

Center for American Progress



Rethinking the Intersection of Climate Policy and the Federal Budget

By Jacob Leibenluft December 2020

Contents

- 1 Introduction and summary**
- 4 Rethinking the connection
between fiscal priorities
and climate priorities**
- 18 Understanding what is meant
by 'fiscal responsibility'**
- 20 Developing a fiscally responsible
approach to assessing climate policy**
- 25 Conclusion**
- 26 About the author**
- 27 Endnotes**

Introduction and summary

During his campaign and in the weeks that have followed, President-elect Joe Biden has made clear that the challenge facing his new administration is to “marshal the forces of science and the forces of hope in the great battles of our time – the battle to control the virus, the battle to build prosperity, the battle to secure your family’s health care, the battle to achieve racial justice and root out systemic racism in this country, the battle to save the climate.”¹ In taking on these battles, the new president will be forced to both reverse the damage done by the Trump administration and take on challenges that existed even before President Donald Trump took office.

In responding to proposals to build a robust and equitable response to both the fallout from the pandemic and the ever-growing climate crisis, some legislators have questioned whether the necessary action is worth the fiscal cost. Yet failing to marshal an appropriately aggressive response to these crises would be a mistake—one that risks shifting even greater burdens onto our children and grandchildren. In light of the unprecedented hit to economic activity caused by the coronavirus pandemic and other factors such as persistently low interest rates, economists have already made the case that worries about near-term deficits should not take precedence over the need to ensure a strong recovery.

Immediate investments to combat climate change should be an important component of those efforts to rebuild the economy. But more broadly, there is also a strong argument to be made that climate action is justified not only on ecological and social welfare grounds, but from a long-term fiscal perspective as well. As the risks of catastrophic climate change become clearer, more is being learned about the potential economic costs of remaining in a so-called business-as-usual scenario—one where policymakers fail to take major steps to reduce emissions. These economic impacts, of course, will ultimately manifest themselves in federal budgeting: as increased spending in areas such as public health and disaster mitigation or response, or as reduced tax revenue due to slower growth. To the extent that taking action now can reduce these economic effects, climate policies can produce long-term savings that help to offset near-term costs.

Indeed, the current pandemic offers a lesson in how to think about this challenge. COVID-19 has imposed massive costs on the federal budget, both due to its direct impact on health and economic activity and due to costs of efforts to mitigate and contain its damage. Yet the magnitude of the fiscal costs the United States is facing—and, more importantly, the human cost—were not inevitable. Investments in pandemic response before the coronavirus hit, including a larger and more effective scaling up of testing and contact tracing, or a more coherent approach that paired economic relief with public health measures would have had upfront costs but might have reduced the spread of COVID-19 in ways that could have substantially limited its economic and fiscal impact. Instead, the fiscal, economic, and human costs of the pandemic are much larger because the Trump administration failed to take steps before the pandemic hit and in its earlier stages.

The climate crisis presents similar questions, albeit on a longer time frame. 2020's hurricanes, flooding, and forest fires—all of which required federal disaster spending as a response—have served as an important reminder of how climate change is already imposing costs on the federal budget. Financial regulators have begun to wrestle with how, in the words of a recent U.S. Commodity Futures Trading Commission report, “climate change poses serious emerging risks to the U.S. financial system” and what the implications should be for financial regulation.² But despite seeing the effects of climate change in real time and a growing understanding of how it might affect the economy in future decades, little progress has been made in reimagining how to think about the fiscal impacts of climate change. While both the Office of Management and Budget (OMB) under President Barack Obama and the Congressional Budget Office (CBO) have taken initial steps to improve their understanding of these issues—including in updates to CBO's long-term budget forecasts this year—the federal budget scoring process still largely ignores climate impacts.³ The result is not only an incomplete understanding of the long-term fiscal picture, but also a political and legislative process that is likely to put a thumb on the scale against emissions-reducing investments.

While there remains considerable uncertainty about the exact magnitude of the fiscal costs that climate change will impose, enough is known today to reject any approach of fiscal analysis that is climate-ignorant. As this report discusses, applying fiscal rules of thumb to new estimates of how climate change is slowing economic growth suggests that these effects alone may be responsible for about \$60 billion per year in higher deficits as soon as 2030, growing larger over time. On a programmatic level, past projections of the impact of climate change on government spending—as a result of diminished public health, disruptions to

agriculture, and the destruction of government-owned property due to hotter temperatures, rising sea levels, and more frequent natural disasters—already reveal significant costs and may well understate the fiscal exposure faced by the U.S. government.⁴ And as major climate analyses such as the 2018 Intergovernmental Panel on Climate Change (IPCC) report warn about the potential for catastrophic outcomes ranging from migration crises to an upsurge in armed conflict to permanent damage to fragile ecosystems, policymakers must reckon with how a climate-ignorant forecast of the federal budget outlook might overlook large costs that future generations will bear if emissions are not reduced. And importantly, the conventions of budget scoring might cause policymakers to understate not only the substantial costs that come from the most likely outcomes, but also the potential for and uncertainty around even worse damage in less likely, but still plausible, scenarios.

This report intends to provide a frame for how federal policymakers might better consider climate policy and fiscal policy in tandem—even as far more analytical work needs to be done to understand climate change’s fiscal effects. It explores how existing conventions that fail to adequately consider the effect of climate on baseline budgetary projections, that focus on shorter time scales, and that largely ignore the risk of catastrophic outcomes could lead to understating the fiscal impact of climate change in a business-as-usual scenario and therefore overstate the costs of climate action. Finally, it recommends a set of actions for fiscal policymakers: 1) updating fiscal and economic baselines to take into account the costs of climate change; 2) increasing the capacity for climate modeling of new policies; and 3) reporting a wider range of economic and public welfare outcomes resulting from climate policy.

Rethinking the connection between fiscal priorities and climate priorities

Even before the pandemic hit, the nature of the discussion on the federal government's fiscal space and the scope of action needed to address the climate crisis had shifted. Economists, including former Treasury Secretary Larry Summers, former Council of Economic Advisers Chair Jason Furman, and former International Monetary Fund Chief Economist Olivier Blanchard, published widely discussed articles suggesting that—especially given the continued downward trend in real interest rates in the United States and around the world in recent decades—near-term increases in public debt may carry substantially lower risks than previously assumed.⁵ Moreover, a wide range of economists have made the case since the pandemic began that deficit fears should not stand in the way of large-scale, unpaid-for economic stimulus.⁶

On the climate side, recent analyses have also brought greater clarity around the immense potential costs of climate change from following a business-as-usual course. The IPCC's report on warming of 1.5 degrees Celsius, or 2.7 degrees Fahrenheit, and the Fourth National Climate Assessment, both published in 2018, offered a comprehensive picture of the broad array of human, economic, and environmental costs that climate change presents. Combined with a growing literature on the economics of climate change—typified by the American Climate Prospectus published in 2015—these reports emphasized how, as stated in the Fourth National Climate Assessment, continued warming will “cause substantial net damage to the U.S. economy throughout this century, especially in the absence of increased adaptation efforts.”⁷

Yet fiscal analysis as traditionally conducted by CBO and OMB has not taken into account the economic, fiscal, and distributional consequences of business-as-usual emissions or how climate policy might change that trajectory. In other words, this analysis has typically been conducted under the implicit assumption that climate change—and, in turn, measures to address it—is trivial in the broader scheme of the long-term economic and fiscal outlook. And while fiscal scoring efforts are ostensibly designed to bring longer-term policy impacts and trade-offs into relief,

they are primarily focused on a 10-year window, while climate policy operates largely on a longer timeline several decades into the future. Moreover, most fiscal forecasts focus on the single, central estimate at the middle of the probability distribution, with relatively little attention paid to the consequences of less likely, but still plausible, outcomes at the tails of the distribution. Finally, to the extent that budget scorekeepers share information on the other consequences of climate legislation on economic and human well-being, they tend to do so on an ad hoc basis, offering less information and less specificity around these other effects.

Examining these features of the budget scoring process in light of the risks of catastrophic climate change is not at odds with the principles that underpin responsible federal budgeting. Indeed, the basic idea behind a politically insulated, expertise-driven budget scorekeeping process is to provide tools that encourage political leaders to consider, and be accountable for, choices they make on policy that may have long-term consequences for the American people. Back in 1976, Alice Rivlin, the first director of CBO, in outlining the workings of her new office to Congress, said, “Like planning, the new congressional budget process is aimed at improving the rationality of decision making. In its role as an analytic arm to this new process, the Congressional Budget Office undertakes analyses that seek to raise the level of budget decision-making rationality by keeping track of the present budget effect flowing from past decisions, by explaining the future impact of current budgetary alternatives, and by outlining how projections of future events affect present options.”⁸ Yet as a senior official at the Government Accountability Office (GAO) noted in December 2019 in testimony to Congress, “[T]he effects of climate change have already posed and will continue to pose risks that can create fiscal exposure across the federal government, and this exposure will continue to increase. The federal government does not generally account for such fiscal exposure to programs in the budget process, and it has not undertaken strategic efforts to manage significant climate risks that could reduce the need for far more costly steps in the decades to come.”⁹ Just as the pandemic has exposed that an economy and society that are less prepared for a public health shock can experience outsize fiscal pain as a result, the climate crisis calls into question whether a failure to invest in resilience upfront could result in substantial cost down the line.

If climate change has the potential to upend American society, the economy and, in turn, the federal budget, it is worth asking how federal methods of fiscal analysis should appropriately take those climate risks into account. This section outlines some of the detailed questions that should be asked.

How should climate be incorporated into the baseline?

Central to both fiscal and climate modeling is a basic question: What will things look like in the future, absent any changes in policy or behavior? In budgeting, this concept is called a baseline, and it is central to the analytical work of budget scorekeepers. For both CBO and OMB, the baseline serves as the starting point for any fiscal analysis, whether of the entirety of a budget or a specific proposal. That baseline projects a set of economic conditions into the future and, on the basis of those conditions and the laws currently in place, estimates future revenues, spending, and deficit and debt levels. For policymakers, the baseline serves two primary purposes. First, it provides context around the expected fiscal and economic environment as policymakers engage in planning for the future. Ideally, policymakers should make decisions with an eye toward current expectations about the course of the nation's economic and fiscal trajectory, whether they are looking to next year or to several decades in the future. Second, a baseline serves as a starting point for evaluating the impact of any new policy. When the president or a legislator offers a new proposal, identifying how much it will change spending levels, revenues, or the macroeconomy requires first answering the question: Compared to what? Baseline projections are designed to aid in exactly that exercise, creating a starting point against which any new policy changes can be evaluated.

Likewise, climate modeling requires a similar exercise: projecting what, absent major changes in policy, will happen to emissions and ultimately warming. Recognizing the inherent uncertainties in projecting well into the future, most major modeling exercises offer a range of scenarios—often referred to as representative concentration pathways (RCPs), given that they estimate outcomes at different concentrations of greenhouse gases in the atmosphere. Often, climate analyses explore pathways that range from the low-emissions RCP 2.6 scenario to the high-emissions RCP 8.5 scenario, with more intermediate pathways in between. (The former scenario refers to 2.6 watts per meter squared of radiative forcing at the end of 2100, a measure of the combined effect of various greenhouse gases and other particles on trapping heat in the atmosphere, while the latter reflects 8.5 watts per meter squared of radiative forcing.)¹⁰

Looking at these two exercises in tandem—and, in particular, taking seriously the latest science about the climate crisis—leads to a clear conclusion: There is no longer a credible case that budget baselines can be climate-ignorant. There are enough data to show that climate change is already shaping macroeconomic growth and the government's fiscal exposure in meaningful ways, and it paints a clear enough picture

that those impacts will grow over time. The only remaining question is how budget baselines should take into account climate change—not whether they should.¹¹

In particular, policymakers need to consider how the baseline should be adjusted in the following ways.

Incorporating the macroeconomic impacts of climate change into the baseline: Fiscal projections are shaped by assumptions around future macroeconomic conditions. A faster-growing economy will result in higher revenues and reduced spending on income-based programs such as Medicaid, unemployment insurance, or food and housing assistance. Moreover, many economists look to measures of fiscal sustainability that compare debt or interest payments with the size of the economy—which means that fiscal health can be improved by increasing growth, as well as by directly addressing growth in the debt itself.

Economists have estimated that climate change could affect future economic growth through several channels, including the following few examples:

- **Lower labor productivity due to hotter temperatures:** There is a wide body of research that shows how workers are less productive at extreme temperatures, which can affect “endurance, fatigue, and cognitive performance, all of which can contribute to diminished ‘work capacity’ and mental task ability as well as increased accident risk.”¹²
- **Lower labor supply due to illness:** Not only can hotter temperatures make workers less productive, but the health consequences of climate change will have the effect of reducing labor supply, as fewer workers are healthy enough to stay in the workforce. The American Climate Prospectus project estimated that labor supply in sectors where workers are at high risk from higher temperatures, such as construction, would decrease 0.8 percent to 2.4 percent by the late 21st century under the high-emissions RCP 8.5 scenario and by 0.2 percent to 1.1 percent under the lower-emissions RCP 4.5 scenario.¹³
- **Reduced agricultural income as a result of lower yields:** As the National Climate Assessment noted, “Climate change has the potential to adversely impact agricultural productivity as local, regional, and continental scales through alterations in rainfall patterns, more frequent occurrences of climate extremes (including high temperatures or drought), and altered patterns of pest pressure.”¹⁴ Similar risks exist not only for farming, but for fishing and timber production as well as industries that rely on agricultural products.

- **Lower returns to investment as it is shifted to less productive mitigation and repair efforts:** Climate change shifts both public and private investment in ways that may be less conducive to future growth, reducing the U.S. economy's long-term potential. As the economist Solomon Hsiang recently testified to Congress, "Hurricanes, floods, tornados, droughts, and fires destroy assets that took communities years to build. Efforts to rebuild then diverts resources away from new productive investments that would have otherwise supported future economic growth."¹⁵

These are only partial examples, and they may understate the economic disruption that could occur as a result of climate change, including from sources such as geopolitical upheaval or mass dislocation. Despite these limitations, economists have tried to quantify the overall impact of climate change using one of two methods: either bottom-up approaches that combine projected impacts from various sectors, or top-down approaches that extrapolate estimates based on past data on the relationship between the climate and the economy.

Fortunately, scorekeepers have begun the task of updating their economic projections to incorporate climate. In September, CBO released a long-term budget forecast and an associated working paper that for the first time provided the agency's estimates of the impact of climate change on economic growth. Using a meta-analysis that attempted to synthesize existing research, CBO estimated that climate change, from the beginning of the 21st century through 2050, is responsible for a 1.0 percent reduction in its projected level of gross domestic product (GDP) in 2050.¹⁶ While CBO did not report the numerical impact that combined effect would have on revenues, spending, or debt, its consideration of climate impacts in its economic baseline implicitly means the agency's long-term forecasts now do include some reflection of the macro impacts of climate change on the budget.

However, CBO's estimates may provide a too conservative estimate for how climate change may affect the macroeconomy. A recent analysis performed by the Rhodium Group's Trevor Houser—a co-author of the American Climate Prospectus—projected an annual GDP impact of climate-driven changes in temperature and hurricane activity of between 1.2 percent and 1.4 percent by 2030 and between 1.8 percent to 2.4 percent by 2050.¹⁷ Estimates of this magnitude imply significant budgetary impacts due to climate change even within a shorter time frame. For example, CBO's rules of thumb concerning the relationship between GDP and revenues, spending, and deficits suggest that a 1.4 percent reduction in GDP in 2030 is associated with increased deficits of about \$60 billion a year—with that effect presumably growing over time.¹⁸

It is also important to note that even as these estimates show a substantial impact from climate change in the aggregate, that impact will be uneven across different parts of the country, across different sectors of the economy, and, ultimately, among different socioeconomic and racial groups. As Hsiang testified, “Research indicates that low-income individuals tend to bear greater cost than wealthier individuals when both are subject to the same climatic stress. In addition, many locations that are poorer today are projected to experience greater economic harms.”¹⁹ Like other economic shocks in the past—for example, due to globalization or technological change—the disruption caused by climate change will not be equally felt across the United States, and policy solutions that ignore that fact will leave many people and communities substantially worse off.

To offer one example, Houser estimates that because poorer counties tend to be hotter, “The poorest 10 percent of counties in the United States face likely damages of 9 to 20 percent of income, while the richest 10 percent see between a 3 percent loss and a 0.4 percent gain” by the end of the century due to climate change under the high-emissions RCP 8.5 scenario.²⁰ As a result, climate change on its current course is likely to be regressive. As policymakers better incorporate the overall impact of climate change into their baselines and their estimates of a given policy’s impact, they should pay close attention to how a business-as-usual approach might affect communities differently—and how the benefits of action might disproportionately accrue to those most at risk.

Assessing costs for existing programs: Under long-term budget protections, a large and growing share of projected spending falls under the mandatory side of the budget—spending that, rather than being dictated by the annual appropriations process, results from statutory criteria. This includes not only Social Security, Medicare, and Medicaid, but also a set of other programs ranging from flood insurance to crop subsidies. All these programs, absent future legislation, will continue to pay out each year in the future according to criteria already set by Congress.

The direct and indirect effects of climate change have the potential to change expected spending under these existing programs—and indeed, research shows how natural disasters such as hurricanes can cause a substantial increase in non-disaster government transfers, including unemployment insurance and health spending.²¹ In 2016, OMB released a report on the potential fiscal risks of climate change, in which it estimated the effect of different warming scenarios on selected areas of the federal budget.²² In the case of crop insurance and health care costs

due to air quality-related illnesses, the report attempted to—based on current law and spending in these areas—evaluate how federal costs might increase over time due to climate change.

OMB estimated that by 2100, reduced air quality as a result of unmitigated climate change would increase spending in federal health programs by \$8 billion a year, in 2015 dollars, due to higher Medicare, Medicaid, and Veterans Affairs health care costs as a result of more nonfatal heart attacks, more respiratory and cardiovascular hospital admissions, and more asthma emergency room visits.²³ That figure alone would be only a very small portion of federal health spending, but it is best understood as an illustrative example rather than an indicator of the broader ways in which climate change could shape federal health spending. Indeed, that figure ignores the impact on federal subsidies for private health insurance, including through Affordable Care Act (ACA) subsidies and tax expenditures that subsidize health care, as well as follow-on consequences from health impacts on labor force participation or productivity.

More importantly, diminished air quality only reflects one potential health consequence of climate change among many. As the Fourth National Climate Assessment described, “Climate change affects human health by altering exposures to heat waves, floods, droughts, and other extreme events; vector-, food- and waterborne infectious diseases; changes in the quality and safety of air, food, and water; and stresses to mental health and well-being.”²⁴ Consider each of the following examples noted in the National Climate Assessment:

- More frequent and extreme hot days increase hospital admissions and emergency room visits as a result of cardiovascular and respiratory complications, renal failure, kidney stones, and negative impacts on fetal health.
- Climate change increases the range and distribution of vector-borne illnesses such as Lyme disease, West Nile virus, dengue, and Zika, introducing these diseases into new parts of the United States.
- Increased water temperatures raise the risk of waterborne pathogens and toxic algae blooms, while flooding and extreme precipitation result in sewage overflows that spread viral and bacterial contamination.
- Climate change alters exposure to foodborne pathogens such as salmonella and disrupts food availability, while rising carbon dioxide concentrations decrease nutrients such as iron and zinc in crops and seafood.

- A higher prevalence of flood, drought, or hurricanes results in increased anxiety, stress, depression, and post-traumatic stress disorder, while hotter days lead to more aggressive behavior.

In any of these cases, more prevalent, more chronic, and more severe illnesses will mean higher health care costs, including for the federal programs that—under law—cover a significant, and rising, share of those costs nationwide. Absent a fuller consideration of how climate change affects these health costs, a baseline scenario might understate the federal spending under the status quo.

Similarly, OMB estimated that by the late 21st century, crop insurance premium subsidies would rise by a mean estimate of \$4.2 billion per year in 2015 dollars under unmitigated climate change, using an approach that calculated how forecasted changes in crop yields would affect payments under the existing crop insurance program. But again, this is likely a very conservative picture of the impact of climate change on agriculture, given warnings of more catastrophic disruptions to farming and fisheries both in the United States and around the world.

Response and mitigation costs: A second category of federal spending that might be included in a climate-adjusted baseline would incorporate the expected costs, outside existing programs, from responding to and mitigating the physical damage caused by climate change. This includes spending that might be reasonably expected as a result of climate change and its consequences but that would not automatically occur as a matter of current law or policy. In technical terms, this category encompasses discretionary spending—the appropriations that Congress passes on either an annual or emergency basis, rather than being set automatically by statute. Examples of this kind of spending might include disaster relief packages as a result of hurricanes or the costs of repairing or rebuilding public assets such as infrastructure or military installations. Under existing budgeting conventions, the baseline incorporates projected disaster spending simply by extending past expenditures into the future, meaning that any expected increase in the costs of natural disasters is left unaccounted for.

Aside from the potential need for disaster appropriations that provide relief to affected communities, the federal government faces fiscal exposure due to the fact that it owns property and land, from military installations to federal buildings to infrastructure. As OMB notes, the federal government “owns more than 775,000 individual buildings and structures with a total estimated replacement cost of nearly \$1.9 trillion.”²⁵ In 2018, according to GAO, Hurricane Florence caused \$3.6 billion

in damages to Camp Lejeune and other Marine Corps facilities in North Carolina, and Hurricane Michael caused \$3 billion in damage to Tyndall Air Force Base in Florida, which is a reflection of the potential exposure to the U.S. Department of Defense's \$1 trillion in domestic and overseas infrastructure.²⁶ GAO separately estimates that "the federal government manages about 650 million acres of land in the United States that could be vulnerable to climate change, including the possibility of more frequent and severe droughts and wildfires."²⁷ As GAO notes, however, little work has been done to actually assess the total fiscal risk that climate change presents to the buildings and land owned by the federal government.

In its report, OMB did provide an initial indication of the potential scale of the damage from one source of risk: coastal flooding.²⁸ Looking at a subset of the federal government's inventory with more precise location information, OMB identified 18,000 individual buildings and structures with a total replacement cost of \$83 billion located in the current 100-year flood plain, based on Federal Emergency Management Agency flood plain maps. According to the report, those buildings and structures represent "roughly 8 percent of the subset of records and 14 percent of the subset replacement value." In addition, "Tens of thousands of additional assets, with a total replacement cost of \$25 billion, were identified in the current 500-year floodplain." OMB also identified 12,000 federal buildings or structures—mostly associated with the Defense Department—"with a replacement cost of \$62 billion, that would be inundated or severely affected by the average high tide under a six foot sea level rise scenario." Importantly, OMB made clear that, aside from the modeling challenges associated with identifying flood risks, its estimates were only for a share of federal assets, with \$1 trillion in federally owned structures not included in its analysis.

Unlike the mandatory programs described above, disaster relief or repairing and rebuilding federal assets would require Congress to appropriate new funding for those purposes, which future congressional lawmakers could or could not choose to approve. But a more realistic assessment of Congress' likely behavior in the future would take these costs into account, given the low probability that legislators would decide not to appropriate assistance to disaster-stricken communities or to allow federal properties to go unrepaired.

Incorporating national security risks: The nation's military and national security experts have, since the 1980s, called attention to the risks that climate change poses to American security, and these concerns have been amplified in recent years.²⁹ In 2015, for example, the Defense Department wrote to Congress that "cli-

mate change is an urgent and growing threat to our national security, contributing to increased natural disasters, refugee flows, and conflicts over basic resources such as food and water.”³⁰ Even under the Trump administration, the Worldwide Threat Assessment issued by the Office of the Director of National Intelligence has described the risks climate change poses: “Global environmental and ecological degradation, as well as climate change, are likely to fuel competition for resources, economic distress, and social discontent through 2019 and beyond.”³¹ Academic research has identified historical connections between climate change and civil conflict; while the direct connection between global warming and armed conflict remains an area of continued study, a recent expert elicitation study that examined the views of top climate scholars from across disciplines estimated a 26 percent increase in conflict risk as a result of warming of 4 degrees Celsius, or 7.2 degrees Fahrenheit—compared with 13 percent under a 2 degrees Celsius, or 3.6 degrees Fahrenheit, warming scenario.³²

Defense spending currently equals about 3.5 percent of GDP—and under current budgetary projections, it is expected to fall as a share of the economy over time. But an increase in security risks as a result of climate change—whether due to regional conflicts that arise from resource competition, destabilization caused by climate-induced migration, or a greater need for U.S. military personnel to deliver humanitarian assistance—will likely increase the cost of keeping America safe. In addition to defense spending, the need for and salience of international aid will likely increase as a result of the dislocation and resource deprivation that climate change will cause in many parts of the world.

Given the inherent uncertainty in predicting how climate change will affect global security, calculating a precise estimate for how this risk will affect future defense and international aid spending is a difficult endeavor. But at the same time, ignoring the likelihood that climate change will produce costs in this space understates the fiscal pressure that global warming will cause on the federal budget. As national security experts gain a better understanding of how different warming paths may affect the risks to U.S. and global security, those risks should be priced into expectations of future spending.

What is the right time frame for analysis?

Fiscal and climate analysis, as a matter of practice, tend to operate on different time scales. From both a political and institutional perspective, fiscal analysis at the current moment focuses most frequently on a 10-year time frame. For example, as part of the president's budget, OMB reports detailed projections of spending, revenues, deficits, and macroeconomic indicators over a 10-year budget window. Likewise, CBO estimates of the fiscal and economic impacts of legislation are typically focused on a 10-year time horizon. These analytical conventions reflect more formal legal and institutional practices: Both statutory and legislative pay-as-you-go rules consider budget impacts five and 10 years in the future, and both budget resolutions and the related reconciliation process typically specify spending, revenue, and deficit levels over a 10-year window. While both CBO and OMB do engage in longer-term budget analysis, they do so less frequently, with less granularity, and typically outside the context of specific legislative proposals.³³

Climate analysis, while lacking the same formal conventions as budget scoring, tends to look at a longer timeline, looking toward outcomes at midcentury, 2100, or beyond. This leads to a potential mismatch when considering climate legislation. That is to say, the fiscal impact of legislation might be considered on a 10-year timeline, while its climate outcomes are evaluated, and designed to have impact, over a much longer time horizon. This mismatch is not wholly unique to climate policy. Arguably, other investments, whether in education, research and development, or infrastructure, are designed to pay off over a period that extends well beyond the 10-year budget window. And the conceptual issues at play are not especially new in either the climate or public economics worlds. In both cases, there is a substantial body of both theoretical and empirical research concerning questions about the relative value that should be put on future outcomes compared with current ones. Indeed, a central question in both fields concerns what discount rate should apply when evaluating the preferences that one might have for a given outcome today over one in the future.

Yet within the actual institutions that make climate policy and the analysis accessible to policymakers as they make decisions about legislation, what is mostly absent is serious consideration of how to balance future benefits against present costs. While CBO has, in the past, provided some information about economic outcomes of legislation beyond the 10-year window, the legislative analysis it produces that receives the most attention—and that has a formal role in the budgeting process—focuses almost exclusively on the upcoming decade.³⁴ Effective climate

change policy is explicitly designed to incur some near-term costs to avoid much greater expenses in the future. The current mode of fiscal analysis, both in concept and in practice, is likely to far overweight those present costs and underweight future costs in a way that can stack the deck against fiscally prudent action.

How should fiscal analysis consider the potential for catastrophic outcomes?

The need for climate action is predicated on a recognition not only that the most likely scenarios could have significant adverse consequences for the future of humanity, but also that climate change presents smaller but nontrivial risks of much more dire outcomes. That is especially true for two reasons: First is the possibility of feedback loops and self-reinforcing cycles, where physical processes such as the melting of Arctic snow and ice can accelerate warming,³⁵ and second is the potential for bad outcomes to be truly catastrophic, involving consequences that would result in a far greater loss of life or in far larger portions of the United States being uninhabitable than under more likely scenarios. As the economist Martin Weitzman wrote, “A fat tail for rare disasters has the potential to dominate economic calculations like the SCC [social cost of carbon]. Therefore, analysis of a situation that might potentially be catastrophic cannot afford to ignore tail behavior. It is not enough in such situations to look just at measures of central tendency or even just at thin-tailed probability distributions.”³⁶

In considering these uncertainties, it is worth emphasizing that it is not necessary to contemplate especially unlikely climate scenarios to identify the potential for outcomes that most people would fairly describe as catastrophic. The IPCC report notes the risk for “large-scale singular events”—described as “components of the global Earth system that are thought to hold the risk of reaching critical tipping points under climate change, and that can result in or be associated with major shifts of the climate system”—as being “high,” at between 1.6 degrees and 4.6 degrees Celsius warming, with the increase in risk being “disproportionately large,” between 1.6 degrees and 2.6 degrees Celsius.³⁷ The IPCC report notes that the consequences of these large-scale singular events, such as accelerated melting of polar ice sheets, a slowdown in the Gulf Stream, extreme El Nino events, or shifts in the Southern Ocean, are generally under-considered or fully ignored from typical models of climate damage, noting that “further analyses of the potential economic consequences of triggering these large-scale singular events have indicated a two to eight fold larger economic impact associated with warming of 3°C

than estimated in most previous analyses, with the extent of increase depending on the number of events incorporated.”³⁸ More broadly, the IPCC report summarizes “one possible storyline among worst-case scenarios” at 3 degrees Celsius warming by 2100—well within the range of business-as-usual forecasts—as including the following consequences:

- “Starting with an intense El Niño–La Niña phase in the 2030s, several catastrophic years occur while global warming starts to approach 2°C. There are major heatwaves on all continents, with deadly consequences in tropical regions and Asian megacities, especially for those ill-equipped for protecting themselves and their communities from the effects of extreme temperatures.”
- “A hurricane with intense rainfall and associated with high storm surges ... destroys a large part of Miami. A two-year drought in the Great Plains in the USA and a concomitant drought in eastern Europe and Russia decrease global crop production, ... resulting in major increases in food prices and eroding food security. Poverty levels increase to a very large scale, and the risk and incidence of starvation increase considerably as food stores dwindle in most countries; human health suffers.”
- “Global mean warming reaches 3°C by 2100 but is not yet stabilized despite major decreases in yearly CO₂ emissions, as a net zero CO₂ emissions budget could not yet be achieved and because of the long lifetime of CO₂ concentrations. ... The world as it was in 2020 is no longer recognizable, with decreasing life expectancy, reduced outdoor labour productivity, and lower quality of life in many regions because of too frequent heatwaves and other climate extremes. ... Droughts and stress on water resources renders agriculture economically unviable in some regions ... and contributes to increases in poverty. ... Almost all ecosystems experience irreversible impacts, species extinction rates are high in all regions, forest fires escalate, and biodiversity strongly decreases, resulting in extensive losses to ecosystem services. These losses exacerbate poverty and reduce quality of life.”
- “Several small island states give up hope of survival in their locations and look to an increasingly fragmented global community for refuge. ... Aggregate economic damages are substantial, owing to the combined effects of climate changes, political instability, and losses of ecosystem services. ... The general health and wellbeing of people is substantially reduced compared to the conditions in 2020 and continues to worsen over the following decades.”

Needless to say, the outcomes outlined in this worst-case scenario—one that could still be reasonably described as well within the bounds of plausible outcomes in a business-as-usual world—would pose significantly greater fiscal costs than those contemplated under today’s central projections of climate change. Like any economic modeling, fiscal projections involve considerable uncertainty, and admirably, fiscal scorekeepers such as CBO frequently look back at previous forecasts to identify how much they have missed by.³⁹ CBO also released a recent report on “one-sided bets” to illustrate how the agency tries to evaluate proposals where different outcomes with varying probabilities might result in very different budgetary impacts.⁴⁰ But taking into account the possibility of catastrophic outcomes—both which will result in far greater costs than the base scenario and which policymakers and the public would likely pay handsomely to avoid—is necessary in order to accurately assess the potential fiscal toll of climate change.

As the economist Michael Greenstone has written, a weakness in current efforts to model the economic effects of climate change is that they treat “climate damages as a known quantity. However, the estimates of climate damages are uncertain for a variety of reasons, including uncertainty about the climate sensitivity parameter, underlying damage estimates, and a variety of other factors. The problem is that people do not like uncertainty, especially when large losses are possible.”⁴¹ That is true for individuals fearing whether they might lose their home to a flood, businesses questioning whether to make investments in areas at risk for disasters, or broader communities who do not want to see disruption to their way of life. A fiscally responsible approach to climate policy should at minimum take this principle in mind, acknowledging the possibility of catastrophic outcomes in its forecasts and ideally using an analytical framework that encourages steps that would minimize the possibility of those outcomes. Arguably, fiscal analysis of climate policies today may actually do the opposite: emphasizing the costs of near-term measures that might limit the probability of the most damaging climate outcomes, while minimizing the estimated benefits.

Understanding what is meant by ‘fiscal responsibility’

In the examples above, this report has attempted to identify ways in which the current conventions of federal budget analysis might serve to overstate the fiscal costs of taking aggressive action on climate change and to understate its benefits. Importantly, though, these complications only relate to that one element of analysis: namely, how much a proposal costs in terms of its impact on the federal budget. That question is one that policymakers should consider in evaluating a given approach, but it is also only one question of many.

The federal budget process is designed to place an emphasis on taking the fiscal impacts of policies seriously—whether because of the potential economic consequences of persistently high levels of debt, such as the possibility of higher interest rates and their impact, or to illustrate the trade-off between deficit-increasing measures today and actions that might be necessary to reverse those deficits in the future. But policymakers should care about those fiscal impacts not simply for their own sake, but also because of their potential impact on a broader range of economic outcomes and public welfare—for both current and future generations. As Olivier Blanchard said last year, “If there is an intergenerational aspect to this, if we say it’s about climate change and we spend a lot of money doing things now, it may make sense to have a bit more debt. ... I think that captures the fact that if we do something for future generations, that maybe part of it should be borne by them.”⁴²

Especially given the relative resources and attention paid to fiscal analysis of new policy during the legislative process, it is important to recognize where that analysis may have gaps. Consider the example of the health consequences of climate change described above: As OMB’s report on the fiscal risks of climate change noted, “[W]hile premature mortality will likely account for the overwhelming majority of economic losses from climate impacts related to health, the non-fatal and chronic health effects will impose the greatest burden for public and private health insurers.”⁴³ Put another way, under some approaches, a more accurate fiscal analysis might, appropriately, give credit to climate action for reducing the

costs to Medicare and Medicaid related to caring for people with climate change-associated illnesses—but still largely ignore the much more significant benefit that comes from people living longer.

Indeed, many of the likely consequences of climate change, from people choosing to preemptively move from areas at risk of floods to the risks to plant and animal species to the simple discomfort from unpleasantly hot days, would not be reflected even in the most sophisticated fiscal scores. Especially as the effects of climate change will not be borne equally by all people or in all communities, simply ignoring these consequences because they do not show up in fiscal analysis could result in particularly inequitable outcomes. And they may miss places where, even if it is outside economists' current analytical capacity, action could reduce eventual fiscal costs. Where they can, future generations and future policymakers will likely be willing to pay considerably to avoid premature deaths, prevent dislocation, and otherwise mitigate the painful consequences of climate change. Preventative measures today that help future generations avoid ever having to pay these costs may well be a fiscally responsible approach, even if they do not show up in today's fiscal estimates.

Developing a fiscally responsible approach to assessing climate policy

The federal budget process was explicitly designed to encourage policymakers to take into account how decisions made today might affect future outcomes. The climate crisis creates both a need and an opportunity to rethink how policymakers should evaluate policies that might incur short-term costs but accrue significant benefits to future generations, both in terms of the federal budget and beyond. In particular, the current understanding of climate risks argues for taking the following steps:

1. Updating fiscal and economic baselines for climate change—under a variety of scenarios: In order to better understand the fiscal impact of new climate policies, policymakers first need more sophisticated modeling on how climate change under a status quo path will affect the U.S. economy and the federal budget. As described above, scientists and economists are developing a better understanding of how climate change might affect areas such as public health, agriculture, and the frequency of natural disasters, as well as the broader macroeconomy—all of which will have an impact on federal revenue and spending levels. Building off that research and the initial work already done by CBO and OMB, both agencies should develop more comprehensive models on how various climate paths will affect the economy and the budget.

In doing so, the budget scorekeepers should develop both a base case that is incorporated into the overall baseline, as well as a set of alternative scenarios based on different emissions pathways. Constructing this baseline should reflect estimates of how both the macroeconomy and specific federal programs might be affected by climate change. These scenarios should be designed to allow policymakers to understand uncertainty in the forecasts around both changes in the Earth's climate and their economic and budgetary effects, including the potential for more catastrophic outcomes. CBO and OMB should also work to provide information that explains how the impacts of climate change might be experienced differently by different populations, including the ways in which those impacts might be distributed by income, race, and geography.

In incorporating climate change impacts more completely in their modeling, CBO and OMB should seek to achieve three things. First, given the fact that climate change is likely to have meaningful effects on the future state of the economy and the budget, both agencies should seek to make their standard baseline model more accurate to account for those effects. Second, CBO and OMB should seek to provide policymakers with forecasts specifically focused on the potential economic and budgetary impacts of climate change, in order to improve understanding of this space, including the potential distributional effects of climate change. Finally, CBO and OMB should explicitly provide policymakers with tools, including multiple scenarios and error bands, to help better understand the uncertainty around climate projections and, in particular, potential tail risks.

CBO's recent effort to incorporate the growth effects of climate change into its macroeconomic forecast and to provide the public with a detailed accounting of its approach is a welcome first step in this process. In addition to further refining this forecast, the next step is for CBO to more fully incorporate climate effects into its spending, revenue, and deficit estimates. This is especially true in evaluating the impact of climate on particular programs. Similarly, while OMB's 2016 report was illustrative in showing the impact of climate on areas of the federal budget, its insights have been entirely ignored by the Trump administration's OMB. Future administrations should work to fully incorporate climate into their budget projections.

2. Increasing the capacity for climate modeling of new policies: Evaluating the complete economic and budgetary impact of climate policy involves first understanding how a proposal might affect emissions, and then how that change in emissions might affect economic outcomes, including revenues and spending. To do that effectively, budget scorekeepers will need to significantly increase their capacity for climate analysis either by developing climate models in-house or closely partnering with other agencies that have the ability to show how different policy options might affect emissions and how those emissions levels will, in turn, shape other economic outcomes.

The goal of building this capacity should be twofold. First, it is important for policymakers in both the executive and legislative branches to have access to state-of-the-art modeling as they develop policy options that take into account the climate crisis. For example, in Congress, the process for developing tax or health policies typically involves an iterative effort between legislators and ana-

lysts at CBO and the Joint Committee on Taxation. This process allows policymakers to better match their policy design with their intended goals, whether by revealing the potential unintended consequences of an approach or helping to identify the pros and cons of various options. Policymakers should have access to technical modeling expertise that would allow them to make science-driven decisions on climate policy.

Second, both policymakers and the public would benefit from better information about how new legislation would affect the climate and, as a result, economic and fiscal outcomes. If a bill, whether climate-focused or not, will have a major impact on emissions, that impact should be a topic of legislative debate just like the bill's impact on the budget or GDP growth. CBO and OMB should develop standardized, transparent approaches for publicly reporting both the emissions impacts of pending legislation and how those impacts flow into their estimates of a bill's fiscal and economic impact.

There are precedents for this approach. CBO, for example, has developed a sophisticated health care model, in collaboration with a group of outside experts, that it uses when it analyzes health care proposals. Its estimates of the fiscal and economic impact of health policies are informed by a microsimulation model that projects how individuals, employers, and health insurance markets will respond to policy changes.⁴⁴ By investing in this technical expertise, CBO has sought to both improve the accuracy of its fiscal and economic estimates of new health legislation and provide more information for legislators and the public on how proposals might affect the health care system.

As this report has acknowledged, providing climate analysis of legislation requires wrestling with considerable uncertainty—about how specific policies affect emissions and about how those emissions changes will affect other outcomes. Doing so accurately should take into account how changes in federal policy could affect other actors—not only states, businesses, and households, but also other countries whose climate policies may be affected by policies enacted by the United States. This requires acknowledging the uncertainty around these behavioral changes. Fortunately, there are precedents in CBO scoring for this as well. While evaluating potential health care changes during the ACA repeal debate in 2017, for example, CBO made assumptions about how many states might take advantage of different waivers contemplated under new proposals.⁴⁵

Enabling this kind of detailed analysis will require Congress to provide resources to scorekeepers to build the necessary modeling capacity. Earlier this year, the majority staff report of the House Select Committee on the Climate Crisis recommended that “Congress should support expanding CBO’s capacity to model and analyze the fiscal and economic effects of major climate risk impacts expected from proposed legislation, including potential savings from avoided costs and reduced risks associated with federal resilience investments.”⁴⁶ The report also called for OMB to “enter into an agreement with the National Academies of Science, Engineering, and Medicine to assess the state of scientific knowledge on evaluation of climate-related benefits and costs in federally supported projects, such as risks of flooding, wildfire, and extreme weather.” Sen. Bernie Sanders (I-VT), the ranking member of the Senate Budget Committee, put forward in 2014 legislation that would have required CBO to issue a climate score on the emissions impact of new legislation.⁴⁷

Importantly, this approach would also require reckoning with the climate impact—positive or negative—of major legislation that is not primarily designed to affect emissions. As the Roosevelt Institute’s Rhiana Gunn-Wright, Kristina Karlsson, Kitty Richards, Bracken Hendricks, and David Arkush recently wrote about stimulus proposals, “The choice facing policymakers is not ‘climate-friendly’ policies or ‘climate-neutral’ policies. All stimulus policies have the potential to affect emissions levels, even if they do not directly relate to climate or emissions.”⁴⁸ To the extent that major bills will affect emissions, positively or negatively, policymakers should be aware of that and take it into account—allowing them to shape policy design in ways that are conscious of the climate impact and avoid incurring future climate-related costs.

3. Reporting a wider range of economic and public welfare outcomes

resulting from climate policy: Providing policymakers with a more complete understanding of the impacts of climate policy will require reporting outcomes that go beyond fiscal and GDP effects. Analyses of legislation with significant emissions impacts should offer estimates of how those changes in emissions levels will affect other measures of well-being over different time frames, including mortality and life expectancy, morbidity, extreme heat days, and property damage.

Such an approach would not be altogether new: CBO already offers qualitative analysis about a wide range of policy impacts when it scores legislation. Additionally, with the benefit of the health care modeling capacity it has built, CBO has in recent years provided significant quantitative information about

health care legislation beyond its simple fiscal impact, including insurance coverage and premium costs, even though those calculations are not expressly required as part of the scoring process. The executive branch, of course, has the capacity to provide estimates of nonfiscal effects of legislation through a variety of channels, including the Council of Economic Advisers and from Cabinet agencies themselves.

Currently, CBO attempts to answer questions from legislators about these nonbudgetary questions when asked. In 2009 and 2010, for example, CBO provided information on a range of questions about pending cap-and-trade legislation, including around household costs, regional impacts, and unemployment. CBO should incorporate these broader measures of economic and welfare impacts into its standard analysis of climate legislation, and not merely when asked directly by members of Congress. As CBO itself notes, “Though CBO has remained true to its original mission, it works with the Congress in ways probably not envisioned when it was first created.”⁴⁹ Given the potential magnitude of climate change’s effects on mortality, morbidity, and the physical environment, CBO should view these questions as central to its analytical mission.

Conclusion

Fiscal scorekeeping and the budget process it supports is designed to help policy-makers consider how today's policy choices might affect costs facing the federal government—and, by extension, the American people—in the future. To ignore the potential impact of climate change on the economy and the budget is to engage in fiscal policy with one eye closed. Properly assessing both the likely costs under a base case scenario as well as the potential for more extreme downside risks is crucial. Indeed, policymakers who are especially focused on the risks of future deficits and debt should be the ones most concerned by the possibility that those risks are not properly understood because the potential impacts on climate change are being ignored. Moreover, any efforts toward fiscal responsibility should view policies that address the longer-term costs of climate change as central to that agenda, even if those policies might involve some increase in deficits in the near term.

Of course, providing more accurate and complete estimates of the impact of climate change—and the effect of legislation to combat it—is only part of the challenge. That information must also be incorporated into the legislative process. In particular, legislators, as well as the experts, advocates, and journalists involved in the policy process, should be conscious of the ways in which the existing conventions and rules of budgeting might actually put a thumb on the scale against taking actions that would improve the welfare of future generations.

In evaluating the deficit impacts of potential legislation, policymakers should be explicit in factoring in the potential long-term budget impacts of climate legislation into any consideration of a bill's fiscal cost. Even beyond that, policy debates around climate legislation—and the analysis that feeds into it—should consider the full range of that legislation's impacts in tandem. Policymakers should evaluate the effects of legislation on long-term fiscal metrics alongside other metrics—for example, changes in human well-being such as mortality and morbidity—as well as estimates concerning the physical impacts of climate change. This evaluation should be done with particular attention to both the tail risk of the most extreme outcomes, as well as to how the consequences of climate change will not be equally

felt. But it requires a framework that, while rightfully giving attention to the fiscal costs that might be borne by future generations, also identifies and, wherever possible, quantifies the nonfiscal benefits that might be accrued to those future generations as well.

The latest science is clear: Absent new policy efforts, climate change will impose significant—and, in some cases, catastrophic—costs on future generations, including for the federal budget. The U.S. budget process must acknowledge that reality, providing policymakers with a clearer picture of the costs of inaction that can clarify the coming debates over how to address this existential threat.

About the author

Jacob Leibenluft is a senior fellow at the Center for American Progress. He previously served as deputy director of the National Economic Council and deputy assistant to the president for economic policy in the Obama White House.

Endnotes

- 1 The Associated Press, "Transcript of President-elect Joe Biden's Victory Speech," November 7, 2020, available at <https://apnews.com/article/election-2020-joe-biden-religion-technology-race-and-ethnicity-2b961c70bc-72c2516046bffd378e95de>.
- 2 Market Risk Advisory Committee Climate-Related Market Risk Subcommittee, "Managing Climate Risk in the U.S. Financial System" (Washington: U.S. Commodity Futures Trading Commission, 2020), available at <https://www.cftc.gov/sites/default/files/2020-09/9-9-20%20Report%20of%20the%20Subcommittee%20on%20Climate-Related%20Market%20Risk%20-%20Managing%20Climate%20Risk%20in%20the%20U.S.%20Financial%20System%20for%20posting.pdf>.
- 3 See Congressional Budget Office, "The 2020 Long-Term Budget Outlook" (Washington: 2020), available at <https://www.cbo.gov/publication/56516>; Evan Herrnstadt and Terry Dinan, "CBO's Projection of the Effect of Climate Change on U.S. Economic Output: Working Paper 2020-06" (Washington: 2020), available at <https://www.cbo.gov/publication/56505>.
- 4 Office of Management and Budget, "Climate Change: The Fiscal Risks Facing the Federal Government" (Washington: Obama White House, 2016), available at https://obamawhitehouse.archives.gov/sites/default/files/omb/reports/omb_climate_change_fiscal_risk_report.pdf.
- 5 Jason Furman and Lawrence Summers, "A Reconsideration of Fiscal Policy in the Era of Low Interest Rates" (Washington: Peter Institute for International Economics, 2020), available at <https://www.piie.com/system/files/documents/furman-summers2020-12-01paper.pdf>; Olivier Blanchard, "Public Debt and Low Interest Rates," *American Economic Review* 109 (4) (2019): 1197–1229, available at <https://www.nber.org/papers/w25621>.
- 6 Chye-Ching Huang and others, "Putting the Size of the Needed COVID-19 Fiscal Response in Perspective" (Washington: Center on Budget and Policy Priorities, 2020), available at <https://www.cbpp.org/research/federal-budget/putting-the-size-of-the-needed-covid-19-fiscal-response-in-perspective>.
- 7 U.S. Global Change Research Program, "Fourth National Climate Assessment" (Washington: 2018), available at https://nca2018.globalchange.gov/downloads/NCA4_2018_Full-Report.pdf.
- 8 Alice M. Rivlin, "Statement of Alice M. Rivlin, Director, Congressional Budget Office, Before the Joint Session of the Subcommittee on Fisheries and Wildlife Conservation and the Environment of the House Committee on Merchant Marine and Fisheries and the Subcommittee on Environment and Atmosphere of the House Committee on Science and Technology," June 30, 1976, available at https://www.cbo.gov/sites/default/files/94th-congress-1975-1976/reports/1976_06_30_wildlife.pdf.
- 9 J. Alfredo Gómez, "Climate Change: Potential Economic Costs and Opportunities to Reduce Federal Fiscal Exposure" (Washington: U.S. Government Accountability Office, 2019), available at <https://www.gao.gov/assets/710/703452.pdf>.
- 10 For further discussion of RCPs, see, for example, Intergovernmental Panel on Climate Change, "Future Climate Changes, Risks and Impacts," in Core Writing Team, Rajendra K. Pachauri, and Leo Meyer, eds., "Climate Change 2014: Synthesis Report" (Geneva: Intergovernmental Panel on Climate Change, 2015), available at https://ar5-syr.ipcc.ch/topic_futurechanges.php.
- 11 Notably, economist Lint Barrage has also pointed out that the failure to incorporate the fiscal costs of climate change risks underestimating the welfare costs of global warming considered when calculating the social cost of carbon. See Lint Barrage, "The Fiscal Costs of Climate Change," *AEA Papers and Proceedings* 110 (2020): pp. 107–112, available at <https://www.aeaweb.org/articles/pdf/doi/10.1257/pandp.20201082>.
- 12 Solomon Hsiang and others, "American Climate Prospectus: Economic Risks in the United States" (New York: Rhodium Group, 2014), p. 68, available at https://www.impactlab.org/wp-content/uploads/2017/10/AmericanClimateProspectus_v1.2.pdf.
- 13 Ibid., p. 71.
- 14 U.S. Global Change Research Program, "Fourth National Climate Assessment," p. 393.
- 15 Solomon Hsiang, "Statement of Solomon Hsiang, Chancellor's Professor of Public Policy, University of California, Berkeley; Director, Global Policy Laboratory, Goldman School of Public Policy; Co-Director, The Climate Impact Lab to the United States House Committee on the Budget, hearing on 'The Costs of Climate Change: Risks to the U.S. Economy and the Federal Budget,'" June 10, 2019, available at https://budget.house.gov/sites/democrats.budget.house.gov/files/documents/House_Testimony_Hsiang_6_10_19_final.pdf.
- 16 See Congressional Budget Office, "The 2020 Long-Term Budget Outlook"; Herrnstadt and Dinan, "CBO's Projection of the Effect of Climate Change on U.S. Economic Output."
- 17 Trevor Houser, "Climate Convexity: The Inequality of a Warming World," in Aspen Economic Strategy Group, *Securing Our Economic Future* (Washington: The Aspen Institute, 2020), available at <https://www.economicstrategygroup.org/wp-content/uploads/2020/12/8-Houser.pdf>.
- 18 CBO's rules of thumb show what small adjustments to productivity or labor force growth would mean for revenues, spending, and deficits. As CBO explains, a 0.1 percentage-point decline in productivity growth every year from 2020 to 2030 would result in real GDP levels 1.4 percent lower than under CBO's baseline forecast and deficits \$63 billion higher in 2030. Using CBO's workbook, a 0.2 percentage-point decline each year in labor force growth would also result in GDP levels 1.4 percent lower—with about a \$70 billion increase in deficits in 2030 under that scenario. See Congressional Budget Office, "Workbook for How Changes in Economic Conditions Might Affect the Federal Budget, February 2020," February 6, 2020, available at <https://www.cbo.gov/publication/56097>; Congressional Budget Office, "How Changes in Economic Conditions Might Affect the Federal Budget: 2020 to 2030" (Washington: 2020), available at <https://www.cbo.gov/publication/56096>.
- 19 Ibid.; Hsiang, "Statement of Solomon Hsiang."
- 20 Houser, "Climate Convexity."
- 21 Tatyana Deryugina, "The Fiscal Cost of Hurricanes: Disaster Aid Versus Social Insurance" (Champaign, IL: University of Illinois at Urbana-Champaign, 2016), available at <https://secureservercdn.net/166.62.111.84/0zv.ccf.myftpupload.com/wp-content/uploads/2018/11/AEJPol-2014-0296-Deryugina-safety-net-final.pdf>.
- 22 Office of Management and Budget, "Climate Change."
- 23 Ibid.

- 24 See U.S. Global Change Research Program, "Fourth National Climate Assessment," Chapter 14.
- 25 Ibid.; Office of Management and Budget, "Climate Change."
- 26 J. Alfredo Gómez, "Climate Change: Opportunities to Reduce Federal Fiscal Exposure (Washington: U.S. Government Accountability Office, 2019), available at <https://www.gao.gov/assets/700/699605.pdf>.
- 27 Ibid.
- 28 Office of Management and Budget, "Climate Change."
- 29 Dana Nuccitelli, "Climate change poses security risks, according to decades of intelligence reports," Yale Climate Connections, April 8, 2019, available at <https://yaleclimateconnections.org/2019/04/the-long-history-of-climate-change-security-risks/>.
- 30 U.S. Department of Defense, "National Security Implications of Climate-Related Risks and a Changing Climate" (Washington: 2015), available at <https://archive.defense.gov/pubs/150724-congressional-report-on-national-implications-of-climate-change.pdf>.
- 31 Daniel Coats, "Statement for the Record: Worldwide Threat Assessment of the US Intelligence Community" (Washington: Office of the Director of National Intelligence, 2019), available at <https://www.dni.gov/files/ODNI/documents/2019-ATA-SFR---SSCL.pdf>.
- 32 Tamma Carleton and Solomon Hsiang, "Social and economic impacts of climate," *Science* 353 (6305) (2016), available at <https://science.sciencemag.org/content/353/6304/aad9837>; Katharine J. Mach and others, "Climate as a risk factor for armed conflict," *Nature* 571 (2019): 193–197, available at https://www.nature.com/articles/s41586-019-1300-6.epdf?sharing_token=u9yy6AY9Ls1EE1VA2-F6dRgN0jAjWel9jnR3ZotV0OKs_okPQ2BFA0HB8Pqk-g7ox160H3VcTRPXlvHkFoBx8Xg6O7mPy7dUa6mix-oTdPxUG0Efr9ltYAZ5iS8T3eHbFRnRG0MFaDuUi-iFzEaflB8iv2V2wZotTMGKv6cU3eHp3YUBv9vNRzF_r-WabPNPoOzxdIKYgXizLU1n4h8DukqxL-kidocQ-ZpmO2r3Q2UQ%3D&tracking_referrer=www.washingtonpost.com.
- 33 Congressional Research Service, "Long-Term Budgeting within the Congressional Budget Process: In Brief" (Washington, 2019), available at <https://fas.org/sgp/crs/misc/R45789.pdf>.
- 34 The biggest exception involves bills passed through the so-called reconciliation process, which—in the Senate—must not raise deficits in the period after the relevant budget resolution ends. As a result, CBO must typically provide some assessment of a bill's deficit impact beyond 10 years if it is pursued under reconciliation.
- 35 U.S. Global Change Research Program, "Fourth National Climate Assessment," Chapter 2.
- 36 In this case, a "fat tail" refers to a distribution where extreme outcomes—while still lower probability—are more likely than under a normal distribution. See Martin Weitzman, "Fat Tails and the Social Cost of Carbon," *American Economic Review* 104 (5) (2014): 544–546, available at <https://www.aeaweb.org/articles?id=10.1257/aer.104.5.544>.
- 37 Ove Hoegh-Guldberg and others, "Impacts of 1.5°C Global Warming on Natural and Human Systems" (Geneva: Intergovernmental Panel on Climate Change, 2018), available at https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Chapter3_Low_Res.pdf.
- 38 Ibid.
- 39 Congressional Budget Office, "CBO's Economic Forecasting Record: 2019 Update" (Washington: 2019), available at <https://www.cbo.gov/system/files/2019-10/55505-CBO-forecasting-record.pdf>.
- 40 Congressional Budget Office, "Estimating the Costs of One-Sided Bets: How CBO Analyzes the Effects of Spending Triggers" (Washington: 2020), available at <https://www.cbo.gov/system/files/2020-10/56698-One-Sided-Bets.pdf>.
- 41 Hsiang and others, "American Climate Prospectus," p. 42. Greenstone was speaking specifically of efforts to calculate the social cost of carbon, but the point applies here as well. See also Tamma Carleton and others, "Valuing the Global Mortality Consequences of Climate Change Accounting for Adaptation Costs and Benefits" (Chicago: University of Chicago Becker Friedman Institute for Economics, 2019), available at <http://dx.doi.org/10.2139/ssrn.3224365>.
- 42 Olivier Blanchard, Beth Ann Bovino, and Kent Smetters, "Rising Debt in a Growing Economy: Perspectives on America's Fiscal and Economic Dynamic" (The Peter G. Peterson Foundation, 2019), available at <https://www.pgpf.org/sites/default/files/2019-summit-transcript-rising-debt-in-a-growing-economy.pdf>.
- 43 Office of Management and Budget, "Climate Change."
- 44 Keith Hall, "CBO Releases Four Products Explaining How Its New Health Insurance Simulation Model Works," Congressional Budget Office, April 18, 2019, available at <https://www.cbo.gov/publication/55116#:~:text=CB%20Releases%20Four%20Products%20Explaining%20How%20Its%20New%20Health%20Insurance%20Simulation%20Model%20Works,-Posted%20by&text=In%20developing%20our%20forthcoming%20baseline,the%20population%20under%20age%2065>.
- 45 See, for example, Congressional Budget Office, "Cost Estimate: H.R. 1628, American Health Care Act of 2017" (Washington: 2017), available at <https://www.cbo.gov/system/files/115th-congress-2017-2018/costestimate/hr1628aspassed.pdf>.
- 46 U.S. House Select Committee on the Climate Crisis, "Solving the Climate Crisis: The Congressional Action Plan for a Clean Energy Economy and a Healthy, Resilient, and Just America" (Washington: 2020), available at <https://climatecrisis.house.gov/sites/climatecrisis.house.gov/files/Climate%20Crisis%20Action%20Plan.pdf>.
- 47 Carbon Pollution Transparency Act of 2014, S. 2905, 113th Cong., 2nd sess. (September 18, 2014), available at <https://www.congress.gov/bill/113th-congress/senate-bill/2905>.
- 48 Rhiana Gunn-Wright and others, "A Green Recovery: The Case for Climate-Forward Stimulus Policies in America's COVID-19 Recession Response" (New York: Roosevelt Institute, 2020), available at https://rooseveltinstitute.org/wp-content/uploads/2020/10/RI_AGreenRecovery_Report_202010.pdf.
- 49 Congressional Budget Office, "10 Things to Know About CBO," available at <https://www.cbo.gov/about/10-things-to-know> (last accessed December 2020).

Our Mission

The Center for American Progress is an independent, nonpartisan policy institute that is dedicated to improving the lives of all Americans, through bold, progressive ideas, as well as strong leadership and concerted action. Our aim is not just to change the conversation, but to change the country.

Our Values

As progressives, we believe America should be a land of boundless opportunity, where people can climb the ladder of economic mobility. We believe we owe it to future generations to protect the planet and promote peace and shared global prosperity.

And we believe an effective government can earn the trust of the American people, champion the common good over narrow self-interest, and harness the strength of our diversity.

Our Approach

We develop new policy ideas, challenge the media to cover the issues that truly matter, and shape the national debate. With policy teams in major issue areas, American Progress can think creatively at the cross-section of traditional boundaries to develop ideas for policymakers that lead to real change. By employing an extensive communications and outreach effort that we adapt to a rapidly changing media landscape, we move our ideas aggressively in the national policy debate.

