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CLIMATE CHANGE ADAPTATION

Federal Efforts to Provide Information Could Help Government Decision Making

Statement of David Trimble, Director
Natural Resources and Environment

November 16, 2011

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Highlights

Highlights of GAO-12-238T, a testimony before the Subcommittee on Oceans, Atmosphere, Fisheries, and Coast Guard, Committee on Commerce, Science, and Transportation, U.S. Senate

Why GAO Did This Study

Climate change is a complex, crosscutting issue that poses risks to many existing environmental and economic systems, including agriculture, infrastructure, ecosystems, and human health. A 2009 assessment by the United States Global Change Research Program (USGCRP) found that climate-related changes—such as rising temperature and sea level—will combine with pollution, population growth, urbanization, and other social, economic, and environmental stresses to create larger impacts than from any of these factors alone.

According to the National Academies, USGCRP, and others, greenhouse gases already in the atmosphere will continue altering the climate system into the future, regardless of emissions control efforts. Therefore, adaptation—defined as adjustments to natural or human systems in response to actual or expected climate change—is an important part of the response to climate change.

This testimony addresses (1) the data challenges that federal, state, and local officials face in their efforts to adapt to a changing climate, (2) the actions federal agencies could take to help address these challenges, and (3) federal climate change strategic planning efforts. The information in this testimony is based on prior work, largely on GAO's recent reports on climate change adaptation (GAO-10-113) and federal climate change funding (GAO-11-317). These reports are based on, among other things, analysis of studies, site visits to areas pursuing adaptation efforts, and responses to a web-based questionnaire sent to federal, state, and local officials.

View GAO-12-238T. For more information, contact David Trimble at (202) 512-3841 or trimbled@gao.gov.

What GAO Found

As GAO reported in October 2009, challenges from insufficient site-specific data—such as local projections—make it hard for federal, state, and local officials to predict the impacts of climate change, and thus hard to justify the current costs of adaptation efforts for potentially less certain future benefits. Based on responses from a diverse array of federal, state, and local officials knowledgeable about adaptation, related challenges generally fit into two main categories: (1) translating climate data—such as projected temperature and precipitation changes—into information that officials need to make decisions and (2) the difficulty in justifying the current costs of adaptation with limited information about future benefits.

Federal actions to provide and interpret site-specific information would help address data challenges associated with adaptation efforts, based on responses to GAO's web-based questionnaire sent to federal, state, and local officials and other materials analyzed for its October 2009 report. In addition to several potential federal actions identified as useful by respondents to GAO's questionnaire, including the development of state and local climate change vulnerability assessments, GAO's 2009 report also contained information about the creation of a federal climate service. Specifically, about 61 percent (107 of 176) of respondents rated the "creation of a federal service to consolidate and deliver climate information to decision makers to inform adaptation efforts" as very or extremely useful. Respondents offered a range of potential strengths and weaknesses for such a service. For example, several respondents stated that a climate service would help consolidate information and provide a single information resource for local officials. However, some respondents to GAO's questionnaire voiced skepticism about whether it was feasible to consolidate climate information, and others stated that such a service would be too rigid and may get bogged down in lengthy review processes. GAO has not made recommendations regarding the creation of a climate service within the National Oceanic and Atmospheric Administration or any other agency or interagency body.

Federal strategic planning efforts could be improved for many aspects of the climate change enterprise. For example, GAO's October 2009 report on climate change adaptation concluded that, to be effective, related federal efforts must be coordinated and directed toward a common goal. This report recommended the development of a strategic plan to guide the nation's efforts to adapt to a changing climate, including the identification of mechanisms to increase the capacity of federal, state, and local agencies to incorporate information about current and potential climate change impacts into government decision making. Some actions have subsequently been taken to improve federal adaptation efforts, but GAO's May 2011 report on climate change funding found that federal officials do not have a shared understanding of strategic governmentwide priorities.

Chairman Begich, Ranking Member Snowe, and Members of the Subcommittee:

I am pleased to be here today to discuss federal efforts to provide climate data and services to decision makers. Climate change is a complex, crosscutting issue that poses risks to many existing environmental and economic systems, including agriculture, infrastructure, ecosystems, and human health. A 2009 assessment by the United States Global Change Research Program (USGCRP) found that climate-related changes—such as rising temperature and sea level—will combine with pollution; population growth; urbanization; and other social, economic, and environmental stresses to create larger impacts than from any of these factors alone.[1] According to the National Academies, USGCRP, and others, greenhouse gases already in the atmosphere will continue altering the climate system into the future, regardless of emissions control efforts. Therefore, adaptation—defined as adjustments to natural or human systems in response to actual or expected climate change—is an important part of the response to climate change.

Many federal entities manage climate change programs and activities. According to the Office of Management and Budget's June 2010 Federal Climate Change Expenditures Report to Congress, 9 of the 15 cabinet-level departments, along with 7 other federal agencies, received funding for climate change activities in fiscal year 2010.[2] In addition, entities within the Executive Office of the President, such as the Office of Science and Technology Policy, and federal interagency coordinating bodies, like USGCRP, work together to ensure federal climate change activities are guided by the latest climate science. A September 2010 report by the National Academy of Public Administration, which was prepared for the National Oceanic and Atmospheric Administration (NOAA) and Congress,

[1]USGCRP coordinates and integrates federal research on changes in the global environment—including climate change—and their implications for society.

[2]Office of Management and Budget, Federal Climate Change Expenditures Report to Congress (June 2010). See http://www.whitehouse.gov/sites/default/files/omb/assets/legislative_reports/FY2011_Climate_Change.pdf

referred to this set of federal activities as the federal "climate change enterprise."[3]

Federal climate programs are shifting their focus to adaptation and climate services. Our October 2009 report on climate change adaptation found no coordinated national approach to adaptation, but our May 2011 report on climate change funding cited indications that federal agencies were beginning to respond to climate change more systematically.[4] About the same time as the issuance of our October 2009 report, Executive Order 13514 on Federal Leadership in Environmental, Energy, and Economic Performance called for federal agencies to participate actively in the Interagency Climate Change Adaptation Task Force.[5] The task force, which began meeting in Spring 2009, is co-chaired by the President's Council on Environmental Quality, NOAA, and the Office of Science and Technology Policy and includes representatives from more than 20 federal agencies and executive branch offices. The task force was formed to develop federal recommendations for adapting to climate change impacts both domestically and internationally and to recommend key components to include in a national strategy. In addition, USGCRP recently launched a national climate assessment designed to engage stakeholders in a process that builds on science, data, and information to help decision making. Individual agencies are also beginning to consider adaptation actions. For example, in May 2009, the Chief of Naval Operations created Task Force Climate Change to address the naval implications of a changing Arctic and global environment.

My testimony today addresses (1) the data challenges that federal, state, and local officials face in their efforts to adapt to a changing climate, (2) the actions federal agencies could take to help address these challenges, and (3) federal climate change strategic planning efforts. The information in this testimony is based on prior work, largely on our recent reports on

[3]Panel of the National Academy of Public Administration, *Building Strong for Tomorrow: NOAA Climate Service*, a report prepared for Congress, the Department of Commerce, and NOAA (Sept. 13, 2010).

[4]GAO. *Climate Change Adaptation: Strategic Federal Planning Could Help Government Officials Make More Informed Decisions*, GAO-10-113, (Washington, D.C.: Oct. 7, 2009), and *Climate Change: Improvements Needed to Clarify National Priorities and Better Align Them with Federal Funding Decisions*, GAO-11-317, (Washington, D.C.: May 20, 2011).

[5]For more information about the Interagency Climate Change Adaptation Task Force, see http://www.whitehouse.gov/administration/eop/ceq/initiatives/adaptation.

climate change adaptation and federal climate change funding.[6] Our work was based on, among other things, analysis of studies; site visits to areas pursuing adaptation efforts; responses to a web-based questionnaire sent to federal, state, and local officials knowledgeable about adaptation; and interviews with such officials. A detailed description of our scope and methodology is available in each issued product. All of the work on which this statement is based was performed in accordance with generally accepted government auditing standards.

A Lack of Site-Specific Data, Such as Local Projections of Expected Changes, Can Challenge the Ability of Officials to Manage the Effects of Climate Change

As we reported in October 2009, insufficient site-specific data, such as local projections of expected changes, make it hard for federal, state, and local officials to predict the impacts of climate change, and thus hard for these officials to justify the current costs of adaptation efforts for potentially less certain future benefits.[7] Based on the responses by a diverse array of federal, state, and local officials knowledgeable about adaptation to a web-based questionnaire designed for that report, related challenges generally fit into two main categories: (1) translating climate data—such as projected temperature and precipitation changes—into information that officials need to make decisions and (2) difficulty in justifying the current costs of adaptation with limited information about future benefits.

The process of providing useful information to officials making decisions about adaptation can be summarized by the following:

- First, data from global-scale models must be "downscaled" to provide climate information at a geographic scale relevant to decision makers. About 74 percent (133 of 179) of the officials who responded to our questionnaire rated "availability of climate information at relevant scale (i.e., downscaled regional and local information)" as very or extremely challenging.

- Second, the downscaled climate information must be translated into impacts at the local level, such as increased stream flow. Some respondents and officials interviewed for our October 2009 report said that it is challenging to link predicted temperature and precipitation

[6]GAO-10-113 and GAO-11-317.

[7]GAO-10-113.

changes to specific impacts. For example, one federal official said that "we often lack fundamental information on how ecological systems/species respond to non-climate change related anthropogenic stresses, let alone how they will respond to climate change."

- Third, local impacts must be translated into costs and benefits, since this information is required for many decision making processes. Almost 70 percent (126 of 180) of the respondents to our questionnaire rated "understanding the costs and benefits of adaptation efforts" as very or extremely challenging.[8] As noted by one local government respondent, it is important to understand the costs and benefits of adaptation efforts so they can be evaluated relative to other priorities.

- Fourth, decision makers need baseline monitoring data to evaluate adaptation actions over time. Nearly 62 percent (113 of 181) of the respondents to our questionnaire rated the "lack of baseline monitoring data to enable evaluation of adaptation actions (i.e., inability to detect change)" as very or extremely challenging.

These challenges make it difficult for officials to justify the current costs of adaptation efforts for potentially less certain future benefits. A 2009 report by the National Research Council (NRC) discusses how officials are struggling to make decisions based on future climate scenarios instead of past climate conditions.[9] According to the report, requested by the Environmental Protection Agency and NOAA, usual practices and decision rules (e.g. for building bridges, implementing zoning rules, using private motor vehicles) assume a stationary climate—a continuation of past climate conditions, including similar patterns of variation and the same probabilities of extreme events. According to the NRC report, that assumption, which is fundamental to the ways people and organizations make their choices, is no longer valid.

[8]The number of respondents varies because some officials did not respond to certain questions.

[9]National Research Council of the National Academies, Panel on Strategies and Methods for Climate-Related Decision Support, Committee on the Human Dimensions of Global Change, *Informing Decisions in a Changing Climate* (Washington, D.C., 2009).

Federal Actions to Provide and Interpret Site-Specific Information Would Help Officials Understand the Impacts of Climate Change and Available Adaptation Strategies

Federal actions to provide and interpret site-specific information would help address challenges associated with adaptation efforts, based on our analysis of responses to the web-based questionnaire and other materials analyzed for our October 2009 report.[10] The report discussed several potential federal actions that federal, state, and local officials identified as useful to inform adaptation decision making. These included state and local climate change impact and vulnerability assessments and the development of processes and tools to access, interpret, and apply climate information. In that report, we also obtained information regarding the creation of a climate service—a federal service to consolidate and deliver climate information to decision makers to inform adaptation efforts.

About 61 percent (107 of 176) of the federal, state, and local officials who responded to the web-based questionnaire developed for our October 2009 adaptation report rated the "creation of a federal service to consolidate and deliver climate information to decision makers to inform adaptation efforts" as very or extremely useful.[11] Respondents offered a range of potential strengths and weaknesses for such a service. Several said that a climate service would help consolidate information and provide a single-information resource for local officials, and others said that it would be an improvement over the current ad hoc system. A climate service would avoid duplication and establish an agreed set of climate information with uniform methodologies, benchmarks, and metrics for decision making, according to some officials. According to one federal official, consolidating scientific, modeling, and analytical expertise and capacity could increase efficiency. Similarly, some officials noted that with such consolidation of information, individual agencies, states, and local governments would not have to spend money obtaining climate data for their adaptation efforts. Others said that it would be advantageous to work from one source of information instead of different sources of varying quality. Some officials said that a climate service would demonstrate a federal commitment to adaptation and provide a credible voice and guidance to decision makers. In an announcement on February 8, 2010, the Department of Commerce proposed establishing a NOAA climate service. Though not yet established, information is available on the NOAA climate service website, including draft vision and strategic framework

[10]GAO-10-113.

[11]GAO-10-113.

documents.[12] According to NOAA documents, such a climate service would provide a single, reliable, and authoritative source for climate data, information, and decision support services to help individuals, businesses, communities, and governments make smart choices in anticipation of a climate changed future.[13] A September 2010 report by the National Academy of Public Administration discusses the factors needed for a NOAA climate service to succeed—such as the designation of a lead federal agency to be the day-to-day integrator of the overall federal effort regarding climate science and services—and makes recommendations on how to achieve those factors.[14]

Other respondents to our questionnaire, however, were less enthusiastic about the creation of a climate service. Some voiced skepticism about whether it was feasible to consolidate climate information, and others said that such a system would be too rigid and may get bogged down in lengthy review processes. Furthermore, certain officials stated that building such capacity may not be the most effective place to focus federal efforts because the information needs of decision makers vary so much by jurisdiction. Several officials noted that climate change is an issue that requires a multidisciplinary response, and a single federal service may not be able to supply all of the necessary expertise. For example, one federal official stated that the information needs of Bureau of Reclamation water managers are quite different from the needs of Bureau of Land Management rangeland managers, which are different from the needs of all other resource management agencies and programs. The official stated that it seems highly unlikely that a single federal service could effectively identify and address the diverse needs of multiple agencies. Several respondents also said that having one preeminent source for climate change information and modeling could stifle contrary ideas and alternative viewpoints. Moreover, several officials who responded to our questionnaire were concerned that a climate

[12]For more information about the NOAA Climate Service, see http://www.noaa.gov/climate.html. A range of climate information is presented at www.climate.gov, NOAA's Climate Services Portal.

[13]The Department of Defense and Full Year Continuing Appropriations Act, 2011 prohibited any funds appropriated in the act to be used to implement, establish, or create a NOAA Climate Service as NOAA had previously described it during fiscal year 2011.

[14]Panel of the National Academy of Public Administration, *Building Strong for Tomorrow: NOAA Climate Service*, a report prepared for Congress, the Department of Commerce, and NOAA (Sept. 13, 2010).

service could divert attention and resources from current adaptation efforts by reinventing duplicative processes without making use of existing structures. The 2009 NRC report on informing decisions in a changing climate recommends that the federal government's adaptation efforts should be undertaken through a new integrated interagency initiative with both service and research elements but that such an initiative should not be centralized in a single agency.[15] Doing so, according to this report, would disrupt existing relationships between agencies and their constituencies and formalize a separation between the emerging science of climate response and fundamental research on climate and the associated biological, social, and economic phenomena. Furthermore, the report states that a climate service located in a single agency and modeled on the weather service would by itself be less than fully effective for meeting the national needs for climate-related decision support. The NRC report also notes that such a climate service would not be user-driven and so would likely fall short in providing needed information, identifying and meeting critical decision support research needs, and adapting adequately to changing information needs.

We have not made recommendations regarding the creation of a climate service within NOAA or any other agency or interagency body, although the provision of climate data and services will be an important consideration in future governmentwide strategic planning efforts, particularly in an era of declining budgets.

Federal Climate Change Strategic Planning Efforts Could Be Improved

Federal strategic planning efforts could be improved for many aspects of the climate change enterprise. Our October 2009 report on climate change adaptation concluded that, to be effective, related federal efforts must be coordinated and directed toward a common goal.[16] This report recommended the development of a strategic plan to guide the nation's efforts to adapt to a changing climate, including the identification of mechanisms to increase the capacity of federal, state, and local agencies to incorporate information about current and potential climate change impacts into government decision making. Some actions have

[15]USGCRP's September 30, 2011 Draft Strategic Plan reflects elements of these NRC recommendations.

[16]GAO-10-113.

subsequently been taken to improve federal adaptation efforts, but our May 2011 report on climate change funding found that federal officials do not have a shared understanding of strategic governmentwide priorities.[17] This report recommended, among other things, the clear establishment of federal strategic climate change priorities, including the roles and responsibilities of the key federal entities, taking into consideration the full range of activities within the federal climate change enterprise. In other reports, we also noted the need for improved coordination of climate-related activities. For example, our April 2010 report on environmental satellites concluded that gaps in satellite coverage, which could occur as soon as 2015, are expected to affect the continuity of important climate and space weather measurements.[18] In that report, we stated that, despite repeated calls for interagency strategies for the long-term provision of environmental data from satellites (both for climate and space weather purposes), our nation still lacks such plans.

Of particular importance in adaptation are planning decisions involving physical infrastructure projects, which require large capital investments and which, by virtue of their anticipated lifespan, will have to be resilient to changes in climate for many decades. The long lead time and long life of large infrastructure investments require such decisions to be made well before climate change effects are discernable. Our ongoing work for the Senate Committee on Environment and Public Works Subcommittee on Oversight and Subcommittee on Transportation and Infrastructure will explore this issue by reviewing the extent to which federal, state, and local authorities consider the potential effects of climate change when making infrastructure investment decisions.

Chairman Begich, Ranking Member Snowe, and Members of the Subcommittee, this concludes my prepared statement. I would be happy to respond to any questions that you or other Members of the Subcommittee may have.

[17]GAO-11-317.

[18]GAO. *Environmental Satellites: Strategy Needed to Sustain Critical Climate and Space Weather Measurements*, GAO-10-456, (Washington, D.C.: Apr. 27, 2010). For another example of the need for improved strategic planning, see *Climate Change: A Coordinated Strategy Could Focus Federal Geoengineering Research and Inform Governance Efforts*, GAO-10-903, (Washington, D.C.: Sept. 23, 2010).

Contacts and Acknowledgements

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