

THE NATIONAL ACADEMIES

Advisers to the Nation on Science, Engineering, and Medicine

AMERICA'S CLIMATE CHOICES

PANEL ON ADVANCING THE SCIENCE OF CLIMATE CHANGE

Statement of Task

The Panel on Advancing the Science of Climate Change will first provide a concise overview of past, present, and future climate change, including its causes and its impacts, and then recommend steps to advance our current understanding. The panel will consider both the natural climate system and the human activities responsible for driving climate change and altering the vulnerability of different regions, sectors, and populations; it will also consider the scientific advances needed to better understand the effectiveness of actions taken to limit the magnitude of future climate change and adapt to its impacts. The panel will be challenged to treat climate variables and the associated human activities and ecological processes as a single system, rather than a collection of individual elements. The panel will describe the observations, research programs, next-generation models, and other activities and tools that could improve our present understanding of climate change and its interactions with ecological and human systems, as well as the data, activities, and physical and human assets needed to support these activities. It is anticipated that the panel will convene a major workshop focusing on the research needed to better understand the potential efficacy, impacts, and risks of various “geo-engineering” proposals (direct interventions in the climate system).

Ultimately, the goal of this panel is to answer the third question in the Statement of Task for the study (“What can be done to better understand climate change and its interactions with human and ecological systems?”). This question will be expanded over the course of the study to include more specific sub-questions such as¹:

- What are the primary causes and mechanisms of climate change, what and where have the most notable climate changes and climate change impacts been, and how significant are these changes in the context of natural climate variability and historical climate impacts?
- What climate changes and impacts are expected to occur under different scenarios of future greenhouse gas emissions, climate sensitivity, and vulnerability of human and natural systems? What irreversible impacts, abrupt changes, or other “surprises” could be in store?
- How well do we understand the processes that determine greenhouse gas emissions, the sensitivity of the climate system to external forcing, the impacts of climate change, and the vulnerability and adaptive capacity of human and natural systems? What can be done to improve our understanding of these processes?
- What can be done to increase the reliability, accuracy, and utility of predictions and projections of future climate and climate-related changes?

¹ These sub-questions are only examples of the types of questions to be addressed by the panel, to indicate the level of specificity intended. Some of these illustrative questions may be revised or dropped, and other questions may be added, at the discretion of the panel and the Committee on America's Climate Choices.

- What more do we need to know about how various interventions in human systems are likely to affect the activities that drive climate change and the ability of human systems to adapt to it?

The panel will be challenged to produce a report that is broad and authoritative, yet concise and useful to decision makers. The costs, benefits, limitations, tradeoffs, and uncertainties associated with different options and strategies should be assessed qualitatively and, to the extent practicable, quantitatively, using scenarios of future climate change and vulnerability developed in coordination with the Committee on America's Climate Choices and the other study panels. The panel should also provide policy-relevant (but not policy-prescriptive) input to the committee on the following overarching questions:

- What short-term actions can be taken to better understand climate change and its interactions with human and ecological systems?
- What promising long-term strategies, investments, and opportunities could be pursued to advance the science of climate change?
- What are the major scientific and technological advances (e.g., new observations, improved models, research priorities, etc.) needed to extend our understanding of climate change and its interactions with other systems?
- What are the major impediments (e.g., practical, institutional, economic, ethical, intergenerational, etc.) to advancing the science of climate change, and what can be done to overcome these impediments?
- What can be done to advance the science of climate change at different levels (e.g., local, state, regional, national, and in collaboration with the international community) and in different sectors (e.g., nongovernmental organizations, the business community, the research and academic communities, individuals and households, etc.)?

Panel Membership:

Pamela Matson (*Chair*), Stanford University

Tom Dietz (*Vice Chair*), Michigan State University

Waleed Abdalati, University of Colorado at Boulder

Antonio J. Busalacchi, Jr., University of Maryland

Ken Caldiera, Carnegie Institution of Washington

Robert Corell, H. John Heinz III Center for Science, Economics and the Environment

Ruth DeFries, Columbia University

George M. Hornberger, Vanderbilt University

Maria Carmen Lemos, University of Michigan

Susanne Moser, Susanne Moser Research & Consulting

Richard H. Moss, World Wildlife Fund

Edward Parson, School of Law, University of Michigan

A.K. Ravishankara, National Oceanic and Atmospheric Administration

Billie Lee Turner II, Arizona State University

Warren Washington, National Center for Atmospheric Research

John P. Weyent, Stanford University

David Whelan, The Boeing Company

Ian Kraucunas (*Study Director*), National Research Council