

America's Climate Choices

The significant risks that climate change poses to human society and the environment provide a strong motivation to move ahead with substantial response efforts. Current efforts of local, state, and private sector actors are important, but not likely to yield progress comparable to what could be achieved with the addition of strong federal policies that establish coherent national goals and incentives, and that promote strong U.S. engagement in international-level response efforts. The inherent complexities and uncertainties of climate change are best met by applying an iterative risk management framework and making efforts to: significantly reduce greenhouse gas emissions; prepare for adapting to impacts; invest in scientific research, technology development, and information systems; and facilitate engagement between scientific and technical experts and the many types of stakeholders making America's climate choices.

Climate change is occurring, is very likely caused primarily by the emission of greenhouse gases from human activities, and poses significant risks for a range of human and natural systems. Emissions continue to increase, which will result in further change and greater risks. Responding to these risks is a crucial challenge facing the United States and the world today and for many decades to come.

Rationale for Action

The estimate of risk of any given event is typically quantified along two dimensions—the probability the event will occur and the magnitude or consequences of the event. The risks posed by climate change are complex because they vary widely in terms of what populations, regions, and sectors are affected and at what point in time, and even in terms of how risks are perceived based on personal values and judgments.

Although there is some uncertainty about future risks, changes in climate and related factors have already been observed in various parts of the United States; and the impacts of climate change can generally be expected to intensify with increasing greenhouse gas emissions (for example, see Figure 1). Some projected future impacts of most concern to the United States include more intense and frequent heat waves, risks to coastal communities from sea level rise, greater drying of the arid Southwest, and increased public health risks. Impacts occurring elsewhere in the world can also deeply affect the United States, given the realities of shared natural resources, linked economic and trade systems,

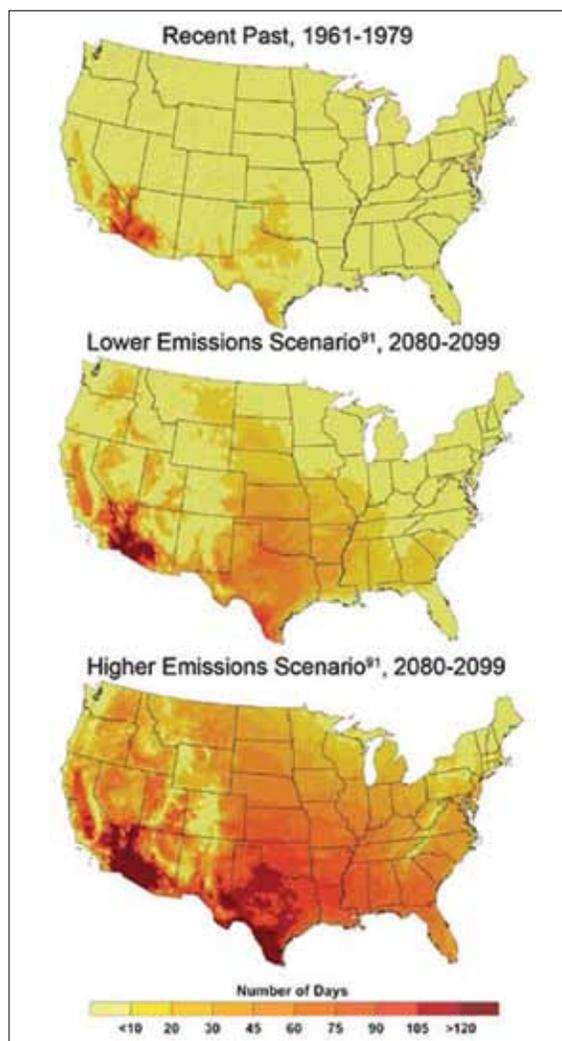


Figure 1. Higher emissions will result in more severe impacts. Models compare the number of days per year projected to exceed 100°F by the end of the century under a higher and lower emissions scenario.

Source: U.S. Global Change Research Program, 2009

migration of species and disease vectors, and movement of human populations.

In the judgment of this report's authoring committee, the environmental, economic, and humanitarian risks posed by climate change indicate a pressing need for substantial action to limit the magnitude of climate change and to prepare for adapting to its impacts. There are many reasons why it is imprudent to delay such actions, for instance:

- The sooner that serious efforts to reduce greenhouse gas emissions proceed, the lower the risks posed by climate change, and the less pressure there will be to make larger, more rapid, and potentially more expensive reductions later.
- Some climate change impacts, once manifested, will persist for hundreds or even thousands of years, and will be difficult or impossible to “undo.” In contrast, many actions taken to respond to climate change could be reversed or scaled back, if they somehow prove to be more stringent than actually needed.
- Every day around the world, major investments are being made in equipment and infrastructure that can “lock in” commitments to more greenhouse gas emissions for decades to come. Getting the relevant incentives and policies in place now will provide crucial guidance for these investment decisions.
- Many of the actions that could be taken to reduce vulnerability to climate change impacts are common sense investments that will offer protection against natural climate variations and extreme events.

Need for Federal Policies and Programs

As a signatory to the Copenhagen Accord in 2009, the United States committed to reduce U.S. greenhouse gas emissions as part of an international effort to limit global mean temperature rise, relative to pre-industrial conditions, to 2°C (3.6°F). Meeting such a commitment will require a significant departure from “business-as-usual” in how we produce and use energy.

The federal government has adopted some policies (e.g., subsidies, tax credits) and voluntary programs to promote the expanded use of climate-friendly technologies. Many non-federal actors are taking important steps as well. For example, many corporations have made commitments to

significantly reduce emissions from their operations; more than 1,000 mayors have pledged to reduce the emissions of their cities; a majority of states have adopted some form of renewable portfolio standard, energy efficiency program requirements or emissions reduction goal; and some U.S. regions have adopted or are planning cap-and-trade systems. Likewise, adaptation planning efforts are underway in a number of states, counties, and communities, and among several nongovernmental organizations.

The collective effect of these efforts is significant but not likely to yield outcomes comparable to what could be achieved with strong federal-level efforts. Furthermore, many current initiatives may not prove durable in the absence of a more comprehensive national response.

Using Iterative Risk Management as a Decision Framework

Given the inherent complexities of the climate system, and the many social, economic, and technological factors that affect the climate system, we can expect always to be learning more and to be facing uncertainties regarding future risks (see Box 1). But uncertainty is a double-edged sword; it is possible that future climate-related risks will be less serious than current projections indicate, but it is also possible they will be even more serious.

Uncertainty is not a reason for inaction. Rather, the challenge for society is to acknowledge the uncertainties and respond accordingly, as is done in so many other realms (for example, when people buy home insurance to protect against unknown future losses and when businesses plan for a range of possible future economic conditions).

Box 1. Two Main Sources of Uncertainty in Projecting Climate Change Impacts

What will future emissions be? This will be driven by a complex set of developments occurring around the world in the coming decades—related to population and economic growth, land use changes, technological innovation, policy developments, and other factors that are impossible to fully predict.

How will the climate system respond to increased greenhouse gases? The exact value of “climate sensitivity”—that is, how much temperature rise will occur for a given increase in atmospheric greenhouse gas concentration—is uncertain due to incomplete understanding of some elements of the earth's climate system.



Climate models project that in the coming decades, New York City will experience more heavy rainfall events, which has significant implications for key infrastructure systems. On August 8, 2007, a major rainstorm caused a system-wide outage of the subway during the morning rush hour. Such events may become more common without innovative adaptation measures.

A valuable framework for making decisions about America's climate choices is *iterative risk management*. This refers to a process of systematically identifying risks and possible response options, advancing a portfolio of actions that emphasize risk reduction and are robust across a range of possible futures, and revising responses over time to take advantage of new knowledge, information, and technological capabilities.

Components of an Effective National Response

The America's Climate Choices committee outlines the following main components of an effective national response to climate change.

Substantially reduce greenhouse gas emissions.

In order to minimize the risks of climate change and its most adverse impacts, the nation should reduce greenhouse gas emissions substantially over the coming decades. The exact magnitude and speed of emissions reduction depends on societal judgments about how much risk is acceptable and at what cost. However, given the long lifetime associated with infrastructure for energy production and use (among other factors), the most effective strategy is to begin ramping down emissions as soon as possible.

The most effective way to amplify and accelerate current state, local, and private sector efforts, and to minimize overall costs of meeting a national emissions reduction target, is with a comprehensive, nationally-uniform price on CO₂ emissions, with a price trajectory sufficient to drive major

investments in energy efficiency and low-carbon technologies. In addition, strategically-targeted complementary policies are needed to ensure progress in key areas of opportunity where market failures and institutional barriers can limit the effectiveness of a carbon pricing system.

Begin mobilizing now for adaptation. Prudent risk management involves advanced planning to deal with possible adverse outcomes—known and unknown—by increasing the nation's resilience to both gradual climate changes and abrupt disaster events. Effective adaptation will require the development of new tools and institutions to manage climate-related risks across a broad range of sectors and spatial scales. Adaptation decisions will be made by state and local governments, the private sector, and society at large, but those efforts will be much more effective with national-level coordination, for instance, to share information and technical resources for evaluating vulnerability and adaptation options.

Invest in science, technology, and information systems. Scientific research and technology development can expand the range, and improve the effectiveness of, options to respond to climate change. Systems for collecting and sharing information, including formal and informal education, can help ensure that climate-related decisions are informed by the best available knowledge and analyses, and can help us evaluate the effectiveness of actions taken. Many actors are involved in such efforts. For instance, technological innovation will depend in large part on private sector efforts; while information, education, and stakeholder engagement systems can be advanced by non-governmental organizations and state/local governments, with support from the federal government.

Participate in international climate change response efforts. America's climate choices affect and are affected by the choices made throughout the world. U.S. emissions reductions alone will not be adequate to avert dangerous climate change risks, but strong U.S. efforts will enhance the nation's ability to influence other countries to do the same. Also, the United States can be greatly affected by impacts of climate change occurring elsewhere in the world, so it is in the country's interest to help enhance the adaptive capacity of other nations, particularly developing countries that lack the needed resources and expertise. Effectively addressing climate

change requires both contributing to and learning from other countries' efforts.

Coordinate national response efforts. An effective strategy requires coordination among a wide array of actors. This includes balancing rights and responsibilities among different levels of government (vertical coordination), assuring clear

delineation of roles among many different federal agencies and other types of organizations (horizontal coordination), and promoting effective integration among the different components of a comprehensive climate change response strategy (e.g., all of the various types of efforts discussed in the previous recommendations).

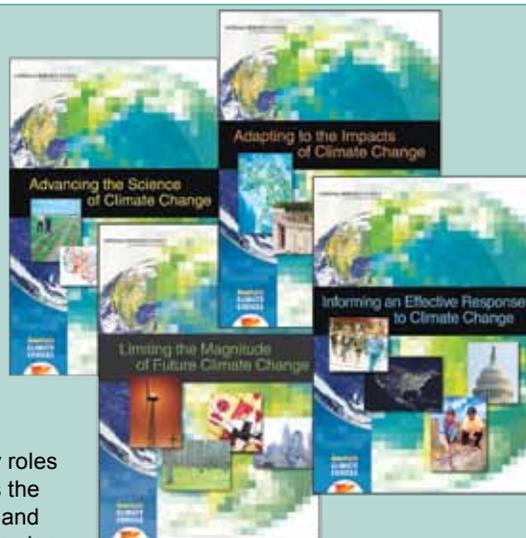
This report builds upon the information and analysis in the four **America's Climate Choices** panel reports:

Advancing the Science of Climate Change describes current scientific understanding and research needs related to the following areas: climate forcings, feedbacks, responses, and thresholds in the earth system; human behavior, institutions, and interactions with the climate system; vulnerability and adaptation; limiting the magnitude of climate change; and decision support.

Limiting the Magnitude of Future Climate Change examines options for reducing greenhouse gas emissions and accelerating technological innovation, the intersections of climate change with other issues of major public interest, the strategies for integrating federal policies with actions at the local and state levels, and the challenges of developing policies that are both durable and flexible enough adapt over time.

Adapting to the Impacts of Climate Change discusses the complementary roles of national adaptation efforts with grassroots bottom-up actions, identifies the key research and information needs for promoting successful adaptation, and provides examples of specific options for facilitating adaptation for the following sectors: ecosystems, agriculture and forestry, water, health, transportation, energy, oceans and coasts.

Informing an Effective Response to Climate Change identifies the range of actors making decisions that affect our nation's response to climate change; reviews the different types of decision support tools that are available, or could be developed, to aid those decision makers (e.g., assessments, databases, greenhouse gas accounting systems, "climate services" institutions); and discusses ways to improve climate change communication through educational systems, the media, and direct public engagement.



Read or purchase this report and locate information on related reports at <http://dels.nas.edu/basc>

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The National Academies appointed the above panel of experts to address the specific task, sponsored by the National Oceanic and Atmospheric Administration. The members volunteered their time for this activity; their report is peer-reviewed and the final product signed off by both the committee members and the National Academies. This report brief was prepared by the National Research Council based on the committee's report.



For more information, contact the Board on Atmospheric Sciences and Climate at (202) 334-3426 or visit <http://nationalacademies.org/basc> or America's Climate Choices at americasclimatechoices.org. Copies of *Advancing the Science of Climate Change* are available from the National Academies Press, 500 Fifth Street, NW, Washington, D.C. 20001; (800) 624-6242; www.nap.edu.

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