

U.S. Climate Change Science Program Making Good Progress in Documenting and Understanding Changes, but Study of Impacts on Humans and Communication with Decision Makers Lag

Scripps climate scientist leads assessment of federally directed climate change research

September 13, 2007

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Scripps Scientist Veerabhadran Ramanathan speaking with the media

Climate change research directed by the federal government has made good progress in documenting and understanding temperature trends and related environmental changes on a global scale, says a new report from a National Research Council committee chaired by V. Ramanathan, distinguished professor of atmospheric and climate sciences at Scripps Institution of Oceanography, UC San Diego.

The ability to predict future climate changes also has improved, but efforts to understand the impact of such changes on society and analyze mitigation and adaptation strategies are still relatively immature, added the committee that wrote the report. Moreover, the U.S. Climate Change Science Program (CCSP), which oversees federal research in this area, has made inadequate progress in supporting decision making, studying regional impacts and communicating with a wider group of stakeholders.

"CCSP, an important initiative that has broadened our knowledge of climate change, needs to package more of that knowledge for policymakers from the national to local level, and place more emphasis on understanding how people will be affected by climate change and how they might react," said Ramanathan.

Adjustments will have to be made in the balance between basic science and applications if CCSP is to achieve its vision of producing information that can be used to formulate strategies for preventing, mitigating and adapting to the effects of climate change, the committee stated. It did not offer recommendations for how to sustain and improve the program's basic science while strengthening its applications, but this will be among the subjects considered in a follow-up report that the committee expects to issue early next year.

The report was requested by CCSP, which asked the Research Council to develop a process for evaluating the program and to conduct a preliminary assessment of its progress. The committee's report is the first review of CCSP's progress since the program was established in 2002.

The committee developed a two-stage evaluation process. The first stage, presented in this report, assesses the strengths and weaknesses of the entire program, and identifies areas where progress has not met expectations and that should be subject to more detailed analysis during a second stage of evaluation. This second stage, to be completed by CCSP because it requires detailed budget and management information not readily available to the committee, would diagnose the reasons for weaknesses and identify strategies for improving the program.

In its review, the committee concluded that discovery science and understanding of the overall climate system are proceeding well. For example, knowledge of the nature and extent of atmospheric warming and other climate

changes over the past few decades and the influence of human activities on these observed changes has advanced significantly. In addition, models that have demonstrated reasonable success in reproducing past climate conditions are improving confidence in future projections. Understanding of the water cycle has also improved, and good progress has been made in documenting land-use changes and estimating how carbon is distributed around the planet.

Uncertainties remain in other aspects of global climate change, particularly the role of man-made aerosols in masking greenhouse warming, the response of hurricanes and ice sheets to global warming, and how climate feedbacks -- the dynamics of water vapor and clouds, for example -- amplify or dampen the effects of greenhouse gases and other climate-change forces.

Overall, research into the social sciences, including human drivers of climate change such as energy consumption, the impact on human systems such as political institutions and economies, and mitigation and adaptation options, is much less developed than research on the natural climate system. One reason for the slow progress is that only \$25 million to \$30 million of CCSP's \$1.7 billion annual budget is devoted to such research. In addition, few social scientists are in leadership positions at the participating federal agencies, making it difficult for CCSP to increase emphasis in this area or to establish links with the academic social science community.

Even where good scientific progress is being made, use of new knowledge to support decision making and risk analysis is proceeding slowly, according to the committee. For instance, although CCSP's temperature trends assessment was influential in this year's report by the Intergovernmental Panel on Climate Change, 19 other synthesis and assessment products that were scheduled for release by now are still in production.

One way CCSP could bridge the gap between science and decision making would be to more closely examine the impact of climate change at regional and local scales, the report says. More accurate models, better regional observations, and the development of impact scenarios will be required to improve predictions of how climate change will affect smaller spatial scales.

Better communication from CCSP also will be critical for confronting climate change at the local level. CCSP should build upon the two-way dialogue envisioned in its strategic plan by engaging state and local officials, nongovernmental organizations, industry and the climate change technology community. This dialogue should go beyond communicating research results to asking what is needed from the program. The committee acknowledged that more resources will be needed to bolster such relationships.

A major hurdle to CCSP progress is the program director's lack of authority to allocate or prioritize funding across participating agencies, the committee said. Likewise, many of the members of CCSP's interagency working groups have little budgetary authority to implement the program's research agenda. As a result, progress tends to occur when the priorities of the 13 participating agencies coincide with CCSP's goals.

The committee emphasized that high-quality data from satellites have been crucial to the advancement of climate change science. However, a number of planned satellite missions have been cancelled or seriously delayed, presenting perhaps the single greatest threat to the future success of CCSP, according to the committee. Without these satellites, scientists' ability to monitor and predict climate change will decline, even as the urgency of doing so increases.

The committee is holding a workshop in Washington, D.C., Oct. 15-17, to discuss future priorities for CCSP research, which will be the focus of its follow-up report. The study was sponsored by the U.S. Climate Change Science Program. The National Academy of Sciences, National Academy of Engineering, Institute of Medicine and National Research Council make up the National Academies. They are private, nonprofit institutions that provide science, technology, and health policy advice under a congressional charter. The Research Council is the principal operating agency of the National Academy of Sciences and the National Academy of Engineering.

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