



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
RESEARCH AND DEVELOPMENT

October 17, 2006

Dr. James H. Johnson, Jr.
Chair, Board of Scientific Counselors
Dean, College of Engineering, Architecture and Computer Sciences
Howard University
2366 6th Street, NW, Room 100
Washington, DC 20059

Dear Dr. Johnson:

On September 26 –28, 2005, Dr. Russell chaired the Global Subcommittee of the Board of Scientific Counselors' (BOSC) evaluation of the Office of Research and Development's (ORD) Global Change Research Program in Washington DC. Following that review, the Subcommittee presented a report of its findings and recommendations about program relevance, quality, performance and scientific leadership to the Executive Committee of the Board of Scientific Counselors. After receiving a copy of the final report, the Global Research Program generated a response to the BOSC's report (attached).

The response of the Global Research Program to the reviewers' comments and recommendations is based on input from members of the Global Research team, program office stakeholders, and the National Program Director for Global Change research. The enclosed narrative identifies specific recommendations made by the reviewers for each of the research focus areas, provides a brief comment in response, and indicates how the Global Program will incorporate the committee's findings into its operation. Also attached is a table summarizing each recommendation, the action to be taken, and a schedule for completion of the action. The Program benefited considerably from your insight and advice and your recommendations were greatly appreciated.

As indicated in the Charge for the Global Change Research Program, ORD intends to conduct periodic evaluations of its program's progress at intervals of four to five years. The purpose of the reviews is to determine progress with regard to relevance, quality, performance, and scientific leadership; identify when clients are applying research to strengthen environmental

environmental decisions; and evaluate client feedback about the research. In addition to a formal review every four to five years, ORD intends to conduct an interim evaluation of the Program's progress midway through the review cycle. At a point which will occur approximately within the next two years, a subset of the Global subcommittee will be invited to participate in a one-day review to evaluate the status of the changes the Program has agreed to implement. In this context, we look forward to the possibility of working with you again.

Sincerely yours,

A handwritten signature in black ink, appearing to read "Kevin Y. Teichman". The signature is fluid and cursive, with the first name being the most prominent.

Kevin Y. Teichman, Ph.D.

Acting Deputy Assistant Administrator for Science

Enclosure

cc: Dr. Milton Russell (Global Subcommittee, Chair)
Dr. Clifford Duke (Global Subcommittee, Vice-Chair)
Dr. John Balbus
Dr. Charles Coutant
Dr. Claudia Nierenberg
Dr. Ruth Reck
Dr. Robert Wilkinson



Office of Research and Development's (ORD) October 2006
Response to the Board of Scientific Counselors (BOSC)
April 2006 Final Report that Reviews ORD's
Global Change Research Program

BOSC Global Change Subcommittee:

Dr. Milton Russell, Chair
Dr. Cliff Duke, Vice Chair
Dr. John Balbus
Dr. Charles Coutant
Dr. Claudia Nierenberg
Dr. Ruth Reck
Dr. Robert Wilkinson

Submitted by:

Joel D. Scheraga Ph.D.
National Program Director
Global Change Research Program

October 2006 ORD Response to BOSC April 2006 Global Change Final Report

On April 26, 2006, the Board of Scientific Counselors (BOSC) transmitted to EPA's Office of Research and Development (ORD) a review of ORD's Global Change Research Program conducted by the BOSC Global Change Subcommittee. The Subcommittee was chaired by Dr. Milton Russell from the University of Tennessee. Dr. Clifford S. Duke from the Ecological Society of America was the Vice-Chair.

The letter of transmittal to ORD noted that the results of the review are anticipated to assist ORD in program enhancement, comparative analysis with similar programs, intermediate mid-term investment decisions, Government Performance Results Act (GPRA) reporting, and response to the OMB Program Assessment Rating Tool (PART) process. In addition to an overall assessment of the Global Program's performance, the review also identified a number of areas in which future performance could be improved to meet the Program's mission and responsibilities. ORD is pleased to report that it has already begun to act upon several of the BOSC's excellent recommendations, and is benefiting from its advice and insights.

The Global Change Subcommittee was charged with evaluating the Global Program with respect to relevance, quality, performance, and scientific leadership. The Subcommittee addressed its charge by responding to a series of sub-questions focused on two fundamental questions:

1. Is the Global Change Research Program engaged in the "right" work?
2. Does the Program conduct its research and assessment activities "well"?

The BOSC's overall conclusion was that "the Program on the whole has done the 'right work' and that it has done it 'well.' It further concluded that "the Program has provided substantial benefits to the nation and that it is on course to make significant further contributions to societal outcomes by informing and facilitating decisions by the public and private sector actors who must consider the prospects of global change."

The BOSC went on to identify a number of areas in which future performance can be improved to meet the Program's evolving mission and responsibilities. These areas include: (1) a more rigorous approach to priority setting; (2) a redirection of its place-based activities toward those that will have broader national applicability; (3) increased attention to threshold- and episode-driven changes (in contrast to incremental changes); (4) an expansion of its consultation with external advisors who can identify emerging opportunities for productive work, help the Program avoid projects with minimal payoffs, and increase interaction with complementary U.S. CCSP efforts; and (5) specific actions in each research focus area.

To assist the Global Program with addressing each of the areas in which future performance can be improved, the BOSC made a number of program-wide recommendations. These recommendations are discussed below, along with specific responses by ORD's Global Program to the recommendations. (The BOSC's comments are written in *italics* and ORD's responses follow in regular type.) Following the

discussion of the program-wide recommendations, we provide responses to specific recommendations made in each research focus area. Attached to this document is a table which provides a summary of BOSC comments and proposed ORD actions.

Responses to program-wide recommendations made by the BOSC

1. *The Program should affirm its current emphasis on decision support for adaptation to global change and direct its resources accordingly. It should, however, assure that sufficient resources are devoted to the “harvest” of the results of the Program’s previous assessment of global change impacts by preparing and making available generally applicable “lessons learned” and other assessment results.*

The Global Program is committed to an ongoing process of synthesizing and communicating its research results—including the results of previous assessments—and making this information available in a timely and useful form to decision makers, resource managers, and other stakeholders. For example, the program is actively engaged in the production of several Synthesis and Assessment Products (SAPs), as part of its commitment to the U.S. Climate Change Science Program (CCSP). The purpose of the SAPs is to respond to the highest-priority CCSP research, observation, and decision support needs, and to provide information to decision makers in a timely and useful way. The Global Program is leading the production of two of the 21 SAPs, and contributing to eight others. The two SAPs being led by EPA draw heavily upon the results of the Global Program’s previous research and assessments, and will make this information and “lessons learned” accessible to the public in a clear and useful way. For example, one of the SAPs will synthesize insights gained about adaptation options for climate-sensitive ecosystems. Another of the SAPs will include insights gained about the potential health effects of climate change.

The Global Program is also committed to making its research and assessment results (including results produced by grantees and contractors) accessible to the public through an improved website. It is also exploring ways in which the existing website for ORD’s STAR program can be improved to make it easier for the public to locate information on global change research, and to sort the information by topic.

2. *The Program should consider developing an explicit framework for priority setting and project selection to guide future Program activities; when articulated, such a framework would aid communication with its publics by making explicit those types of activities that were and were not candidates for action.*

The ORD Global Program is currently exploring a “decision-assessment approach” and, if successful, will use the results to develop an explicit framework for priority setting and project selection. More specifically, the program is developing a dynamic “decision inventory” to identify different classes of climate-sensitive decisions in different regions

of the country and to evaluate the returns from providing better scientific information to inform those decisions.

This “decision assessment” is focusing on decisions that may be sensitive to climate or important to determining the net effect of climate change. These include decisions where plausible ranges of climate change could lead decision makers to different courses of action or influence the effectiveness, efficiency, or success of decisions. These also encompass actions that play an important role in determining the net effect of climate change. These decisions and actions are frequently interrelated, and examples include (1) design of flood control structures; (2) capacity of water treatment facilities; (3) management of water supply systems; (4) strategies for ecosystem or vegetation restoration; (5) policies influencing the extent of impervious surfaces; (6) acquisition of water rights to maintain surface water flows; and (7) approaches to the detection and eradication of invasive species.

Outcomes associated with each of these decisions and actions depend, at least in part, on climatic conditions. Such examples of climate sensitive decisions and actions are easy to find, but a systematic assessment is not available for important groups of decision makers. Moreover, the Global Program’s goals require each type of decision to be described in the context of operational constraints and opportunities, including factors such as cost, regulatory mandates, frequency, and reversibility. This will help the program identify decisions where targeted research and development activities can lead directly to results of greatest value to specific user communities.

The overall goals of the decision assessment effort are to: (1) identify the scope of climate-related decisions made by important groups of decision makers associated with high-priority issues relevant to EPA’s mission; (2) provide a broad sample of the social, economic, and environmental attributes of climate-related decisions; and (3) develop a decision-support system to help the Global Program use information about climate-related decisions to identify and prioritize research opportunities.

- 3. The Program should engage diverse and multidisciplinary (“wise” as well as expert) external advisors to assist in formulating future Program direction and focus area projects. Given the very long-term nature of potential global change impacts (including consequences that occur across decades) such advisors should be tasked to address intergenerational concerns.*

The Global Program is committed to continuing its practice of engaging external advisors at key points in its research activities at which major decisions are made about future Program directions and focus area projects. For example, with the imminent completion of its “interim” Climate Change/Air Quality Assessment, the program will be holding a workshop to develop a strategy for characterizing, quantifying and communicating uncertainty, as it plans the longer-term (2010) Global Change/Air Quality Assessment. (The workshop will take place November 1–2, 2006, in Durham, NC.) The workshop will address uncertainty in complex environmental assessments, focusing on

the program's 2010 Assessment of the Impact of Global Change on U.S. Air Quality. This workshop will provide the foundation for meeting three key needs: (1) Development of a strategy for properly tracking and quantifying uncertainty within large, complex, model-based environmental assessments. (2) Development of a strategy for effectively communicating this uncertainty to a diverse set of stakeholders, clients, and users. (3) Application of these strategies to the Assessment of the Impact of Global Change on U.S. Air Quality, as well as future assessments. Participants in the workshop will include diverse and multidisciplinary external advisors, including academic experts (*e.g.*, experts in climate research and modeling communities, air quality research and modeling, uncertainty research), and expert stakeholders in EPA's Office of Air and Radiation.

The Global Program is also committed to engaging the National Academies at appropriate times. For example, the program has just co-funded with NOAA a study of "decision support science" by the National Research Council's (NRC) Committee on the Human Dimensions of Global Change. Given the Global Program's new emphasis on decision support for adaptation to global change, it felt it prudent to engage the NRC in the formulation of this new research direction. The objectives of the NRC study are to (1) elaborate a framework for considering climate-related decision support objectives and activities; (2) assess the strengths and limitations of various strategies, activities and tools; and (3) recommend strategies that the sponsors might use for organizing decision support activities.

4. *The Program should take a more integrated and comprehensive systems approach when designing and implementing its activities across focus areas. In particular, it should consider integrating the Program's water quality and ecosystems focus areas to a greater extent. Further, it should consider and take into account ancillary benefits and costs in evaluating its past and proposed activities.*

We are currently restructuring the Program along the lines suggested by the BOSC review—and including this proposed restructuring as part of our PART submission to OMB. Specifically, we are integrating the Program's water quality and ecosystems areas. We are more closely aligning these areas with EPA's statutory mandates related to water quality.

We have accomplished this realignment by recognizing that the Clean Water Act is designed to protect designated uses. The Program focuses on two designated uses: human uses of water (*e.g.*, our work on MCL violations, pollutants and pathogens, POTW treatment costs, and CSOs fall into this area) and aquatic life uses (*e.g.*, our work on biocriteria, invasive species, the South Platte and Sierra Nevada case studies, and coral reefs fall in this area). Finally, EPA's Office of Water (OW) is increasingly focused on watersheds as the appropriate scale for analysis and management (*e.g.*, TMDL), and the Global Program is also moving toward a watershed approach to increase its relevance and saliency for OW.

- 5. The Program should explicitly take account of intra-Program and external synergies in research and in project evaluation, selection, design, and implementation.*

The Global Change Research Program is committed to taking account of intra-Program and external synergies in research and in project evaluation, selection, design, and implementation. As noted in the “overview” documentation provided to the Subcommittee at the outset of the review process, the Global Program is an *integrated program* that accomplishes its goals through investments in both “intramural” and “extramural” activities.

The intramural component includes both research and assessment activities coordinated across multiple ORD laboratories and centers. Each of EPA’s labs and centers has specialized expertise. The use of these skills is coordinated by the National Program Director. The intramural research is focused on developing scientific information and tools necessary for conducting the ongoing assessments.

Extramural activities engage the outside academic community in targeted research that complements the Global Program’s intramural research program. The extramural component consists of grants and cooperative agreements awarded through a competitive solicitation process, which includes independent peer review and programmatic relevancy review. All of the grants (as opposed to the cooperative agreements) are awarded through ORD’s Science to Achieve Results (STAR) program. Additional research is done through joint RFAs with other federal agencies.

Detailed planning, coordination of research and assessment activities, and identification of research needs that can be met by the STAR grants program, is accomplished by workgroups that address a particular focus area. These workgroups are composed of staff members from the ORD labs and centers and staff from EPA Program and Regional Offices. The workgroups maintain direct ties with external collaborators (*e.g.*, cooperating universities, other federal agencies, and other research partners) to accomplish research and assessment objectives.

Our planning is also tied to the interagency CCSP. The CCSP coordinates and integrates scientific research on global change and climate change sponsored by 13 participating departments and agencies of the U.S. Government. CCSP Workgroups, in which ORD staff participates, regularly explore possible synergies between CCSP agencies in research and in project evaluation, selection, design, and implementation.

- 6. The Program should expand its efforts on non-steady-state (nonlinear-response) issues such as thresholds and episode-driven changes.*

The program is committed to expanding its efforts on nonlinear response issues such as thresholds and episode-driven changes. A sign of this commitment is the RFA that the Program recently issued on non-steady-state (*i.e.*, nonlinear response or thresholds)

changes in ecosystems. The RFA is entitled, “Nonlinear Responses to Global Change in Linked Aquatic and Terrestrial Ecosystems and Effects of Multiple Factors on Terrestrial Ecosystems: A Joint Research Solicitation—EPA, DOE.” The RFA was intended to attract research on: (1) when and how climate change stressors produce nonlinear ecological responses in linked aquatic and terrestrial systems, and (2) when and how multiple global change factors might alter the structure and function of terrestrial ecosystems. Proposals are expected to address nonlinear ecological responses caused by climate change and variability on the scale of decades or longer. The RFA indicated that linked ecosystems are of particular interest to EPA and include: freshwater wetlands, riparian areas, watersheds, and near-coastal environments such as estuaries. Unmanaged and managed terrestrial systems such as forests, grasslands, woodlands, deserts, and field crops are of interest to DOE.

7. *The Program should explore cooperation with other efforts to provide decision support tools and information.*

The Program is exploring cooperation with other efforts to provide decision support tools and information primarily through the Climate Change Science Program (which was established to foster such cooperation). EPA is currently a co-chair of the Human Dimensions Work Group, which has the lead for decision support within the CCSP.

In addition, as noted earlier, the program has just co-funded with NOAA a study of “decision support science” by the National Research Council’s (NRC) Committee on the Human Dimensions of Global Change. Given the Global Program new emphasis on decision support for adaptation to global change, it felt it prudent to engage the NRC in the formulation of this new research direction. The objectives of the NRC study are to (1) develop a framework for considering climate-related decision support objectives and activities; (2) assess the strengths and limitations of various strategies, activities and tools; and (3) recommend strategies that the sponsors might use for organizing decision support activities.

8. *The Program should develop a new strategy for place-based adaptation decision support activities that recognizes the importance of engagement of local stakeholders while assuring that the results of the investment have extended applicability of national significance and verifiable traction with decision makers.*

The Global Program is assessing place-based adaptation for ecosystems as part of CCSP Synthesis and Assessment Product (SAP) no. 4.4, entitled “A preliminary review of adaptation options for climate-sensitive ecosystems and resources.” ORD’s Global Program is responsible for production of this SAP. The purpose of SAP no. 4.4 is to review management options for adapting to climate variability and change, and to identify characteristics of ecosystems and adaptive management responses that promote successful implementation and meet resource managers’ needs.

Water quality also lends itself to place-based adaptation, and the Program has several projects underway that investigate this issue.

Responses to specific recommendations made by the BOSC in each research focus area

Air Quality

The BOSC did not recommend changes in the structure of the priorities of the Air Quality Focus Area. However, a natural result of the Program restructuring noted above is that air quality will become one of two major foci of the Program (water quality will be the other focus). This will align the Program with the Clean Air Act, and enhance our (already good) working relationships with the Office of Air and Radiation.

The Program will explore the potential for extending the results of the Air Quality Assessment. In particular, the Program will consider (1) using the results of the Air Quality Assessment to evaluate ecosystem impacts (*e.g.*, changes in ozone concentration on high-elevation forests). (2) using the results of the Air Quality Assessment to evaluate health consequences; and (3) using the downscaled climate scenarios in other applications (*e.g.*, in water quality, ecosystems, and health assessments);

The Program will investigate and monitor the possible use of the Semantic Web for decision support.

Water Quality

As noted previously, we have restructured our program along two main pillars: water quality and air quality. This structure is directly responsive to EPA's mission as the agency responsible for implementing the Clean Water Act, Safe Drinking Water Act, and Clean Air Act.

Under the new structure, water quality encompasses human uses of water (*i.e.*, the current Water Quality Focus Area) and aquatic life uses (*i.e.*, the current Ecosystems Focus Area), and the development and application of an integrated watershed-based (or place-based) approach for protecting water quality. Ecosystem protection is a goal of the Clean Water Act, and thus the ecosystem focus area is fully integrated into the water quality area.

We have initiated a dialog with EPA's Office of Water (OW) to identify their needs and priorities, and will use this information to ensure that Global Program activities effectively support decision makers in EPA's OW.

Human health impacts associated with climate-induced changes in water quality will also be undertaken within the new Water Quality Area, resulting in a closer integration.

The mandates of the Clean Water Act and the Safe Drinking Water Act provide the framework for examining water-quality-related health endpoints under conditions of climate and land use change.

The Program is seeking (with some success) to make greater use of internal expertise, especially within OW, and engaging OW to tackle these water issues.

The Program recognizes that water quality and water quantity are inextricably linked. However, to maintain the unique contributions that the Program can make, water quantity will only be addressed in the context of how it affects water quality (*e.g.*, the Program will not investigate dams to provide adequate water supplies or to provide hydropower, the supply of water to thermally cool power plants, etc.). For example, an examination of how climate change affects water recharge and reuse and consequently impacts aquatic life uses would be appropriate for the program.

The benefits of this restructuring include: (1) better integration of program elements including water quantity, water quality, ecosystems, and place-based assessments through application of a watershed approach; (2) better integration of human health impacts with water quality; (3) facilitated development of tools and methodologies to evaluate multiple benefits for more effective adaptation through application of a watershed approach; (4) better identification of criteria for project prioritization based on utility to national-scale water and air quality protection programs (including choice of projects that represent OW's most critical needs—thus responding to the BOSC's recommendation that selected projects have national scale significance); (5) closer alignment with OW programs that will allow a greater focus on regulatory thresholds such as water quality standards or permit violations; (6) closer alignment with OW programs that will allow better integration of data and expertise within OW; and (7) direct relevance of our research and information tools to decision makers and managers.

Given the definition of our stakeholders as EPA's Office of Water and Office of Air and Radiation, we have identified a set of advisory-like groups that we will interact with to better direct our stakeholder interactions and outreach, and to periodically re-evaluate our approach to place-based assessments. These groups include: (1) an NRC panel on decision support; (2) a cross-agency (OW/ORD) advisory committee; and (3) CCSP Interagency Working Groups and their Science Steering Committees.

Human Health

The BOSC did not recommend changes in the structure of the priorities of the Human Health Focus Area. However, as part of the Program restructuring, the program believes that it can be more effective if the human health focus is incorporated more directly into the Air Quality and Water Quality Focus Areas.

The Program's 2007 Air Quality Assessment will provide input to an analysis of the health impacts of criteria pollutants, including ozone and fine particulates. BenMap 2.3 (an OAR benefits model) will be used to develop high resolution analyses of health impacts at the urban- or metropolitan-level. The Program will engage OAR as collaborators and partners in these health-effects modeling efforts.

Closer integration between human health and the water quality focus area is also being addressed as described above.

In conjunction with other Federal Agency Partners, EPA is continuing to lead assessments of human health and welfare. The Climate Change Science Program's Synthesis and Assessment Product no. 4.6 is led by EPA and coordinated with NIH, CDC, NOAA, DOE, and NASA. This assessment calls for an analysis of climate impacts on human health, human welfare, and human settlements in the United States.

The Program agrees that it has neither the resources nor the mandate to address data and research needs for public health protection. In order to best take advantage of EPA expertise, the Program will increase its focus on health impacts associated with climate-induced changes in air quality and water quality (*i.e.*, secondary effects).

Ecosystems

Many of the recommendations have been addressed in the Overview and Water Quality areas above (*i.e.*, nonsteady-state responses, integration with water quality, ongoing advisory committees, etc.).

The first recommendation to focus on truly representative aquatic ecosystems for adaptation decisions, where *truly representative* means either that the results can be generalized and applied elsewhere or that many individuals/organizations needs are met, is partially addressed by the integration of ecosystems into the water quality focus area. The point is well taken however, and the Program will incorporate the notion of "representativeness" into its decision criteria where feasible.

Regional/Placed-based Assessments

We agree with the BOSC that the regional assessments were “right for their time,” and we are actively considering alternatives for “place-based” work (e.g., watersheds, biomes, urban environments).

Our major reports being conducted under the auspices of the CCSP reflect this change in thinking about “regions.” SAP no. 4.4 is focusing on managed systems and is using place-based case studies of a particular ecosystem type to illustrate adaptation issues and options. SAP no. 4.6 will include human settlements (including urban environments) in its scope.

The Program actively engages other Federal Agencies through the CCSP.

Global Change Research Program

Summary of program-wide BOSC recommendations from March 27, 2006 review by the Global Change Subcommittee, and proposed ORD actions

	Action Items	Timeline
<p><i>Recommendation 1: The Program should affirm its current emphasis on decision support for adaptation to global change and direct its resources accordingly. It should, however, assure that sufficient resources are devoted to the “harvest” of the results of the Program’s previous assessment of global change impacts by preparing and making available generally applicable “lessons learned” and other assessment results.</i></p>		
	<p>The Global Program is committed to an ongoing process of synthesizing and communicating its research results – including the results of previous assessments – and making this information available in a timely and useful form to decision makers, resource managers, and other stakeholders.</p>	<p>Ongoing</p>
	<p>The Program will complete production of CCSP Synthesis and Assessment Products #4.4 and #4.6 through a FACA process.</p>	<p>December 2007</p>
	<p>The Global Program is also committed to making its research and assessment results (including results produced by grantees and contractors) accessible to the public through an improved website.</p>	<p>September 2007</p>
<p><i>Recommendation 2: The Program should consider developing an explicit framework for priority setting and project selection to guide future Program activities; when articulated, such a framework would aid communication with its publics by making explicit those types of activities that were and were not candidates for action.</i></p>		
	<p>The ORD Global Program is currently exploring a “decision-assessment approach” and if successful, will use the results to develop an explicit framework for priority setting and project selection.</p>	<p>September 2007</p>

October 2006 ORD Response to BOSC April 2006 Global Change Final Report

	Action Items	Timeline
<p>Recommendation 3: <i>The Program should engage diverse and multidisciplinary (“wise” as well as expert) external advisors to assist in formulating future Program direction and focus area projects. Given the very long-term nature of potential global change impacts (including consequences that occur across decades) such advisors should be tasked to address intergenerational concerns.</i></p>		
	<p>The Global Program is committed to continuing its practice of engaging external advisors at key points in its research activities at which major decisions are made about future Program directions and focus area projects.</p>	<p>Ongoing</p>
	<p>The Program will hold a workshop with external advisors focusing on uncertainty in complex environmental assessments, focusing on the program’s 2010 Assessment of the Impact of Global Change on U.S. Air Quality.</p>	<p>November 1-2, 2006</p>
	<p>The Program will co-sponsor (with NOAA) an NRC study of “decision support science.”</p>	<p>Commence October 2006</p>
<p>Recommendation 4: <i>The Program should take a more integrated and comprehensive systems approach when designing and implementing its activities across focus areas. In particular, it should consider integrating the Program’s water quality and ecosystems focus areas to a greater extent. Further, it should consider and take into account ancillary benefits and costs in evaluating its past and proposed activities.</i></p>		
	<p>The Program will integrate the water quality and ecosystems areas. The Program will more closely align these areas with EPA’s statutory mandates related to water quality. This will be reflected in a revised Multi-Year Plan.</p>	<p>September 2007</p>
<p>Recommendation 5: <i>The Program should explicitly take account of intra-Program and external synergies in research and in project evaluation, selection, design, and implementation.</i></p>		
	<p>The Global Change Research Program is committed to taking account of intra-Program and external synergies in research and in project evaluation, selection, design, and implementation.</p>	<p>Ongoing</p>
<p>Recommendation 6: <i>The Program should expand its efforts on non-steady-state (nonlinear-response) issues such as thresholds and episode-driven changes.</i></p>		

October 2006 ORD Response to BOSC April 2006 Global Change Final Report

	Action Items	Timeline
	The program is committed to expanding its efforts on nonlinear response issues such as thresholds and episode-driven changes. This will be reflected in a revised Multi-Year Plan.	September 2007
	The program will issue an RFA entitled, "Nonlinear Responses to Global Change in Linked Aquatic and Terrestrial Ecosystems and Effects of Multiple Factors on Terrestrial Ecosystems: A Joint Research Solicitation- EPA, DOE."	Completed
Recommendation 7: <i>The Program should explore cooperation with other efforts to provide decision support tools and information.</i>		
	The Program is exploring cooperation with other efforts to provide decision support tools and information primarily through the Climate Change Science Program (which was established to foster such cooperation). EPA is currently a co-chair of the Human Dimensions Work Group which has the lead for decision support within the CCSP.	Ongoing
	The Program will co-sponsor (with NOAA) an NRC study of "decision support science."	Commence October 2006
Recommendation 8: <i>The Program should develop a new strategy for place-based adaptation decision support activities that recognizes the importance of engagement of local stakeholders while assuring that the results of the investment have extended applicability of national significance and verifiable traction with decision makers.</i>		
	The Global Program will assess place-based adaptation for ecosystems as part of CCSP Synthesis and Assessment Product (SAP) #4.4, entitled "A preliminary review of adaptation options for climate-sensitive ecosystems and resources."	December 2007
	The program will investigate place-based adaptation related to global change and water quality through several projects.	Ongoing