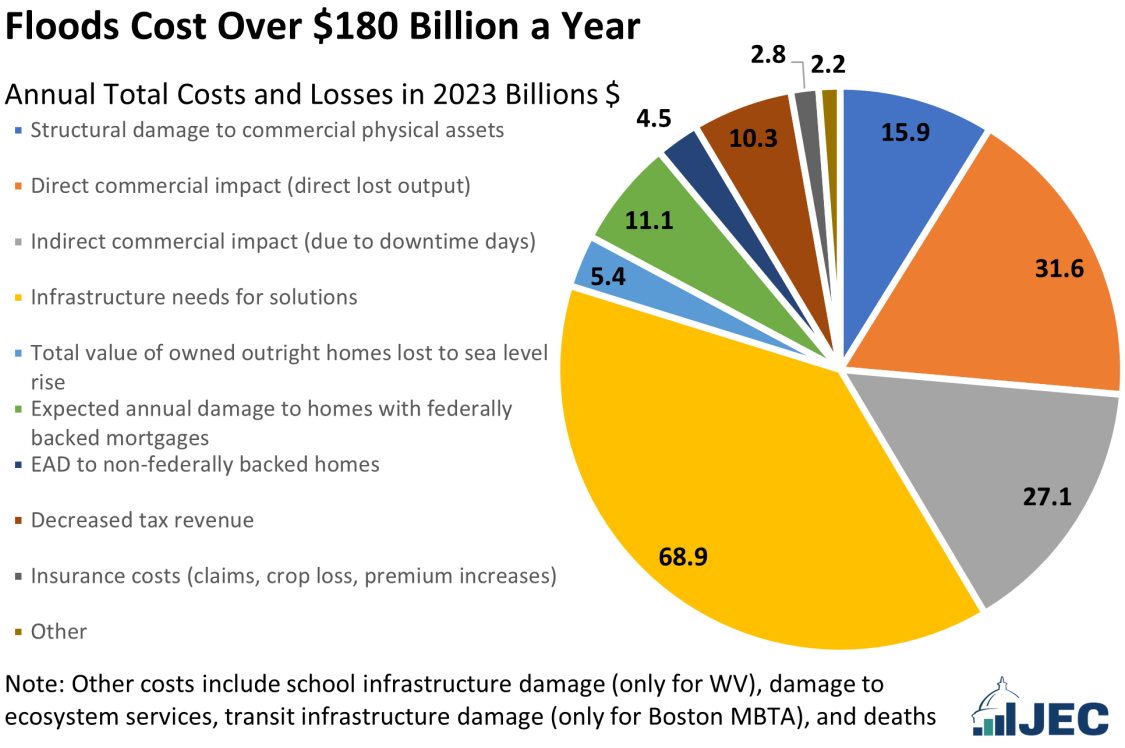
Flooding Costs the U.S. Between $179.8 and $496.0 Billion Each Year

Whether from an overflowing river, rising coastal waters, or a flash flood, flooding causes extensive harm to American households, infrastructure, and businesses across the country. In the last year alone, devastating floods have hit Vermont, California, and Kentucky as climate change increases the threat of these disasters in both inland and coastal communities. This string of deadly flooding years—along with higher threats of future floods—underscores the massive costs of flooding and climate inaction.

The Joint Economic Committee's Democratic staff estimates that the total cost of **flooding in the United States is between $179.8 and $496.0 billion each year** in 2023 dollars. The graph below shows the lower-bound estimate of what flooding costs the country in total each year. It is important to note that, while climate change is increasing the cost of flooding, there is significant uncertainty around what the true total cost of flooding is in any given year. Regardless of the exact number, it is clear that floods represent a massive cost to the U.S. economy.



Note: Other costs include school infrastructure damage (only for WV), damage to ecosystem services, transit infrastructure damage (only for Boston MBTA), and deaths

This range was calculated based on existing research on the effects of flooding in the United States. Each underlying study focused on specific costs like damage to infrastructure, lost

economic output, and damage to homes, just to name a few. Staff then adjusted these cost estimates to both isolate the cost in a single year and to adjust for inflation.

The total annual economic burden of flooding in the United States is between $179.8 and $496.0 billion.

The JEC Democratic staff's analysis finds that flooding in the United States causes between $179.8 and $496.0 billion dollars in damages annually, which is equivalent to 1-2% of U.S. GDP in 2023. This range is notably higher than existing estimates in the literature, which put the cost of either a subset of the damages or a subset of floods at between $4.4 and $82.7 billion in 2023 dollars. The economic costs in this analysis in billions (B) include:

- Infrastructure upgrades needed to protect against flooding: $68.9 to $344.5B
- Direct commercial impact from flooding: $31.6 to $40B
- Indirect commercial impact from flooding: $27.1 to $34.3B
- Structural damage to commercial physical assets: $15.9 to $19.9B
- Expected annual damage to homes with federally-backed mortgages: $11.1 to $15.1B
- Total value of owned outright homes lost to sea level rise: $5.4 to $10.8B
- Annual loss in tax revenue due to flooding: $10.3B
- Damage to transit infrastructure from flooding: $0.059 to $9.7B
- Expected annual damage to homes with non-federally backed mortgages: $4.5 to $6.1B
- Insurance claims from flood damage to mortgage-free homes: $2.3B
- Costs associated with flooding deaths: $1.2 to $1.5B
- Damage to ecosystem services from flooding: $0.76B
- Increases in insurance premiums: $0.46B
- School infrastructure damage from flooding: $0.17B
- Insured crop loss from flooding: $0.08B

The total costs in this report should be viewed as a likely undercount of the true total cost, as there are several costs connected to flooding that are difficult to measure and have not been fully quantified by researchers.[1] Climate change may also increase many of the included and excluded costs going forward as heavier precipitation makes flash and river floods more damaging while rising sea levels put coastal areas at greater risk. Given these compounding factors and the inherent challenge in measuring the total economic cost of natural disasters, especially when compounded by climate change, expert opinion suggests that the "true total

[1] These additional costs include: injuries suffered from flooding; mental health effects from displacement or fleeing from floods; damage from erosion and landslides caused by flooding exacerbated by wildfires destabilizing land; water contamination; damage to cultural heritage; slower economic growth, including from tourism loss; prevention of access to essential public services, including healthcare and emergency services and grid power loss; and broader social impacts and displacement costs beyond moving costs, which are partially represented by reduction in value and damage estimates to real estate above.

cost" of flooding lies somewhere between 0.5 to 2x the range estimated by the JEC Democratic staff.

These significant flooding costs motivate continued cost-effective investments in resilience.

Recent legislation like the Inflation Reduction Act, Bipartisan Infrastructure Law, and Water Resources Development Act of 2022 have made substantial investments to combat climate change and make communities more resilient to its impacts like more devastating flooding. Policymakers should continue to invest in cost-effective investments that safeguard key public assets and infrastructure like the energy grid, healthcare facilities, wastewater treatment plants, postal services, and transportation (including airports) from the effects of flooding.

On average every dollar invested in flood protection can save $5-8 in damages with some estimates showing that projects protecting water and waste treatment plants can produce $31 in returns per $1 invested.[2] A recent report also found that adaptation measures can prevent job losses and increase employment growth. In January 2024, the Government Accountability Office recommended that the U.S. Army Corps of Engineers include climate resilience in its day-to-day operations to better manage flood risk.

Watershed management and investments in natural protection like coastal wetlands and mangroves provide additional protection against flooding. Nature-based solutions are cost-effective ways to protect against coastal flooding, with **every $1 spent to restore wetlands and reefs saving $7 in direct flood reduction benefits.**

The Natural Resources Conservation Service Watershed Protection and Flood Prevention Program provides technical and financial assistance to manage the effects of flooding. These grants to states, local governments, and tribes can fund watershed projects to address flooding, erosion, water quality protection and improvement, recreation, ground water recharge, municipal and rural water supplies, and wildlife habitat protection. This very popular program is always oversubscribed, so additional funding would enable more flooding resilience projects that would provide significant return on investment. The Emergency Watershed Protection-Floodplain Easement Program also helps landowners address flooding hazards on agricultural lands. Stakeholders of the program have generally described it as important and well managed with opportunities for improvement.

[2] A prior version of this report included a higher value for the return on resilience investments that was later discovered to be incorrect. This report was updated in July 2024 to use an accurate number.

Improving flood insurance and disaster relief will support Americans and the economy.

Finally, improving both how flood insurance is managed and priced and how FEMA aid is disbursed would better support Americans before and after flooding hits their homes and assets. Extending the National Flood Insurance Program (NFIP)'s authorization on March 22, 2024 was an important first step. However, the program was only extended through the end of September 2024, and short term patches to NFIP reauthorization (which has been patched 29 times since 2017) create uncertainty for the real estate market. When flooding damages homes and displaces people and insurance is limited, FEMA disbursements help people get back on their feet. A recent change by the Biden Administration eliminates red tape, expands eligibility, and establishes new benefits, including up front funds for emergency housing.

The JEC Democratic staff have previously written about climate risks to the insurance sector and how policymakers could reduce these financial risks. Increasingly devastating flood risks are contributing to certain parts of the country becoming uninsurable, leaving families and local governments facing significant financial risks and economic burdens. Our previous report discussed the need for innovations in insurance and risk-sharing, including improved data that feeds into insurance decision-making using real-time, actionable earth monitoring from satellites and other technological advances. Accurate data is essential, as flood risk disclosure laws can have large economic impacts—a recent law in Texas, post-Hurricane Harvey, required this disclosure, and the most affected homes dropped approximately $15,000 in sales price.

Flooding imposes large costs on Americans and the economy, which are increasing with climate change. By investing in flood protection, watershed management, and climate resilience efforts, the federal government will save money long-term while minimizing the harmful effects of flooding on people's health, well-being, and finances.

For more information about the methods used in this report, see the methodology and technical appendix.

Methodology and Technical Appendix

This section includes additional details on how the underlying studies used in this analysis calculated specific cost and damage estimates related to flooding. Some of these underlying estimates are taken directly from the literature while others were calculated by the JEC Democratic staff based on information in the literature. While the final calculations were adjusted to account for any overlap identified across categories, there is still a possibility that some double-counting occurred across categories. Given that the topline total cost estimates likely reflect a significant underestimate of the true annual costs (as explained above), the impact of any additional double-counting is likely small.

Because many of these underlying studies and cost estimates focused on different calendar years, the total cost estimate is for a generalized flooding year rather than one year in particular. Adjustments have been made to all the damages and cost estimates to convert them to reflect the cost in a single year (in situations where the estimates were expressed over a multi-year time span) and to adjust for inflation by convert all dollar values into December 2023 dollars using the Consumer Price Index for December of the source year.

The required investment in repairs and upgrades to the nation's water and wastewater infrastructure to protect against flooding is estimated to cost $68.9 to $344.5 billion.

Aging infrastructure in the United States needs repairs and added resilience to withstand the more frequent and powerful flooding that climate change is fueling. The 2021 Report Card for America's Infrastructure identifies a $688.9 billion funding gap in 2023 dollars from 2020 to 2029 for water, wastewater, and stormwater; dams; and levees to be upgraded in the face of flooding and climate change. We distribute that funding gap across the ten years from 2020 – 2029 for our low-end estimate ($68.9 billion) and realized over a smaller subset of years ($344.5 billion) to approximate a scenario in which these costs are incurred over a shorter time period.

The direct commercial impact from flooding is estimated to be $31.6 to $40 billion.

The direct commercial impacts from flooding refer to the lost business output directly associated with flood-related retail and office building closures. These costs only include direct economic damages from economic activity not occurring that would normally occur in the impacted building due to the estimated downtime.

The indirect commercial impact from flooding is estimated to cost $27.1 to $34.3 billion.

The indirect commercial impact from flooding also stems from businesses being shut down due to structural damages but quantifies broader economic impacts, such as foregone economic activity in the region (given the role of directly affected businesses as suppliers and buyers of other outputs) due to the aforementioned direct economic impacts. These indirect costs account for economic activity like lost output, lost value, lost household earnings, and lost jobs.

The structural damage to commercial physical assets is estimated to cost $15.9 to $19.9 billion.

The structural damage to commercial physical assets drives the direct and indirect commercial costs of flooding. The cited study quantifies this cost by applying the risk of a flood hazard happening to properties to the expected units needing repairs or replacement to calculate the expected damage.

The expected annual damage to homes with federally-backed mortgages is estimated to cost $11.1 to $15.1 billion.

Expected annual damage (EAD) is the monetary damage that a home would incur in a year, on average, over many years of exposure to a given profile of flood risk. This category is the EAD to homes with mortgages backed by the Government Sponsored Enterprises (GSEs), Department of Veterans Affairs, or the Federal Housing Administration. The high-and low-end ranges for this cost correspond to the expected damages associated with current risks to the median home and risks under 2020 and 2050 climate conditions, respectively.

The total value of owned-outright homes lost to sea level rise is estimated to be $5.4 to $10.8 billion.

This category provides an estimate of the total value lost of homes that are mortgage-free or owned outright. We approximate this value by taking an estimate of total property value at risk from sea level rise from the Union of Concerned Scientists (UCS) and estimating the proportion of those homes without a mortgage. We use the percentage of homes in Florida that do not have mortgages for this purpose, as the percentage in Florida is roughly the average across the United States and reflects a state with a large percentage of high-value coastal homes that are owned outright. The range is calculated by assuming that the total value lost is distributed evenly across 2018 and 2100 (lower estimate) or realized over a smaller subset of years (higher estimate).

The annual loss in tax revenue due to flooding is estimated to be $10.3 billion.

As homes lose value or are completely lost due to flooding, the associated property tax revenue also disappears. This estimate comes from the same UCS report used to estimate the lost value of homes due to sea level rise. This number is likely an underestimate as it does not include other tax revenue which may be lost due to flooding.

The damage to transit infrastructure from flooding is estimated to cost between $0.059 and $9.7 billion.

Flooding poses a risk to local transit systems like subways in addition to roads, highways, and airports. A recent study suggested that many major airports are at or below sea level and at particular risk from flooding with climate change. The low-end estimate is drawn from a study of annual flood costs to just the Boston transit system, and the high-end estimate reflects the same study area but under more extreme climate impacts in the future. Because the cited study only looks at impacts on Boston, this is almost certainly an underestimate.

The expected annual damage to homes with non-federally backed mortgages is estimated to be $4.5 to $6.1 billion.

Expected annual damage (EAD) is the monetary damage that a home would incur in a year, on average, over many years of exposure to a given profile of flood risk. This category is the EAD to homes with non-federally-backed mortgages. The high- and low-end estimates for this cost correspond to the expected damages associated with current flood risks to the median home and flood risks under 2020 and 2050 climate conditions, respectively.

Insurance claims from flood damage to mortgage-free homes are estimated to be $2.3 billion.

This category represents additional insured damages beyond those to mortgage-backed homes, using the same methodology used above to isolate only mortgage-free homes. Insurance claims from flood damage averaged $5.3 billion per year when inflation-adjusted from 2003 to 2012 data reported by FEMA, which we multiply by the percentage of mortgage free homes in Florida (43.7%).

Costs associated with flooding deaths are estimated to be $1.2 to $1.5 billion.

Costs associated with flooding deaths are calculated using a range of estimated average deaths per year from flooding (106–127 depending on how you average annual data) multiplied by the value of a statistical life (VSL) used by the Environmental Protection Agency.

Damage to ecosystem services from flooding is estimated to cost $0.76 billion.

Damage to ecosystem services from flooding reflects an average from 2001 to 2016 from a Resources for the Future study.

Increases in insurance premiums are estimated to cost Americans $0.46 billion.

Due to the increasing risk of flooding from climate change, flood insurance premiums are increasing. This cost was estimated by multiplying the average number of flood insurance policies from a Congressional Research Service study by the average expected rate increases.

School infrastructure damage from flooding is estimated to cost at least $0.17 billion.

Schools from West Virginia to California have experienced infrastructure damage from increasing floods. This estimate reflects only the costs associated with recent flood-related infrastructure damage to West Virginia schools and is thus a significant underestimate of total national costs in a given year.

Insured crop loss from flooding is estimated to be $0.08 billion.

Insured crop loss from flooding is estimated from indemnities paid by the National Crop Insurance Program for reasons of flooding.