

THE CCSP STRATEGIC PLAN

A new *Strategic Plan for the Climate Change Science Program* was released in July 2003. This document is the first comprehensive update of a national plan for climate and global change research since the original USGCRP strategy was issued at the inception of the program. The original plan was published in the inaugural edition of *Our Changing Planet*, which accompanied the President's FY 1990 budget.

Development of the CCSP Strategic Plan

In July 2002, the CCSP undertook a year-long process to prepare a new 10-year strategic plan for the program. This planning process was designed to ensure a comprehensive examination of research and observation needs, transparent review by the national and international scientific and stakeholder communities, and establishment of defined goals for research on climate and global change.

Scientists and research program managers from the 13 participating agencies and the Climate Change Science Program Office drafted the Strategic Plan. The plan reflects a commitment by its authors to high-quality science, which requires openness to review and critique by the wider scientific community. The process by which the plan was drafted proceeded with the transparency essential for scientific credibility.

The Administration released a *CCSP Discussion Draft Strategic Plan* for public review in November 2002. The discussion draft built upon the significant investments already made in climate change science and was guided by the priority information needs identified by scientists and stakeholders, both nationally and internationally. The draft plan outlined a comprehensive, collaborative approach for developing a more accurate understanding of climate change and its potential impacts.

External comments played an important role in revising the initial draft of the plan. A Climate Change Science Program Workshop, held in December 2002 in Washington, DC, was attended by 1,300 scientists and other participants, including individuals from 47 states and 36 nations. The workshop was designed to facilitate extensive discussion and comments on the draft plan from all interested domestic and international groups



The U.S. Climate Change Science Program

and individuals, including the scientific community, stakeholders, nongovernmental organizations, interested members of the public, and the news media.

Written comments on the *Discussion Draft Strategic Plan* were submitted during a public review period. These comments amounted to nearly 900 pages of input from hundreds of scientists, representatives of interest groups, and interested members of the lay public.

In addition, a special committee of the National Academy of Sciences' National Research Council (NRC) reviewed the discussion draft plan at the request of the CCSP. The 17-member Committee to Review the U.S. Climate Change Science Program Strategic Plan included experts in the physical, biological, social, and economic sciences. In February 2003, this committee reported its recommendations, which provided invaluable assistance in the revision of the draft plan.

The *Strategic Plan for the U.S. Climate Change Science Program*—available online at <http://www.climatechange.gov>—was released in July 2003, after consideration of all of the workshop discussions, the full range of written public review comments, and the NRC review of the discussion draft plan, as well as an extensive internal U.S. Government review process. A shorter companion document—*The U.S. Climate Change Science Program: Vision for the Program and Highlights of the Scientific Strategic Plan*—was released at the same time.

The plan will guide the conduct of research activities sponsored or conducted by the U.S. Government. It will be modified as warranted by the emergence of key findings and important new questions of public interest and scientific questions.

In February 2004, the NRC review committee issued a second public report—*Implementing Climate and Global Change Research: A Review of the Final U.S. Climate Change Science Program Strategic Plan*—expressing the committee's conclusions on the content, objectivity, quality, and comprehensiveness of the updated Strategic Plan, on the process used to produce it, and on the proposed process for developing subsequent findings to be reported by the CCSP. The report made a number of recommendations on

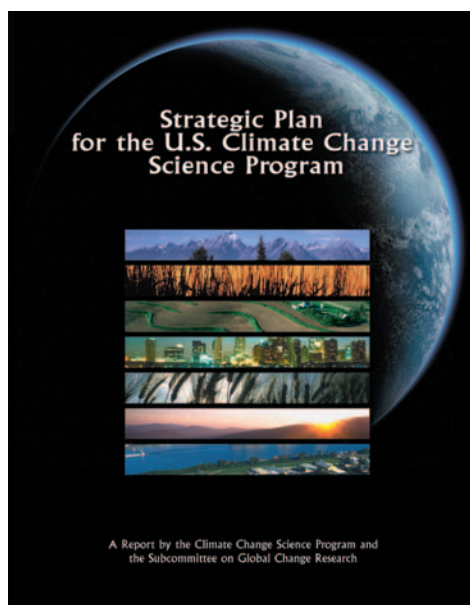


Figure 1:
The CCSP Strategic Plan.

implementing the plan. The NRC review concluded:

“The *Strategic Plan for the U.S. Climate Change Science Program* articulates a guiding vision, is appropriately ambitious, and is broad in scope. It encompasses activities related to areas of long-standing importance, together with new or enhanced cross-disciplinary efforts. It appropriately plans for close integration with the complementary Climate Change Technology Program. The CCSP has responded constructively to the National Academies review and other community input in revising the strategic plan. In fact, the approaches taken by the CCSP to receive and respond to comments from a large and broad group of scientists and stakeholders, including a two-stage independent review of the plan, set a high standard for government research programs. As a result, the revised strategic plan is much improved over its November 2002 draft, and now includes the elements of a strategic management framework that could permit it to effectively guide research on climate and associated global changes over the next decades. Advancing science on all fronts identified by the program will be of vital importance to the nation.”



Vision, Mission, and Goals of the Climate Change Science Program

Climate and climate variability play important roles in shaping the environment, natural resources, infrastructure, the economy, and other aspects of life in all countries of the world. Human-induced changes in climate and related environmental systems, and the options proposed to adapt to or mitigate these changes, may have substantial environmental, economic, and societal consequences. Because of the pervasiveness of



CCSP GUIDING VISION

A nation and the global community empowered with the science-based knowledge to manage the risks and opportunities of change in the climate and related environmental systems.

the effects of climate variability and the potential consequences of human-induced climate change and response options, citizens and decisionmakers in public

and private sector organizations need reliable and readily understood information, including a clear understanding of the reliability limits of such information, to make informed judgments and decisions.

Over the past 15 years, the United States has invested heavily in scientific research, monitoring, data management, and assessment for climate change analyses to build a foundation of knowledge for decisionmaking. The seriousness of the issues and the

The U.S. Climate Change Science Program

unique role that science can play in helping to inform society's course give rise to CCSP's guiding vision.

The core precept that motivates the CCSP is that the best possible scientific knowledge should be the foundation for the information required to manage climate variability and change and related aspects of global change.

CCSP MISSION

Facilitate the creation and application of knowledge of the Earth's global environment through research, observations, decision support, and communication.

The CCSP adds significant integrative value to the individual Earth and climate science missions

of its 13 participating agencies and departments, and their national and international partners. A critical role of the interagency program is to coordinate research and integrate and synthesize information to achieve results that no single agency, or small group of agencies, could attain.

In the Strategic Plan, the CCSP adopted five overarching scientific goals. By developing information responsive to these goals, the program will ensure that it addresses the most important climate-related issues. For each of the goals, the CCSP will prepare information resources that support climate-related discussion and decisions.

The five goals frame what might be termed an "end-to-end" approach to climate and global change research—including observations, understanding of processes, projections of future change, understanding potential consequences of change, and applications of knowledge to management decisions. The goals thus form a unified framework, and their ordering does not suggest an order of priority. The CCSP Goals are discussed in greater detail in the CCSP Strategic Plan.

CCSP GOALS

Goal 1: Improve knowledge of the Earth's past and present climate and environment, including its natural variability, and improve understanding of the causes of observed variability and change.

Goal 2: Improve quantification of the forces bringing about changes in the Earth's climate and related systems.

Goal 3: Reduce uncertainty in projections of how the Earth's climate and related systems may change in the future.

Goal 4: Understand the sensitivity and adaptability of different natural and managed ecosystems and human systems to climate and related global changes.

Goal 5: Explore the uses and identify the limits of evolving knowledge to manage risks and opportunities related to climate variability and change.

See Chapters 1 and 2 of the *Strategic Plan for the U.S. Climate Change Science Program* for further discussion of the CCSP Goals.

Core Approaches

The CCSP employs four core approaches in working toward its goals. Each of these components of the program is discussed in greater detail in the CCSP Strategic Plan.

CCSP CORE APPROACHES

Scientific Research: Plan, sponsor, and conduct research on changes in climate and related systems.

Observations: Enhance observations and data management systems to generate a comprehensive set of variables needed for climate-related research.

Decision Support: Develop improved science-based resources to aid decisionmaking.

Communications: Communicate results to domestic and international scientific and stakeholder communities, stressing openness and transparency.

See Chapter 1 of the *Strategic Plan for the U.S. Climate Change Science Program* for further discussion of the CCSP Core Approaches.

1. *Scientific Research: Plan, Sponsor, and Conduct Research on Changes in Climate and Related Systems*

The greatest percentage of the CCSP budget is devoted to continuing the essential ongoing investment in scientific knowledge, facilitating the discovery of the unexpected, and advancing the frontiers of research. The CCSP participating agencies coordinate their work through seven interdisciplinary “research elements,” which together support scientific research across a wide range of interconnected issues of climate and global change. These research elements pertain to major components of the Earth’s environmental and human systems, which are undergoing changes caused by a variety of natural and human-induced causes. The CCSP will encourage evolution of the research elements over the coming decade in response to new knowledge and societal needs. The CCSP research elements are:

- 1) Atmospheric Composition
- 2) Climate Variability and Change (including Climate Modeling)
- 3) Global Water Cycle
- 4) Land-Use/Land-Cover Change
- 5) Global Carbon Cycle
- 6) Ecosystems
- 7) Human Contributions and Responses.



The U.S. Climate Change Science Program

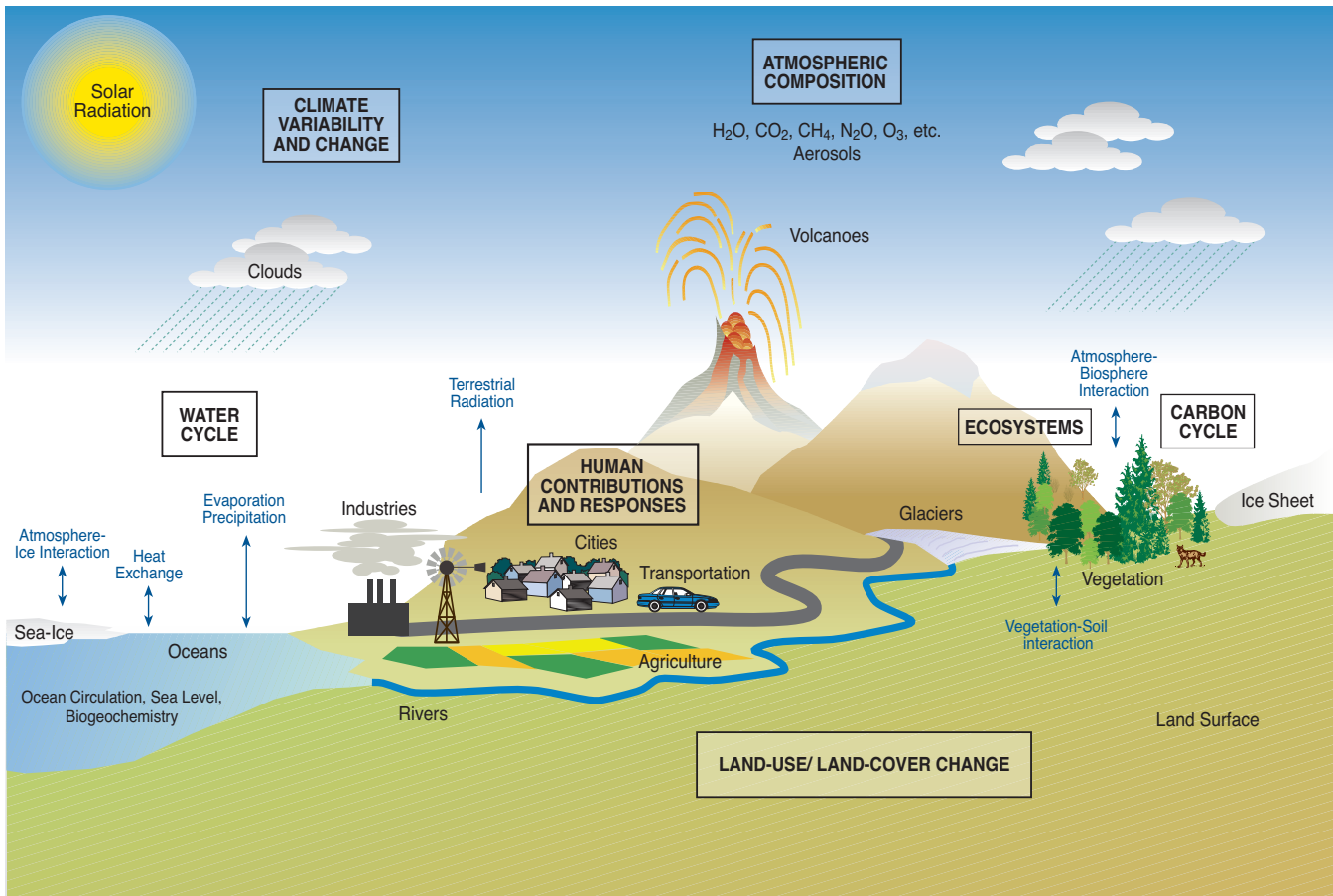
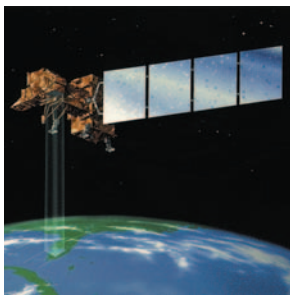


Figure 2: Major components needed to understand the climate system and climate change.



2. Observations: Enhance Observations and Data Management Systems to Generate a Comprehensive Set of Variables Needed for Climate-Related Research

Since the early years of the USGCRP, an expanded program of global observations has been developed to characterize climate variability and change on global and regional scales. These observations have included paleoclimatic records spanning thousands of years, satellite remote-sensing systems covering the entire planet, and numerous *in situ* observations on land (including the polar regions), in the atmosphere, and throughout the oceans.

Prior and current investments in new observations, as they come to fruition, will significantly enhance knowledge of environmental variables in the coming years. But there is also a need for enhanced global and regional integration of observation and data management systems, especially to help generate new and improved products for

supporting decisions. The CCSP will increase the capacity to prioritize, ensure the quality of, archive, and disseminate (in useful format) the large quantity of available observations.

At the Earth Observation Summit, held in Washington, DC, in July 2003, 33 nations and the European Commission made a commitment to move toward the development of a comprehensive, coordinated, and sustained Earth observation system. The Earth Observation Summit established the Group on Earth Observations (GEO) to prepare a 10-year implementation plan (see the “International Research and Cooperation” section for further discussion).

3. Decision Support:

Develop Improved Science-Based Resources to Aid Decisionmaking

The available scientific record has been used for many years to address a range of questions, from detecting climate change and attributing it to particular causes, to utilizing satellite and ground-based observations and related analyses in resource management applications. The CCSP will improve interactions with stakeholders and develop resources to support public discussion and planning, adaptive management, and policymaking. The program also will encourage development of new methods, models, and other resources that facilitate economic analysis, decisionmaking under conditions of uncertainty, and integration and interpretation of information from the natural and social sciences in particular decision contexts.

4. Communications: Communicate Results to Domestic and International Scientific and User Communities, Stressing Openness and Transparency

The domestic and international communities addressing global climate change are already well-developed. This is evident in publications in the scientific literature, Intergovernmental Panel on Climate Change (IPCC) collaborations, and many other scientific forums; in policy discussions in Washington and other world capitals; and in the media throughout the world. The CCSP has a responsibility to communicate with interested partners in the United States and throughout the world, and to learn from these partners on a continuing basis. The CCSP will aim to improve dialogue with public and private sector constituencies with the end result of providing users of climate change information with adequate opportunities to help frame important scientific research activities. This dialogue is an essential component of the development of decision support.

Because of the major commitment of public resources to CCSP activities, the CCSP also has a responsibility to report its findings in the form of educational materials suitable for use at various educational and public information levels, without sacrificing



The U.S. Climate Change Science Program

accuracy or indulging in oversimplification, so that the dissemination of its findings will be effective. As an essential part of its mission, the CCSP undertakes the significant responsibility of enhancing the quality of public discussion by stressing openness, transparency, and accuracy in its findings and reports.

Each of these approaches is essential for achieving the CCSP's goals. Scientific Research and Observations will rely heavily on existing programs and mechanisms, as well as integration of capabilities developed outside the prior global change research framework. Decision Support and Communications will require the development of new capabilities and initiatives during the coming years.

Climate Change Research Initiative

President Bush launched the U.S. Climate Change Research Initiative in June 2001, "to study areas of uncertainty and identify priority areas where investments can make a difference." The CCRI represents a focusing of resources and attention on those elements of the USGCRP that can best support improved public debate and decisionmaking in the near term. The CCRI has three principal aims, as described below.

1. Focus on Three Key Areas of Climate Science

Develop reliable representations of the climatic forcing resulting from atmospheric aerosols. Aerosols and tropospheric ozone play unique, but poorly quantified, roles in the atmospheric radiation budget. Proposed activities include field campaigns (including aircraft missions), *in situ* monitoring stations, improved modeling, and satellite data algorithm development.

Improve understanding of the global carbon cycle (sources and sinks). The CCRI funds will be targeted for activities to carry out the integrated North American Carbon Program, a key element of the U.S. Carbon Cycle Science Plan. This program will improve monitoring techniques, reconcile approaches for quantifying carbon storage, and elucidate key processes and land management practices regulating carbon fluxes between the atmosphere and the land and ocean.

Increase knowledge of climate feedback processes. "Climate feedbacks"—such as feedbacks from clouds, water vapor, atmospheric convection, ocean circulation, ice albedo, and vegetation—can either amplify or dampen the climate system's response to changes in radiative forcing that result from changing greenhouse gas concentrations, solar



variability, or land-cover changes. Insufficient understanding of these feedbacks is responsible for large uncertainties in the ability to reliably predict climate variability and project climate change. The CCRI will focus activities to support increased understanding of feedback processes.

2. Enhance and Expand Observations of the Earth System

CCRI efforts will contribute to and benefit from the design and operational implementation over the next 10 years of a new international, integrated, sustained, and comprehensive global Earth observation system, designed to minimize data gaps and maximize the utility of existing observing networks.

3. Increase Climate Modeling Capacity

The CCRI will support continued development and refinement of computational climate models. Priority activities will focus on improving model physics (particularly with respect to clouds and aerosols), increasing resolution of climate model simulations, improving methods to assimilate observations into model analyses and predictions, and exploring limits to predictability of climate variability and change. The CCRI also will support development of climate modeling to provide routine model products for policy and management decision support.

The Administration also launched the parallel Climate Change Technology Program (CCTP) in June 2001, “to strengthen research at universities and national labs, to

enhance partnerships in applied research, to develop improved technology for measuring and monitoring gross and net greenhouse gas emissions, and to fund demonstration projects for cutting-edge technologies.” Technological breakthroughs will be needed to address the long-term challenge of global climate change. The CCSP and the CCTP are closely collaborating to ensure that (a) science drives the definition of technology needs, and (b) science is used to evaluate the potential consequences of proposed technology innovations.

