

New Tools Needed to Assess Climate-Related Financial Risk

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One of the most important roles that economists play is to provide policymakers with a better understanding of trends in the economy. From the development of national income and product accounts, to estimating poverty thresholds, to indices that capture market concentration, economists have developed quantitative tools to help create and evaluate policy.

New challenges require economists to develop innovative tools to inform and guide policymakers. This is certainly true in the case of climate change, as it is increasingly clear that the consequences touch virtually every corner of our economy, with the potential for cascading damages and unprecedented systemic risk to globally interconnected economic systems. These damages will accrue disproportionately to vulnerable communities, entrenching existing inequities and increasing costs to the government. Although the study of how climate change and climate policies will affect the economy is not a new field of inquiry, it is only recently that economists [have begun to develop](#) tools to incorporate the risks of climate change into economic and financial forecasts and assessments of systemic macroeconomic risks.

The risks of climate change and the opportunities of the transition to a carbon-neutral economy are core to President Biden's Build Back Better agenda, which includes regulating heat-trapping greenhouse gas emissions and investing in clean energy and other climate solutions. A critical piece of the President's whole-of-government climate strategy is laid out in [Executive Order 14030](#), which calls on the Federal government to measure, disclose, and mitigate climate risks to the U.S. economy and financial system as part of the Federal oversight function. Indeed, the physical damages from climate change are already forcing expenditures on disaster responses from governments at the [Federal and state](#) levels, precipitating difficult questions about how to fund these efforts.

This issue brief outlines the importance of incorporating climate change into the economic projections that underlie assessments of financial risk and government finances. It concludes that governments, financial institutions, and private companies alike need new tools in the face of an increasingly unstable climate.

Risks of climate change

The risks of climate change can be divided into [two](#) categories: *physical* and *transition* risks. The physical risks are risks resulting from climatic events, such as wildfires, storms, and floods, whereas transition risks result from policy action taken to transition the economy off of fossil fuels. Physical risks are both acute and chronic. Economic actors face the [acute physical](#) risk of more extreme weather and climate events. Already, [the economic damages](#) from storms, floods, droughts, and wildfires have risen to over 100 billion dollars per year in the United States. There is also the [chronic physical](#) risk of temperature increases, sea level rises, ocean acidification, and other gradual changes to the climate that will increasingly alter crop yields, reduce labor productivity, and disrupt ecosystems, among [many other consequences](#). By the end of this century, the increase in global average temperatures [could surpass 3 degrees](#) Celsius (5.4 degrees

Fahrenheit), which [one recent meta-analysis](#) finds could cause damages equal to 7 to 11 percent of annual global GDP year-after-year.

The physical risks of climate change also include unprecedented systemic risk, as crossing [certain environmental tipping points](#) could cause irreversible impacts and lead to catastrophic outcomes to the climate and economy. For example, large methane releases from the thawing permafrost or sea floor could allow the [release](#) of biological, chemical, and radioactive materials that have been underground for millennia, disrupting the ecosystem. It could also produce shifts in ocean currents, potentially leading to oxygen [declines](#) and thus, [imperiling](#) sea life. These tipping points create systemic risk for economic systems globally.

Then, there are the transition risks that arise as the economy moves from reliance on carbon-based energy toward using net zero carbon. Economic actors—business and families, as well as government at all levels—should [adjust](#) their day-to-day decisions in the face of a changing climate. Businesses will need to reshape their production from carbon-intensive to carbon-free methods, and support will need to be provided to communities that are economically dependent on carbon-intensive industries. Without appropriate analysis and planning, there will be an otherwise-avoidable number of stranded assets, plants, and equipment designed for carbon-based production—as climate change alters the value of investments held by banks and insurance companies.

At the same time, the economic transition creates new economic opportunities, which, if taken advantage of, [can drive industrial transformation](#) through new innovation, enhanced economic competitiveness, and the creation of new, good jobs—particularly for hard-hit communities.

Strong, stable, and shared U.S. economic growth is intricately tied to managing and mitigating both the physical and transition risks of climate change and avoiding catastrophic tipping points, while also seizing the economic opportunities associated with the transition to a carbon-neutral economy. The development of new methods for robust assessments and disclosures of climate-related risks will help achieve this outcome.

Credit allocation and financial stability

Financial regulators are responsible for ensuring the resilience of the financial system. While an adequate flow of capital is imperative to a well-functioning economy, the instability caused by climate change creates [new systemic risks](#) for the financial sector. Policymakers and private sector actors alike need greater clarity on the cost of externalities and the potential for economic shocks. While steps taken to ensure the resilience of the financial system can have the added benefit of spurring greener investment and encouraging an orderly transition, they are not substitutes for the many other types of policies required (e.g., legislation and environmental/energy regulations) to address climate risks and encourage the transition to a carbon-neutral economy.

The defining characteristic of financial institutions is their ability to allocate capital from savers to borrowers; financial institutions make it possible for firms to access the capital necessary to make productive investments, thus putting the savings of others to good use. However, private

market actors—including many financial institutions—do not internalize the negative externalities tied to the risks of climate change that are associated with their credit allocation decisions. These decisions include the over-provision of credit to certain activities that exacerbate climate change risks, such as investments in fossil fuel extraction, or more carbon-intensive methods of producing products (like electricity, which can also be produced in cleaner ways).

One consequence of climate change is the greater likelihood of shocks that disrupt the financial system. Generally, when the financial system experiences a shock, such as those experienced at the beginning of the COVID-19 pandemic, funds stop flowing as credit intermediation slows down or freezes entirely. In other words, households and businesses find it more difficult, if not impossible, to obtain cash to maintain normal operations. The consequences of financial instability on the real economy were made apparent during the 2007-08 financial crisis due to the deterioration of the housing market, amplified by an inadequately capitalized banking sector. This was observed again in 2020 due to shutdowns caused by the COVID-19 pandemic. Similarly, shocks resulting from climate change or repeated extreme weather events could impair the value of certain financial assets, increase the cost of credit via higher-risk premiums, or result in higher operational losses. In turn, these could lead to decreased employment and output in the economy.

It is not only investment activities that are at risk. The insurance industry is directly exposed, as extreme weather events and rising sea levels pose risks to insured physical assets and property. This creates the need for higher payouts, which is likely to lead to higher premiums or a lack of insurability. Indeed, extreme weather events are already causing substantial increases in the probability of large damages, and as a result, [increasing property insurance premiums](#) to families in several states, [including California](#) and [Florida](#). Future extreme events could force insurers to fire-sell assets to pay off claims. Such a significant devaluation of assets could cause stress throughout the financial sector, leading to spillover effects in the broader economy.

The banking and mortgage industries are also exposed. For instance, government-sponsored enterprises, such as Fannie Mae and Freddie Mac, hold [over \\$6 trillion in mortgage debt that does not price flood risk](#). The impacts of climate change have tended to be localized, with extreme events causing severe economic (and humanitarian) damage via wildfires, hurricanes, and other extreme events. But, this is shifting: this year, Hurricane Ida led to higher global oil prices as refineries in the Gulf of Mexico [accounting for 13 percent of the United States' capacity were shut down](#). Similarly, extreme weather events in one part of the country can [affect food prices](#) across the country as well.

As the impact of climate change broadens and intensifies over time, it could become a systemic risk to entire regions that are highly dependent on energy or agriculture, possibly resulting in a wave of small- and medium-sized bank failures in energy and agriculture states. Indeed, [in a 2018 study](#), the Federal Deposit Insurance Corporation (FDIC) examined 1,617 instances of banks either failing or requiring FDIC assistance. They found that banks in Oklahoma and Texas in particular faced stresses whenever the price of oil declined and that the boom-bust cycle of fossil fuels contributed to regional bank stresses and failures.

New tools can help regulators and private sector actors understand and elucidate the ways in which climate change alters risks to the U.S. economy and financial system and develop strategies in response.

Risk to government finances

Climate change and the transition to a carbon-neutral economy also pose threats to government expenditures and revenues. Improved assessment and disclosure is a first step toward mitigating these threats.

The physical impacts of climate change will create pressures on public finances by reducing revenues and increasing costs. Certain pressures will build over time because of gradual changes in the climate, such as reduced labor supply from extreme heat and increased investments in adaptation that will be diverted from more productive investments. These gradual changes will put downward pressure on long-run [economic output](#), reducing tax revenues as a result.

Other pressures will be felt much sooner, as climate change worsens the occurrence and severity of extreme weather and climate events, thereby increasing outlays as the government provides emergency support or facilitates greater adaptation efforts. For instance, Federal government appropriations for [wildfire management](#) have roughly doubled in the past decade to over \$6 billion during the 2020 fiscal year. These larger expenditures on adaptation and emergencies come in lieu of spending on other policy priorities; or, they lead to increases in deficits or taxes.

The transition to a cleaner economy also presents major economic risks. Absent proper planning and coordination, local economies that are directly or indirectly reliant on tax revenues from carbon-intensive industries could see the departure of these industries and the [erosion](#) of the community's overall tax base. Federal, State, and local governments can work together to successfully manage the shift to clean production methods, but not if the impacts on government expenditures and revenues are unexpected or unaccounted for in budget and economic forecasts.

The President [established](#) the Interagency Working Group on Coal and Power Plant Communities to provide Federal leadership, in partnership with coal, oil and gas, and power plant communities, that spurs economic revitalization in hard-hit energy communities. Since its inception, this Working Group has [facilitated hundreds of millions of dollars](#) of investments in energy communities. In addition, the Working Group has begun robust coordination with State, local, and Tribal officials; labor unions; business leaders; environmental justice organizations; and community groups to ensure these investments enable local economies to seize the opportunities of clean energy industries.

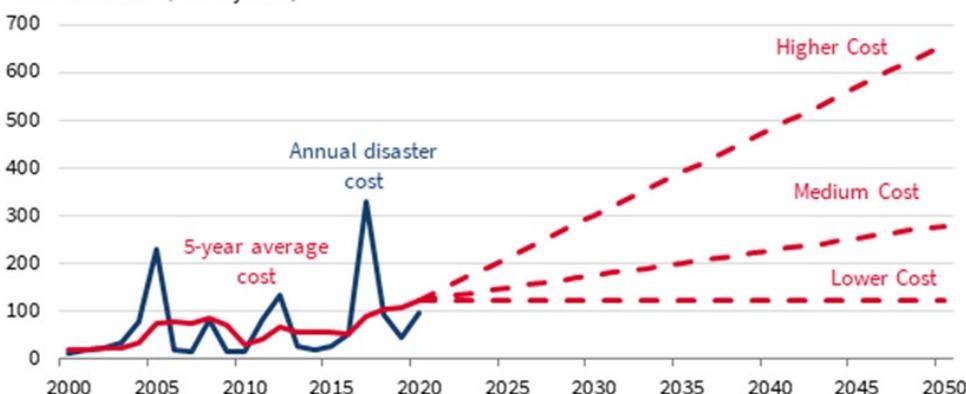
The existence of large climate threats is now crystal clear, and it is important to make economic projections that account for threats as accurately as possible. However, even assessing the climate-related expenditures for the next twelve months is a challenging task because the changes to the climate are unprecedented in human history. Fiscal projections typically focus on "most likely" outcomes. But, future climate shocks are essentially unknown unknowns, so prudent risk management would require planning for a wide-ranging distribution of outcomes—including the particularly large downsides caused by systemic risk, which can provide a strong

precautionary motive for policy responses. Just as financial regulators and supervisors developed stress tests for financial institutions following the 2008 global financial crisis, policymakers need new ways to assess the systemic risk of climate for the macroeconomy. To capture this distribution of outcomes, economic projections may have to use scenario analysis, as shown illustratively in the figure below.

Cost of Climate & Weather Disasters in the United States

Historical: 2000–2020, Illustrative projections: 2021–2050

Billions of dollars (CPI-adjusted)



Source: National Centers for Environmental Information.

Historical data are for weather and climate events with costs exceeding one billion dollars, including drought, flooding, freeze, severe storm, tropical cyclone, wildfire, and winter storms.

Perhaps on account of these challenges, very few budgeting efforts to date have attempted to capture climate threats. But, this is rapidly changing. [The Congressional Budget Office](#) now factors the physical impacts of climate change into its Federal Budget projections. The [2021 Fiscal Risks Report](#) from the United Kingdom’s Office of Budget Responsibility includes a chapter devoted to describing the various climate risks. [The Coalition of Finance Ministers for Climate Action](#) was launched in 2019 with the core principle of accounting for climate change in fiscal planning. And, [Stanford University](#) recently released a study with specific recommendations to the State of California on how it can incorporate climate risk disclosure practices into direct expenditures and pension fund investments.

Conclusion

New risks to the economy require economists to develop new tools. Despite the increased focus on climate risks, our understanding of the risks and opportunities of climate change to the U.S. economy remain in its infancy. We need to better capture the full range of climate threats and their potential to cause cascading damages throughout the economy. We also need a better understanding of transition risks and the policy measures that can enable U.S. workers and firms to thrive in an increasingly clean economy. Finally, our analyses need to take seriously the deep uncertainties associated with the unprecedented nature of climate threats. We at the Council of Economic Advisers look forward to working with the economic and broader scientific community to further develop these tools in the months and years to come.