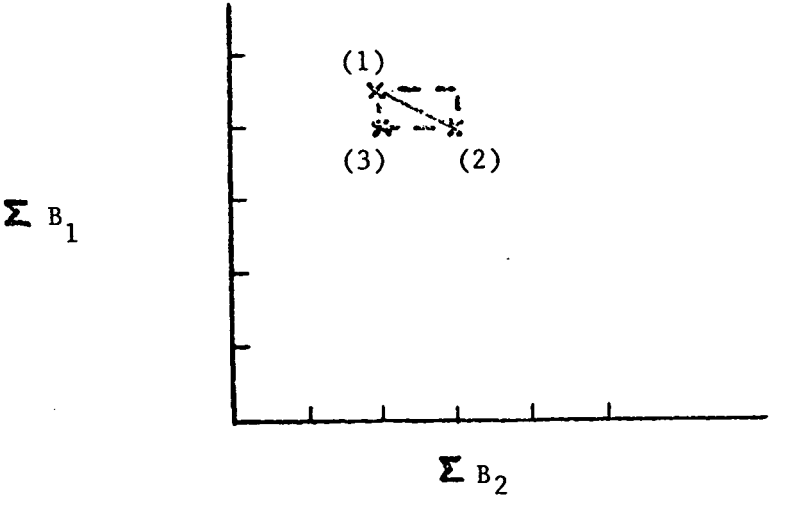

FIGURE 5

Given these criteria, the decisionmaker should reject all project combinations which cost $30 and which do not fall within the bounded rectangle. The reason for this is that for any project set falling outside this boundary there is at least one choice which yields at least as much of one benefit and more of the other benefit within the rectangle. The remaining problem then is to decide how to choose among project sets which fall within the rectangle. The appropriate approach is to begin by asking the decisionmaker to say how he would choose between say, 1 and 2 both of which cost $30. He can respond by saying 1 preferred to 2, 2 preferred to 1, or 1=2. Any of these responses conveys important information about the decisionmaker's preferences.

Consider first a 1=2 response. This means that the decisionmaker is willing to make an even trade of (1–3) B_1 benefits for (2–3) B_2 benefits; that is, the slope of the line, 12, is the decisionmaker's acceptable rate of substitution between B_1 and B_2.[2] We can now construct a preference map using this slope, with any possible project set northeast from the line 12 being preferred to either 1 or 2. Our decision rule will now be that the choice should be the project set on the highest preference curve in this rectangle; that is, closest to the northeast corner. If there is no project set beyond line 12 for the same cost, the decisionmaker should choose either 1 or 2.

Consider, now, a response 1 preferred to 2. This means the decisionmaker is not willing to give up (1–3) B_1 benefits to obtain (2–3) additional B_2 benefits. Alternatively stated, the slope of 12 is greater than the acceptable rate of substitution. The decisionmaker can now be asked how much additional B_2 it would take to make a trade of (1–3) B_1 benefits worthwhile. Given the answer to this question, the analyst can now construct a preference map as in the first case. (See fig. 6.) The

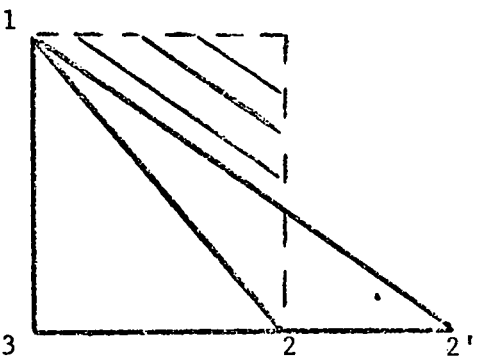

FIGURE 6

decision rule in this case is to select the project set on the highest preference curve above the line 12′. If there is no project set beyond 12′ for the same cost, project set 1 should be selected.

The case of a response 2 preferred to 1 is handled in the same way and produces a preference map such as shown in figure 7.

[2] I am assuming that, for this restricted choice situation, a linear approximation of the preference function is reasonable.

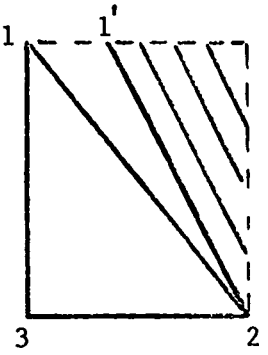

FIGURE 7

The decision rule works the same way as in the previous case. Select the project set on the highest preference curve above 1'2. If there is no project set beyond 1'2 for the same cost, select project set 2.

The third approach mentioned on page 5 will not be discussed in detail here because it is essentially an intuitive rather than an analytical approach. It is conceivable that good choices can be made this way, but it is unlikely that much information can be transmitted about the choices or choice procedure. It fails, in short, to accomplish the two major purposes of benefit/cost analysis mentioned in the opening paragraphs.

In dealing with multiple objectives and joint products, therefore, it is suggested that three possible analytical approaches can be used:

(1) Reduction of all benefits to a common measure: for example, dollars;

(2) Establishment of a systematic functional relationship among objectives to determine acceptable preference maps; and

(3) Arraying of all project outputs, without reduction to a single measure, where the concern is information loss due to analytic assumptions or computations or an inability or unwillingness to establish agreed upon tradeoffs among valued outputs.

The particular approach selected should be a function of the policy or program. There is no need to forego the advantages of analysis in case where all outputs cannot be stated in dollar terms. The primary advantage of a dollar (or other single) measure is the possibility of making a wider range of comparisons than is possible without it. There is little point, however, in forcing comparisons on a dollar basis when doing so requires the analyst to bury commensurability problems in his assumptions. Part of the point of analysis is clarity and transmission of information to decisionmakers which is not achieved by the appearance of forced simplicity.

DISTRIBUTIONAL OBJECTIVES

Many public programs have objectives which indicate a desire to pay particular attention to who benefits or to where the benefits occur. Even in cases where the programs do not have distributional objectives, they have distributional effects. The traditional benefit/cost analysis does not treat distributional benefits, except indirectly in cases

where policy or program constraints restrict benefits to particular target groups or areas. The assumption has usually been made that the marginal utility of income (benefits) is the same for all recipients. The conceptual reason for making this assumption is that assigning different values to increments of utility for recipients of benefits requires interpersonal comparisons of utility which has no scientific basis.

Recently, a number of economists have urged that this assumption should be changed in order to take account of distributional effects and objectives. I agree with this point of view. There are three primary reasons for this:

(1) Program and project choices based upon getting the "most" for the taxpayer's dollar in physical benefits will result in misallocation of resources and little increase in local welfare compared to a decision rule which includes welfare judgments (i.e., adjustments for varying marginal utility of income);[3]

(2) There are an increasing number of programs and policies which have overt distributional objectives; and

(3) One of the major roles of a public decisionmaker who had discretion about cost sharing, location of public investments and types of public investments is making interpersonal or interregional comparisons of utility in the form of his choices.

The conclusion, therefore, is that benefits and costs should be weighted to take account of the distributional effects.[4]

Given a weighting system,[5] the benefit/cost ratio can be converted into a utility ratio for comparing programs and projects. Insofar as distributional effects and objectives are taken seriously, this ratio

$$\frac{\Sigma B_i \lambda_i}{\Sigma C_j \lambda_j} = \frac{B_u}{C_u}$$

(where the λ represents marginal utility of benefits and costs and B_u and C_u represent the utility gains and losses, respectively) is the relevant ratio for program and project choice.

In practice, attaching distributional weights to project or program outputs and costs in calculating utility benefits and costs increases the information requirements for evaluating activities because the incidence of benefits and costs must be known or estimated. In principle, however, it certainly should be attempted in programs with distributional objectives because such programs should be judged on their efficiency in achieving these objectives as well as narrower efficiency objectives. In this sense, efficiency and equity objectives are inseparable.

Similarly, in programs with sizable distribution effects, even when these are the unintended effects of pursuing other objectives, it is useful to display for the decisionmaker information about the incidence of benefits. As in the preceding section, I am arguing for a systematic weighting system but would settle for an array of distributional effects to accompany the array of outputs.

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[3] This point is argued in detail in McGuire/Garn, "Problems in the Cooperative Allocation of Public Expenditures," op. cit., pp. 51–55.

[4] This point is discussed, also, in the papers by McGuire and Garn cited above.

[5] One such is the use of area characteristics such as unemployment rates and income levels as proxies for utility of benefits in area specific programs such as those of the Economic Development Administration.

CONCLUSIONS

From the perspective of this paper the ideal system would be one in which all outputs, including incidence, are translated into a single measure of project worth and in which the decisionmaker is familiar with the assumptions which are necessary for combining outputs. In practice, this combination of outputs can lead to relevant information loss in some cases. This is likely to be true particularly when the outputs do not have market prices and the decisionmaker will not or cannot provide sufficient information to establish a preference map. In such a situation, information can be conveyed by arraying estimated outputs (including incidence) for the decisionmaker. In this case, it may be possible, also, to infer the preference map from actual choices over time.

A major conclusion of this paper is that even though there are clear advantages to stating all benefits and costs in terms of a common measure, primarily because it permits development of formal decision rules and broad comparisons, there is no reason to abandon the major purposes of analysis of public programs in cases where outputs cannot be stated in common terms. So long as project and program outputs can be defined and measured or estimated there are advantages to providing structured analytical information to decisionmakers in either aggregated or disaggregated terms. If some possible benefits or costs are so intangible or unmeasurable that there is no way to estimate their magnitude, it is sensible to conclude that they cannot be treated systematically. It is not sensible, however, to conclude that analysis of other measurable effects should be abandoned because of such intangible or unmeasurable benefits and costs.

RESPONSE OF ARNOLD C. HARBERGER, DEPARTMENT OF ECONOMICS, UNIVERSITY OF CHICAGO

1. In general I think benefits are appropriately measured in the standard consumer-surplus way. The benefit that a user places on an item is measured by his marginal demand price and the cost associated with the supplying of an item is measured by its marginal supply price. The relevant modifications have to be made in cases where the demander is a monopsonist or where the supplier is a monopolist. In general, this approach is fully consistent with all kinds of distortions being present in the economy.

2. Secondary benefits indeed can be important. In general if B_i measures the "distortion" in activity i: i.e. the excess of marginal social benefit over marginal social cost per unit level of activity i, then the relevant measure of external effect (secondary benefits) is $\Sigma b_i \Delta x_i$, where x_i stands for the level of activity i. The change measured by Δx_i is the difference in the level of activity i that comes as a consequence of having the particular project present or absent. The Σ in this case runs over all activities other than those already taken account of in the analysis of the direct benefits of the project. Note that many activities have zero or very small distortion levels vis-a-vis. At the same time any project is going to have a perceptible effect only on a relatively small number of activities in the economy. As a consequence, when analyzing the external effects of a project, one is interested in only the subset of activities for which (*a*) the distortion is of significance and (*b*) the activity is going to be significantly affected by the project.

3. In general I have always thought that it didn't make much sense to measure the degree of progression or regression of individual taxes. By the same token, I do not think that a very important purpose is served by worrying about the distributional consequences of particular projects. One should, obviously, be worried about the overall impact of government taxes and expenditures on the distribution of income or welfare. The one exception to this general rule that I would make is in cases where the objective of a project or program is precisely to have a particular impact on, say, poor farmers, or poor people generally.

4. I am a sort of a middle-of-the-roader on this matter. I think that we can push quantification into areas where it has not yet been successfully applied, and I think that considerable effort should be made in this direction. On the other hand I see no point in requiring agencies to develop what might be called "fictitious" cost-benefit analyses when the underlying data and the techniques of estimation are not strong enough to support them. I think BOB should dictate the interest rate to be used by all agencies and certain general conceptual matters. I would then propose that BOB get out a list as to the types of projects on which cost-benefit analysis would be required. This list would presumably get longer as time went on, with the development of better techniques.

5. I think the answer [to this question] is implicit in my response under 4. The real issue is whether acceptable techniques of that benefit measurement have been developed in a particular area, and I think that is the way we ought to think about the problem, rather than asking what do irrigation projects, road projects, and educational investments have in common that is not shared by medical research projects, for example.

6. [No answer.]

RESPONSE OF J. CHARLES HEADLEY, DEPARTMENT OF AGRICULTURAL ECONOMICS, UNIVERSITY OF MISSOURI (COLUMBIA)

1. In my opinion, the concept of benefits which should be applied to national investment programs is the value assigned to goods and services produces as a result of the project or program in question. Naturally, this definition assumes an ability to value the output by some means either by direct measures given by market prices or by imputational methods where willingness to forgo consumption of market commodities implies a value on certain extra-market goods. The existence of market imperfections in no way alters the concept only the means used to determine and assign values to the outputs.

2. If the economic system is at or very near full employment and if national prices are used to measure costs and benefits, then secondary benefits are not legitimate because they represent transfers from other employment. This is true because the costs of the inputs into the project approximate the social cost of the resources and the primary benefits measure the utility created by the project. To add secondary benefits results in double counting unless all of the losses associated with the secondary activity are also counted and deducted.

The question of the use of secondary benefits for projects that make use of otherwise unemployed resources is another matter. If the total goods and services available to the economy is increased by public investment whether primary or secondary then surely welfare is increased, assuming no change or an improvement in income distribution. However, these are often difficult items to trace through the system. Evidence showing stepped up commercial activity in an area where a large multi-purpose reservoir has been constructed is not prima-facie evidence of secondary benefits that represent a legitimate increase in national welfare.

Therefore, there is no clear answer to the second part of this question. It depends on the situation. My personal fear is that the costs of allowing all alleged secondary benefits to be used to justify public investment exceed the sacrificed benefits by not including them.

3. I suggest that the income distribution and growth effects be separated from the efficiency aspects of benefit-cost analysis. If possible a separate analysis of the distribution and growth effects should be done as carefully as possible to be used along with benfit-cost analysis in project selection. Furthermore if the objective is income distribution and/or growth, analyses of various ways of effecting redistribution and growth could be studied and a choice made among various efficient projects which would achieve the redistribution and growth goals at minimum social cost. I am sure that there are more ways of bringing about economic growth and eliminating pockets of depressed incomes than are available through water resource development, for example.

4. With respect to the appropriate discount rate to use, I am extremely uneasy. Given the varied sources of funds and the problems

of intertemporal values, this question is not clear. I favor the use of discounting in evaluation because I am sure that future income is worth less than present income. A case cannot be made for variable discount rates between agencies because then evaluation procedures are not on the same relative basis unless it can be ascertained that certain kinds of benefit streams are preferred to others. One might argue perhaps that education, defense, and public health are superior collective groods and therefore that society was willing to make larger present sacrifices for future consumption of these. However, our weighting schemes are not well enough developed to cause me to argue for lower discount rates for these goods. I believe a guideline document is needed to assure consistency.

In general, our ability to measure benefits and costs of public activities is limited only by our imagination and willingness to see them measured. We have the capability now to measure many more impacts of public action than we are willing to measure.

5. In my judgment all those values used in quantitative benefit estimation for the purpose s of economic efficiency evaluation should be measurable either explicitly or implicitly in dollars and cents. The emphasis here is on the aspects of expenditure decisions dealing with efficiency and does not involve questions of equity or other goals of public development which may be measurable in ordinal fashion such as the level of well-being and security.

6. The list of outputs produced by Federal expenditures is a long one. My particular view is that many outputs not currently being measured are amenable to measurement as I have mentioned earlier. A partial list would include effects on health, education, crime, political activity, and social participation. These are only a few. Such effects once measured can be valued in exchange terms by the sacrifices required to bring about changes in the levels of the indices used to measure them. Much more effort needs to be applied in the development and use of the methodology in this area.

RESPONSE OF FRED S. HOFFMAN, VICE PRESIDENT, LAIRD SYSTEMS, INC., FORMER ASSISTANT DIRECTOR, U.S. BUREAU OF THE BUDGET

1. To choose among alternative ways of allocating its resources, the Federal Government must consider and evaluate all of the important implications of the choice. An important element entering in the evaluation is the market value (real or hypothetical) of the stream of goods or services resulting, net of the market value of the resources used up in the project. The stream of costs and benefits over time is itself, in unaggregated form, an important datum; in addition, a calculation should be made of the present discounted value of the cost and benefit streams using a discount rate equal to the opportunity cost of capital in the private sector (a weighted average of the rates of return in investment and consumption). This concept of benefits is a relevant measure even in the presence of market imperfections unless the project itself affects those market imperfections by for example, reducing the degree of monopoly in a particular market, by internalizing external costs or benefits, or by resulting in the employment of otherwise unemployed resources.

2. and 3. The concept of secondary benefits is a legitimate, though often abused, economic concept. It is abused because the alleged effects which are to be accounted for as secondary benefits are either hard to estimate, as in the case of contributions to the rate of development of a particular sector, or hard to evaluate as in the case of distribution effects. For this reason, I would be strongly opposed to any submergence of secondary benefits by adding them inextricably into what I have referred to as the market benefits. If they are to be presented, they should be presented in such a way that they may be separately identified and evaluated. The ostensible objective of an expenditure program either announced formally in statute, emerging as legislative intent, or in the form of statements by officials of the Executive, is relevant to measuring the extent to which Government is able to hit the targets at which it aims. The evaluation of an expenditure program from the point of view of the efficacy of resource use, however, should be based on information concerning all its effects, whether intended or byproduct. The public, the Congress, and the responsible officials, can then weigh the various effects in terms of their respective intentions.

4. Some attempt to codify and clarify benefit estimation might very well be useful. At the very least, some kinds of abuses, such as the confusion between redistributional effects and efficiency effects as measured in GNP increases might be reduced. In neither the application of discounting nor benefit estimation are we likely, in my opinion, to be able to introduce a high degree of uniformity as a practical matter. The treatment of risk in discounting procedures is likely to be a continuing source of conceptual difficulty; the diversity of Government's economic activities which result in hypothetically measurable market benefits but which do not result in directly observable market prices are likely to

make benefits estimation an even less uniform set of activities than discounting. In both cases the objective should be to eliminate the worst abuses and to introduce at least some minimal degree of consistency; in neither case are we likely to approach uniform procedures reducing benefits estimation to a mechanical process. In addition, with respect to benefits estimation, our empirical knowledge is highly deficient. Much research is necessary to appreciably narrow the range of uncertainty.

5. In general, an important Government program will have several different kinds of output some of which may be measurable, some nonmeasurable, and of the measurable ones, some may be expressible in dollars, others only in physical or social magnitudes. It is not possible to generalize about the kinds of benefits that are quantifiable. It is however, possible to generalize about those which are expressible in dollar terms. The benefits that are expressible in dollar terms are those which could conceivably (whether in fact they are or not) be sold through a market, or which affect the supply and demand of goods that could be sold through a market. Thus, programs that produce goods and services other than public goods that deal with the effects of externalities, or that remove market imperfections, are conceptually expressible in dollar terms. The outputs of programs that produce public goods and services or redistribute income cannot be evaluated in dollar terms. Where the outputs of Government programs include both public and private goods, the private, marketable element of the output should be evaluated in market terms and the public, nonmarketable output should be measured, if possible, in other terms or otherwise specified so that the various elements may each be considered appropriately.

6. Programs where an important element of output might be measured in dollar terms but the treatment is often inadequate are Government programs for the development of new technologies which are intended to go into production in the private sector. I would include the AEC's reactor programs, the development programs of the Department of Transportation, and those of the Department of Housing and Urban Development. The relevant efficiency measure is the value of shifting the future supply schedule for the relevant products, given the anticipated future demand curve. It is rare, however, that no attempt is made to quantify the benefits of Government programs in evaluating them. The problem is generally in the quality and consistency of benefit measurement, a situation which will take continuing effort and systematic research to improve.

RESPONSE OF CHARLES W. HOWE, DIRECTOR, WATER RESOURCES PROGRAM, RESOURCES FOR THE FUTURE, INC.

1. The benefits which should be measured by the National Government in evaluating the economic worth of a project or program are constituted of the increases in the net value of goods or services emanating directly or indirectly from the project, whether or not passing through or valued by the market, but valued at observed or simulated market prices from a national point of view so as to reflect accurately the social evaluation of the output in terms of an observed or simulated willingness to pay and the opportunity cost in terms of other outputs given up in the undertaking of the project.

Such a definition would hold under all circumstances, but the task of finding and measuring indirect benefits not directly connected with the project need be undertaken only when market imperfections exist.

2. Secondary benefits can legitimately accrue from a national viewpoint from projects in the face of market imperfections. They are constituted of income increases (or the prevention of income decreases) in activities related to the project through market relationships. Secondary benefits are to be expected whenever the economy in general or particular areas affected by the project are characterized by: (1) chronic underemployment; (2) immobility of capital and labor resources; (3) substantial economies of large-scale production in expanding activities.

3. Income distribution impacts should be described in side displays or supplementary reports accompanying the evaluation of national economic benefits and costs. No arbitrarily quantifiable impacts such as amounts of income redistributed to the poor, esthetic effects, and so forth, should be added into the national economic benefits and costs account. It must be recognized that quite a few seemingly unquantifiable things of value (or example, recreational opportunity) can have meaningful dollar measures attached to them.

4. The discount rate is overwhelmingly important in assessing the costs and benefits of a project. It is no less important than the measures of benefits and costs themselves and can override substantial variations or refinements in those measures as applied to distant points in time.

Methods of benefit measurement have proceeded to a point where many types of programs could benefit from wider application. The measurement of benefits in metrics other than dollars is possible and often necessary, and may represent the only approach to new social programs.

5. Nearly any program can have its outputs quantified in appropriate measures, for example, acre-feet of water, lives saved, recreation days, cases of health improved, and so forth. The question really

is whether or not these can be reduced to a common metric such as a dollar value.

In general, they cannot be in my opinion. For an important subset of project types, however, this can be done in most important respects—namely in the public development of natural resources.

6. One very important aspect of projects not now measured is the interregional distribution of benefits and costs. A knowledge of the regional incidence of benefits and costs could prevent the undertaking of projects with heavily detrimental effects on regions other than the project region.

RESPONSE OF ALLEN V. KNEESE, DIRECTOR, QUALITY OF THE ENVIRONMENT PROGRAM, RESOURCES FOR THE FUTURE, INC.

DEAR SENATOR PROXMIRE: The following are my personal opinions concerning the questions raised in your letter of May 5. They do not necessarily reflect those of any institutions with which I am associated. My comments relate specifically to water resource projects about which I am better informed than other public expenditures.

1. The concept of benefit can be defined only with respect to a particular objective. An important objective of public projects is to increase national income. This does not only mean individual or business income in a narrow sense but must include all outputs for which it can be determined that a willingness to pay by the public exists. For example, improvements in environmental quality should be included. A large body of theory and technique exists in connection with this objective and it has great conceptual clarity. Perhaps the strongest reservations about its use relate to the status it accords the existing income distribution. Suggestions are sometimes made that weights be applied to benefits flowing to particular income groups or regions to reflect desirable (or undesirable) impacts of projects on income distribution. I do not feel that it is presently possible to obtain satisfactory general weights of this kind and I feel that efforts to apply such procedures would endanger the clarity and integrity of the benefit concept. I feel that information concerning personal and regional income should be provided in separate displays in the project report. One desirable result of more direct and explicit income redistribution policies (such as the negative income tax) would be to improve the basis for evaluating public projects.

The concept of national income or contribution to national production benefits is fully compatible with taking into account immobilities, externalities, and unemployment. In fact, a correct application of this concept requires that they be taken into account—although it is often difficult to do so. The present concept of primary benefits is usually too narrowly defined to comprehend all contributions to national production.

2. Secondary benefits as presently calculated by the Bureau of Reclamation do not measure any useful economic magnitude whatsoever. Use of these figures should be abandoned forthwith. Secondary benefits are often confused with taking account of such matters as unemployment and externalities. As explained above these must be accounted for in a correct measure of primary national income effect. Similarly, secondary benefits do not provide a meaningful measure of personal or regional income distribution effects. The concept is confusing and useless and has no legitimate place in benefit-cost analysis.

3. This question was largely answered in 1 and 2 above. As a routine matter an effort should be made to calculate the regional and personal

income distribution effects of Federal projects and present them in a separate display. To add them to national income benefits would be incorrect and confusing. There may be special instances where it is desirable to design a project to meet very specific objectives, for example to improve the economic base of an Indian reservation. In that case such a design should be made but the project report should be accompanied by a conventional efficiency analysis. This would tend to make subsidies explicit and provide a basis for letting executive agencies and the Congress make straightforward comparisons with other programs of economic assistance.

4. I think a BOB guidelines document would be valuable. Encouraging progress has been made in applying benefit evaluation techniques to outputs previously considered intangible. Important recent examples as the Delaware estuary water quality study and the Texas Reservoir recreation study.

5. I feel an effort to evaluate all project benefits should be required however difficult to measure, remote in place, or indirect they may be (indirect here refers to roundabout—not indirect benefits). The same of course applies to costs (although this aspect is often forgotten). It should be understood that the planner will usually lack time, resources, and methodology to carry out this mandate fully. In that case he should make every effort to list the unmeasured benefits and costs and supply whatever information he does have about them.

6. I think all important outputs produced by Federal water resources projects have had values estimated for them although not always systematically or routinely. One important point that is often overlooked, however, is that benefit estimation should not only provide a justification for public projects but also influence their design and operation and possibly location. Usually the engineering design is fixed and then the economic evaluation is made. This procedure cannot lead to maximum net benefit.

Sincerely,

ALLEN V. KNEESE.

31-159 O—69——17

Response of Arthur Maass, Department of Government, Harvard University

Dear Senator Proxmire: This relates to your letter of May 5 and to your questions on guidelines for estimating benefits.

Questions 1–3 are directed to a one-sided view of the proper role of benefit-cost analysis in public investment economics, or of the proper objective of the expenditure of public funds, or both of these. To answer these questions directly requires the respondent to view national income benefits as the principal or only legitimate benefits of taxpayers' investments, or of benefit-cost analysis. Thus, the first question refers to market imperfections, but these are imperfections in terms of national income or efficiency benefits only. The second question asks if nonefficiency benefits are legitimate and if they should be used in ascertaining the economic value of a particular expenditure. *Of course* they are legitimate, and *of course* they should be used; yet to ask the question in this way is to imply a contrary assumption. Nor should nonefficiency benefits be considered "secondary," which is the term used in the question. The third question asks whether the objectives of a public program should influence how nonefficiency benefits are handled. *Of course* they should. There are no benefits except in terms of objectives.

It seems to me most unfortunate to propound questions that turn us back to the very narrow point of view of benefits and objectives that has been one of the legacies of the "Green Book." The Water Resources Council is presently working on new procedures for evaluating water and related land resource projects. A recent draft of the Council's special task force on this purpose gives evidence of the progress that we are making in developing benefit-cost analysis into a powerful tool to reflect in project and program design the legitimate multiobjectives of society. Your committee's work should not drive in the opposite direction. To do so might result in the new administration's rejecting the good work of the Council's task force.

I note that you have inserted in the *Congressional Record* (May 16, pp. 5278–82), with approval, the statement before your subcommittee of Jack Carlson of the Bureau of the Budget. This statement is excellent in its explicit recognition of the multiple objectives of most Government programs; but by insisting that benefit-cost analysis be limited to national income benefits and costs and that the contributions of any public investment to other objectives be measured separately and independently by cost effectiveness analyses, the statement represents a step backward from more advanced thought on this subject. How, pray tell, can Government planners design a project or program to satisfy a combination of objectives if they do not compare the different scales that they must use to measure the benefits of the project for each objective? The WRC task force report is, I believe, more sophisticated on this score when it proposes for framework planning

that programs be designed for several different mixes of objectives; and that the executive branch and the Congress, using the information provided by these alternative designs, then agree on a narrower range of comparison weights that can be used for detailed planning.

As for questions 5 and 6, measurement is not the problem. There are a number of metrics available, and others can be devised, for measuring the effects of public programs in terms of different objectives. The problem is, rather, valuation, or how to reduce to a common base measurements that are made on different scales. The basic problem, in other words, and the problem with which senior officers in the executive branch and you in Congress should be concerned, is how to establish tradeoffs between different objectives. Jack Carlson seems to say that this cannot be done because "there is no objective social basis for assigning a specific value" to a dollar used for any nonefficiency benefit, and because "the weights attached to each objective will differ for each participant in the decisionmaking process." For pity sakes, what is the political process all about? Shouldn't you and your colleagues be debating the tradeoff weights to be used in the design of projects and programs, more than simply authorizing, and appropriating funds for, projects that have been designed for objective functions about which you have had no discussion and judgment?

I enclose from an article that I am now completing pages that relate to benefit cost analysis in the context of these issues. (See attachment 1, following.)

Sincerely yours,

ARTHUR MAASS,
Professor of Government.

ATTACHMENT 1

BENEFIT-COST ANALYSIS

At the same time that multipurpose planning has been reduced to a burlesque, benefit-cost analysis (hereafter referred to as BCA) has so aborted in its development that it is today a mischievous dwarf when compared to its potential as a technique of analysis.

The Flood Control Act of 1936, the statutory foundation for BCA in water resources planning, provided, in language similar to that of the National Resources Planning Board reports, that projects are to be considered feasible economically if "the benefits, to whomsoever they may accrue, are in excess of the estimated costs." [1] *However, the words "benefits" and "costs" have no meaning per se; they are significant only in relation to particular objectives. Depending on the objectives, a project or program can be designed, and its benefits and costs measured, in terms of increased national income—that is economic efficiency benefits and costs; redistribution of national income to certain social and economic classes and regions of a nation and the world; objectives such as national self-sufficiency, national defense, the preservation of wild areas; or any combinations of these. Thus the 1936 provision, calling for the measurement of benefits "to whomsoever they may accrue," was not operational. And the executive agencies, work-

*See notes, p. 251.

ing through a succession of interagency committees, have since 1937 sought to give useful meaning to this metric. [2] Their deliberations have had two major results.

First, they have designated a single objective that is to be maximized in BCA—namely, national economic efficiency. BCA has become a technique for designing projects that will make the greatest contribution to national income.

Second and consistent with the first result, the executive agencies have provided that economic efficiency benefits are to be treated as the principal or primary benefits of water programs. The all-important ratio of benefits to costs is calculated in these terms only. Benefits and costs that relate to other objectives are given lipservice in planning guides, but in the evaluation of projects and programs they are treated as supplementary or secondary to efficiency benefits. [3]

As a consequence of these decisions, programs and projects for water and related land resources have been alone among all Government programs and projects in having to justify themselves in terms of a national income objective. Yet the legislative histories of major water statutes—for example the Reclamation, Flood Control, and Tennessee Valley Acts, like the Planning Board reports of the 1930's, show that executive and legislative policymakers have not been concerned exclusively with national economic efficiency. As a rule the U.S. Government has not undertaken investment programs for the purpose of increasing national income alone, nor even for this purpose principally. Redistribution of income to classes or to regions has been one of several other important objectives in Government plans—witness the programs for Appalachia and the Tennessee Valley.

Tension between the implicit if not explicit legislative objectives of water resources development on the one hand and the restriction of these brought about by the limitation of benefit-cost analysis to efficiency, on the other, has led to disagreements in the executive and Congress over what are to be considered properly as primary or efficiency benefits. Confronted with an analytical technique that counts efficiency benefits only or largely and with pressure from overseers and auditors in the Budget Bureau, congressional Committees on Appropriations, and the General Accounting Office to demonstrate that their projects have a benefit-cost ratio greater than unity, those planners who have wanted to emphasize what they believed to be the broader objectives of water programs have tried to sweep into the efficiency category all sorts of benefits that the purist knows are not really efficiency benefits.

This resolution of the uncertainties of 1936 raises several interesting questions. Why did the executive agencies paint themselves into the economic efficiency corner? Why have they stayed there? Why has this key policy decision been maintained over the years by purely executive actions, without any systematic discussion and confirmation in the legislation process?

The most important reasons why the interagency committees initially designated national income as the single objective of BCA were these. In government, knowledge of the economics of public investment was primitive in the early years. The professionals were feeling their way, experimenting with microanalytical techniques for public investment that were not well understood. Thus, for example, the

now familiar definition of national economic efficiency, as increases in national income or product, came to be understood and accepted by the executive experts as a consequence of their efforts to define the benefits and costs provision of the 1936 act. Second, the executive experts were much influenced by the analytical techniques of the "new welfare economics" which focused on economic efficiency.[4] Also, at the time, in the late New Deal period, considerable attention was being given to construction of public works as a means of fighting the depression, thereby reducing national unemployment and increasing gross national product; and water projects were an important class of public works.[5]

The fact that the executive branch has stayed with its initial decision in favor of national economic efficiency in BCA and that the policy implications of this decision have never been examined systematically in the legislative process are owing to different reasons, however—principally to the successful efforts of those who are much concerned about limiting the size of Federal expenditures on water projects. Policymakers will be concerned inevitably with the expenditure levels of programs for water resources development, in terms of both fiscal policy and the relative importance of water and other Federal programs. But to control expenditures by imposing on the planning agencies criteria that confine the types of benefits that can be used in designing and evaluating projects, without considering explicitly the policy implications of these criteria, can mean that a restricted budget is invested in a group of projects that does not fulfill the community's objectives as well as one or more other groups might fulfill it. A procedure which, for the purpose of limiting expenditures, excludes from project design all benefits other than those for efficiency has the result of foreclosing any real consideration of alternative objective functions.

There are other techniques for determining program levels that do not suffer this disqualification. [6] Nonetheless, some executives, particularly those in the Bureau of the Budget, have defended vigorously the use of an efficiency-oriented design criterion, although they have not always been explicit that their purpose in doing so, is to limit expenditures. To protect the executive against political pressures for raising program levels, these officers have chosen to rely on a control technique that is indirect and, therefore, difficult for opponents to reach and change.

The budget cutters have received support from partisans of two other points of view. Some economists, both in and out of Government, believe that the Federal Government should design and develop water resource systems for the objective of increasing national income, but not for the purpose of redistributing income to the disadvantaged or to underdeveloped regions of the Nation. The latter objective can be achieved more efficiently, they believe, by alternative Government programs, principally those involving direct payments to the groups or areas; and they prefer the more efficient means. [7]

Finally, there is a group of experts that has a professional and vested interest in perfecting the technique of BCA. When this technique is limited to efficiency, there are nonetheless many difficult problems in applying it to public investments; for example, estimating

beneficiaries' willingness to pay where existing market prices are not relevant or where market prices do not exist, accounting for so-called externalities, and defining proper discount rates; and these men want to solve these problems before they are asked to broaden the scope of their analysis to include other types of benefits and costs that may be even more difficult to handle. They do not object necessarily to designing water resource programs and projects for objectives other than efficiency, but they want to limit BCA to the efficiency objective. The consequences, however, of their pursuit of perfection in analysis are likely to be the same as those sought by men who would limit the design of projects to national income gains. This is so because the apparent precision of the ratio of efficiency benefits to costs gives it a dominant weight, compared to descriptive statements about other objectives, in decisions on how to rank and approve projects.

Because they fear that their preference for a predominant reliance on national efficiency benefits may not necessarily be that of the Congress, or alternatively, because they fear that Congressmen do not have the capacity to understand the consequences of any actions that they might take on this subject, the economy and efficiency oriented experts in the executive have sought to avoid legislative activity on the criteria themselves. They have not initiated major legislative proposals on criteria; these have been consummated by purely executive measures. This procedure has had a crucial impact on executive-legislative relations in water policy; and for this reason the final section of this article, following an examination below of some connections between multipurpose planning and BCA, is devoted to an analysis of the recent history of these relations.

I have argued elsewhere that the technique of BCA can be expanded to include nonefficiency objectives. [8] The principal problem is not, as so many have claimed, that nonefficiency benefits are intangible, that they cannot be measured. There are metrics or indicators available, and others can be devised, for measuring achievements in terms of redistribution of income, environmental quality, and other objectives. [9] These measures of different objectives cannot simply be added to each other, however. Tradeoff or comparison weights are required if programs are to be designed, and benefits and costs evaluated, in terms of multiple objectives. Such weights, when available, tell, for example, how much the Nation is willing to sacrifice in national income in order to achieve a certain level of income redistribution to those who could be served by a program, or in order to achieve a certain level of wild land preservation.

The principal problem of expanding BCA is, then, to make the policy decisions that are represented by these weights. These decisions can be made in the legislative process—the President proposing tradeoff values, based on analyses made for him by the executive agencies, and the Congress reviewing, amending, approving them. Under this procedure the professionals in the executive would sketch out broadly the engineering and economic consequences of using a number of different tradeoff weights as the design criterion for a program of projects, or for a single large project. These alternative consequences would then be compared and debated in a legistlative process. When, as a result of this process, a meaningful objective or design function was agreed to, the executive agencies would proceed with project planning.

The recent history of executive-congressional relations in water policy, developed in the final paragraphs of this article, shows that while tradeoff values have not been adjudged to date in a legislative process, they probably could be so determined if the executive were prepared, as to date it has not been, to initiate the action, which is, it should be noted, the normal procedure in legislation. Furthermore, recent case studies of Federal programs for interstate highways and housing rent supplements provide evidence that the legislative process contains considerable capacity to deal with multiobjective functions. [10]

NOTES

[1] 49 Stat. 1570.

[2] The following list includes for illustration some of the many interagency committees that have been concerned with definitions of benefits and costs and the titles of their principal reports:

1938. Water Resources Committee, National Resources Committee, "Drainage Basin Problems and Programs": 1937 Revision, pp. 7–10, 68–120.

1941. Subcommittee on National Water Policy, Water Resources Committee, National Resources Planning Board, "National Water Policy," printed as Part 3 of "Development of Resources," 1941.

1947. Subcommittee on Benefits and Costs, Federal Inter-Agency River Basin Committee, "Qualitative Aspects of Benefit-Cost Practice."

1948. Same, "Measurement Aspects of Benefit-Cost Analysis."

1950. Same, "Proposed Practice of Economic Analysis of River Basin Projects" (the so-called Green Book).

1951. Interagency Water Policy Review Committee, Bureau of the Budget, "Draft Water Resources Policy Act of 1952" and Budget Circular A–47.

1955. Presidential Advisory (Cabinet) Committee on Water Resources Policy, "Water Resources Policy," especially Section 6: "Evaluation of Water Resources Projects."

1962. President's Water Resources Council, "Policies, Standards, and Procedures in the Formulation, Evaluation, and Review of Plans for Use and Development of Water and Related Land Resources."

1968. Economics Committee, U.S. Water Resources Council, "Conference on Economic Analysis in Comprehensive River Basin Planning."

In addition to the interagency committees, there have been a number of *ad hoc* government committees that have concerned themselves with this same problem. These include:

1950. President's Water Resources Policy (Cooke) Commission, "A Water Policy for the American People."

1955. Commission on Organization of the Executive Branch of the Government (2nd Hoover Commission), "Water Resources and Power and Task Force Report on Water Resources and Power."

1961. Panel of Consultants to the Bureau of the Budget, "Standards and Criteria for Formulating and Evaluation Federal Water Resources Development."

[3] Just as there are no benefits and costs in the abstract, the classes primary and secondary have no significance except in relation to specific objectives.

The executive agencies have used the phrase "secondary benefits" also to describe a small class of efficiency benefits that are induced, rather than produced directly, by public investments, but we are not concerned with that distinction here.

[4] On this point see Arthur Maass, "Benefit-Cost Analysis: Its Relevance to Public Investment Decision," *op. cit.* note 7, pp. 213–218.

[5] The National Resources Committee, in its 1937 Revision of "Drainage Basin Problems and Programs," *op. cit.* note 2, said at p. V: ". . . policies for drainage basin development must be related . . . to the business cycle. . . . The Committee has previously emphasized and now reiterates the important consideration that both the amount and type of construction and the division of costs among Federal, State and local agencies should vary with the movements of the business cycle."

[6] For a systematic treatment of budget constrains in this context, see Stephen A. Marglin, "Economic Factors Affecting System Design," in Arthur Maass, *et al*, "Design of Water-Resource Systems," *op. cit.* note 7, pp. 159–177.

In a similar manner policy makers who are concerned that expenditure levels for water resources programs may be too high or simply out of control have sought to reduce or control them by raising the discount rate that is used in the design of projects for the purpose of evaluating on a common basis benefits and costs that are realized in different time periods. In general, raising the rate reduces the size and cost of projects and programs, because it tends to discount more heavily the value of benefits, many of which are received in later years of a project's life, than that of costs, which are incurred typically in the early years. But to control expenditures by imposing on the planning agencies a discount rate that is designed for this purpose, rather than for the purpose of reflecting intertemporal comparisons of benefits and costs, is to foreclose policy makers' consideration of these intertemporal comparisons and to invest in a program of projects that in the general case will be less responsive to community objectives than a number of alternative programs.

For a systematic treatment of discount rates in this context, see Marglin, "Public Investment Criteria," *op. cit.*, note 7, pp. 47–69.

[7] For an illustration of this view, see Robert Haveman, "Benefit-Cost Analysis: Its Relevance to Public Investment Decisions: Comment"; and for a rebuttal, Arthur Maass, "Reply". 81 "Quarterly Journal of Economics," 695–702 (1967).

[8] "Benefit-Cost Analysis . . ." *op. cit.* note 7.

[9] See for example, U.S. Department of Health, Education, and Welfare, "Toward a Social Report" (Washington: GPO, 1969), a report on indicators for measuring social change.

[10] On the highway program, see David C. Major, "Decision-Making for Public Investment in Water Resource Development in the United States" (Cambridge: Harvard Water Program, 1965) Ch. 5, and Arthur Maass, "Benefit-Cost Analysis . . .", *op. cit.* note 7, pp. 219–221. On the rent supplement program, see Maass, *ibid.*, pp. 221–225, which was prepared with the assistance of Major.

Response of Stephen A. Marglin, Department of Economics, Harvard University

Dear Senator Proxmire: This responds, albeit belatedly, to your letter of May 5, 1969. Let me deal with the questions you raise one by one, as far as possible.

1. Benefits are the quantitative measures of the contributions to particular objectives of governmental programs, objectives such as increasing GNP, increasing the income of particular groups of people (blacks, American Indians, the poor), or increasing the income of specific regions. Benefits with respect to these objectives share the common feature of being measurable in money terms, but differ in that the social weight attached to a dollar of "benefit" with respect to the GNP objective will very likely not be the same as it is with respect to redistributional objectives.

2. "Secondary benefits" is a legitimate concept in many instances but a confusing concept in all. The term has unfortunately been applied in Federal practice both to (1) GNP benefits and costs other than those measured by the market value of project inputs and the market value of project outputs as well as to (2) all benefits with respect to objectives other than increasing GNP. The second sense of the term is misleading because it implies that the GNP objective is more primary than others, which can hardly be defended today in the light of the proliferation of programs designed to improve the distribution of income. The first sense of the term is also misleading because it suggests that differences between market values and benefits and costs are not important with respect to objectives other than increasing GNP. A better procedure would be to distinguish direct and indirect (rather than primary and secondary) benefits and costs with respect to each objective of public programs.

3. My answers to questions (1) and (2) point to counting benefits and costs with respect to each objective separately. Perhaps at some future time these benefits can be appropriately aggregated, once Congress is ready, willing, and able to specify quantitatively the relative importance of benefits and costs with respect to different objectives. At the present time I suggest that the art of benefit: cost analysis has advanced only to the point that alternative programs or projects be designed that emphasize one of the significant objectives of the Government in the area in question, and that the benefits and costs with respects to each objective be displayed for each alternative. This will aid in the design of programs responsive to all objectives by emphasizing the tradeoffs between performance with respect to the various objectives that is inherently involved in choosing one alternative over the others.

4. I'm not sure I understand the question, but I am sure that improvements in the discounting procedure only make sense in connec-

tion with efforts to count benefits and costs correctly with respect to all objectives, not just gross national product. Much of the intuitive, emotional attachment to low-interest rates is really a reflection of a misdirected (but laudable) desire to see that nongross national product objectives get appropriate consideration.

5. The line between the quantifiable and the intangible is a shifting one, and I lack sufficient experience to delineate in detail where that line should be drawn today.

6. No; but that doesn't mean such outputs don't exist. I'm just not sufficiently familiar with the details of benefit-cost accounting procedures in the Government.

I hope these answers are of some help. I should be glad to amplify them in such directions as may be helpful to your committee.

Yours sincerely,

STEPHEN A. MARGLIN.

RESPONSE OF EDWIN S. MILLS, CHAIRMAN, DEPARTMENT OF ECONOMICS, THE JOHNS HOPKINS UNIVERSITY

DEAR SENATOR PROXMIRE: I am pleased to respond to your letter of May 5, 1969, requesting my views on benefit estimation with Federal Government expenditure. I will respond to your questions in the order they were asked.

1. The attempt should be to estimate the benefits that will actually be received as a result of the Federal Government project. Benefits should be valued at prices that recipients would be willing to pay. Immobilities, externalities, and unemployment should be taken into account in realistic fashion.

By far the biggest barrier to adequate benefit estimation on Federal projects is the absence of adequate pricing. Many, but not all, Federal investments benefit identifiable groups. Charges for these benefits that reflect costs would substantially improve resource allocation. Less often realized, however, is the fact that better pricing would greatly facilitate benefit estimation. For example, it would be easier to estimate benefits from additional irrigation projects if farmers were paying realistic prices for water from existing projects. Likewise, benefits from new or improved airports could be estimated more easily, if present users were paying realistic prices for the use of existing facilities. The point of these and other possible examples is that the use made of a public facility that is provided free or nearly so is a poor guide to the value of the facility. It is instructive to observe the difficulties that have been experienced in obtaining local cost sharing that Congress now requires on some Corps of Engineers projects. Local groups may claim that a proposed dam is crucial to the future development of a region, but it may prove impossible to find any group of people willing to pay the 10 or 20 percent of required cost sharing.

2. The concept of secondary benefits is a legitimate economic concept, but must be used with care and caution. Most secondary benefits result from the effect of Federal projects in putting to work labor and other resources that would otherwise be unemployed. Such benefits are rare in a virtually full employment economy.

3. As a practical matter, I believe it is important to display separately benefits that are alleged to accrue to particularly needy groups. It is often claimed that projects that fail the efficiency test are nevertheless justified because the benefits will accrue to particularly needy groups. I believe this claim is usually mistaken. For example, many Bureau of Reclamation projects badly fail the efficiency test, but are advocated because they will allegedly help farmers, a low-income group. But benefits from reclamation project show up mainly in increased land values, and landowners, even if they are farmers, are not an especially needy group.

4. I believe that the proposed BOB document is an excellent idea. The use of more careful benefit estimation and more realistic discount rates is probably the most significant way available to reduce waste through unjustified public investment.

5. Those "outputs" that cannot be measured for cost-benefit analysis, cannot be measured for use in any other decisionmaking process. Therefore, the fact that the output cannot be measured is a reason for not undertaking the project. Of course, measurement is a matter of degree and approximation, but the need for measurement is neither more nor less important in benefit-cost analysis than in other methods of decisionmaking.

6. Some Federal projects have "disbenefits" or "negative outputs" which are not taken into account adequately in project evaluation. For example, a harbor dredging project may have deleterious consequences for recreational uses of the harbor. More effort should be made to take disbenefits into account in project evaluation.

Sincerely yours,

EDWIN S. MILLS.

RESPONSE OF BURTON A. WEISBROD, DEPARTMENT OF ECONOMICS, UNIVERSITY OF WISCONSIN

1. If benefits of Government programs are considered simply as favorable outcomes, then the appropriate concept of benefits involves a specification of (*a*) governmental (or social) objectives, and (*b*) the degree to which the given governmental program achieves each of the objectives. Then, since the objectives may well be in a variety of units—for example, increased gross national product, increased leisure, more desirable distribution of income or wealth, greater equality of opportunity, et cetera—it is necessary (*c*) to devise a means for making commensurable an additional unit of each desired result. The latter may be thought of as involving, in part, determination of trade-off ratios indicating the additional degree of success in achieving one desired outcome that is deemed sufficient to offset a given reduction in the achievement of another desired outcome.

In addition to stating program benefits in commensurable terms, it is necessary, at some stage in the process, that the benefits be stated in value terms so that they can be compared with program *costs*.

It should be emphasized that even if all desired outcomes were stated in the same unit—dollars, for example—it would not necessarily follow that the results were additive. Specifically, those benefits that are of an income redistributional form, such that while there are benefits to some persons there are concomitant losses to others, cannot properly be added to other ("real") benefits that expand opportunities for some persons without reducing them for others.

Market imperfections and unemployment influence the relevance of observed market prices as indicators of marginal values of resources and of outputs. Thus, they enter when the discussion turns to operational *measures* of benefits, but they do not require modification of the *concepts* stated briefly above.

2. Secondary *benefits*, as that term is generally employed, should be termed secondary *effects* because the notion involves redistributional effects that benefit some persons while hurting others. Secondary effects of a government program include results of the changing demand patterns for resources used in the program and the accompanying changes in incomes of the resource owners and producers. They also include results of the changing demand pattern for particular *outputs* and the accompanying changes in incomes of sellers, as the initial beneficiaries spend their added incomes and the initial cost-bearers reduce their spending. Secondary effects do not reflect any increase in the economy's total productive capability; thus, it is a mistake to count as benefits the favorable redistributional side-effects of programs without paying equal heed to the unfavorable effects on those who are hurt. If the net redistributional consequences of the secondary effects are deemed desirable, then, as noted in connection with question 1 above, an appropriate value should be placed on this result. But the point to be emphasized is that the secondary *benefits* are

clearly an exaggeration of the importance of the *net* secondary *effects;* in fact, the net effects might be judged to be unfavorable, even though there were positive secondary benefits to some persons.

The concept of secondary effects—when properly applied—is a "legitimate economic concept." Such redistributional effects should be used—in some fashion—in ascertaining the economic value of a particular government expenditure. The key issue is whether the social importance of x dollars to the gainers is greater (or less) than the social importance of x dollars to the losers. The appropriate action is to place a value on the secondary, redistributional effects—a positive value of the redistribution is of a desired sort, a negative value if it is of an undesired sort, and a zero value if the gainers and losers are deemed equally deserving. Clearly, value judgments are involved in deciding when a redistribution is desirable.

3. Given the present stage of development of economic thinking on such nonefficiency objectives as the distribution of income or regional growth, these effects should *not* be lumped together with the efficiency effects—and certainly not in any simple additive fashion. As a practical matter, the following steps are warranted: (1) State explicitly each of the objectives that is being sought; (2) Whenever *distributional* objectives are involved—for example, helping low-income persons or low-income regions of the country—present additional information on the extent to which each of the target groups is expected to *benefit* from the program; and (3) Indicate which groups are expected to be *adversely* affected by the redistributional effects.

Whether redistributional effects are desired or not, they often are significant. Whenever these effects are expected to be important—that is, whenever the favorable or the unfavorable effects of a program are concentrated on particular portions of the population—the nature of the affected groups should be described. In particular, I suggest that it be made clear what the program's effects are on each of the following groups, at least: the poor; high-income persons; young people; the aged; and various geographic regions.

4. [I do not understand the first question in the paragraph and so I am simply skipping it.]

The methods for quantitative estimation of program benefits are becoming better developed but the procedures remain as much art as science. I favor continually increased efforts to estimate benefits in quantitative terms—though quantitative terms do not necessarily imply monetary terms.

While expanded efforts to quantify benefits are desirable, a companion need is to expand the supply of persons who understand the fundamental economic concepts underlying such matters as the distinction between efficiency benefits and redistributional effects, the relevance of external effects to the significance of market prices, and the need for operational statements of program objectives.

5. As noted above, one should not confuse *quantitative* estimates of benefits with estimates of *values* of benefits. For example, it is one thing to determine the number of lives that might be saved by additional expenditures on, say, prevention of German measles; it is another matter to place a value on the lives saved. The two tasks are analytically separable, and whether or not consensus can be obtained

on the usefulness of the latter, valuation step, it is surely helpful in program planning to tackle the former, quantification step. Since there are alternative means for reducing premature mortality—for example, via a variety of alternative health programs, via increased safety of airplane and automobile transportation, and so forth—program planning would be facilitated by information regarding the number of lives that could be saved with a given expenditure on each type of program.

Thus, the issue of *quantification* of benefits should be distinguished from that of *valuation*. Some useful quantification is probably feasible for all forms of public sector outputs—or, at least, this is the presumption with which the quantification task should be tackled. When one turns to placing a value on the outputs, severe problems will arise whenever ethical considerations are involved. Foremost among such cases are those programs that involve saving human lives, and those that involve significant shifts in the distribution of income or wealth.

6. No response.

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