II. Framework for USGCRP

USGCRP Vision and Mission

Vision: *A Nation, globally engaged and guided by science, meeting the challenges of climate and global change.*

Mission: *To build a knowledge base that informs human responses to climate and global change through coordinated and integrated Federal programs of research, education, communication, and decision support.*

The Program's vision reflects the urgent challenges discussed in the Introduction, and the central role of U.S. science in addressing those challenges. The mission statement articulates the Program's role in addressing the mandated scope of the Global Change Research Act over the next decade. Together they form a foundation for this Strategic Plan, which emphasizes better integration of social, ecological, and physical sciences to understand changing conditions, increased utilization of scientific information and knowledge, and better communication and education. This more integrated approach requires enhanced coordination among the member agencies and will build on the strong partnerships already in place. It also requires the Program to expand relationships beyond its current membership, to better understand and respond to the science needs of the agencies and their stakeholders, and to increase the use of USGCRP science in the Nation's response to global change.

The Strategic Plan is based on the Program's previous accomplishments in monitoring and understanding global change, the likely future impacts of global change, and their relevance to society's needs. Over the next decade, USGCRP will maintain these strengths and build on the Program's initial efforts in decision support to increase the impact of USGCRP science. The Program will enhance its current capabilities to better assess, understand, and integrate stakeholder science needs into its planning, and to provide global change assessments and information in ways that are more useful for decision making. These directions reflect the Program's emphasis on developing and sharing information that is useable and useful. Throughout the Strategic Plan, the Program focuses on the interaction between climate change and other aspects of global change, such as land-use change, loss of biodiversity, changing hydrological conditions, and alteration of key biogeochemical cycles.

This Strategic Plan is meant to guide USGCRP strategic directions for the next 10 years. It is not a detailed plan for programmatic activities, which will evolve considerably over the decade. Rather, it provides guiding principles and mechanisms for implementing and linking the Strategic Plan to intermediate and near-term priorities and activities. In implementing the Strategic Plan, USGCRP will continue to uphold principles of intellectual rigor, transparency, accessibility, and traceability. In addressing major scientific challenges, the Program will mobilize the best scientific skills at home and abroad, use merit review processes to develop priorities, and use peer review to ensure the quality and accuracy of products.

This chapter provides a brief overview of the USGCRP and key elements that frame the goals and objectives of the Strategic Plan. See Chapter V for more detailed material on Program structure, governance, and implementation.

Overview

The USGCRP is a confederation of the research components of 13 Federal departments and agencies. These 13 departments and agencies carry out research and maintain and develop capabilities that support the Nation's response to global change, in coordination with the Subcommittee on Global Change Research (SGCR). The SGCR reports to the Committee on Environment, Natural Resources, and Sustainability (CENRS), which is part of the National Science and Technology Council (NSTC) (**Box 6**), and provides coordination with other parts of that structure, including other CENRS subcommittees with mandates that relate to global change.

Box 6. USGCRP Governance Structure

The SGCR coordinates interagency activities through the USGCRP National Coordination Office (NCO) and interagency working groups (IWGs). Generally, the IWGs correspond to program functions and are designed to bring agencies together to plan and develop coordinated activities, implement joint activities, and identify and fill gaps in the Program's plans. They allow public officials to communicate with each other on emerging directions within their agencies, on their stakeholder needs, and on best practices learned from agency activities. Together, these functions allow the agencies to work in a more coordinated and effective manner. The Program will continue to draw from and leverage agency strengths in achieving the collective USGCRP Strategic Plan goals and objectives.

In this document, the phrase "USGCRP agencies" is used when referring to research and operations carried out by the 13 member agencies to implement priorities linked to USGCRP. "USGCRP" and "the Program" are used interchangeably when referring to activities that require coordinated planning for agency implementation, as well as the planning, coordination or integration functions themselves carried out by the SGCR, the IWGs, and the NCO. When referring to coordination activities carried out by only one part of the Program, such as the NCO, that entity is identified by name.

The Program's mission will be implemented by USGCRP agencies, scientific staff in agency and contractor laboratories, and agency grant recipients. The USGCRP investments in activities such as observations and monitoring, information services, research and modeling, assessment, communications, and outreach totaled about $2 billion in Fiscal Year (FY) 2010. The USGCRP also builds on investments made by the agencies that are not included in this total. Results from prior USGCRP programs and activities are highlighted in the Introduction and in boxes throughout this Strategic Plan. Outcomes from these activities, along with the investments made by USGCRP agencies, are summarized on a regular basis in the Program's annual report to Congress, *Our Changing Planet*. USGCRP priorities also have the potential to encourage and inspire cooperative efforts by state and local governments, the academic community, and industry, as well as Federal entities not included formally in the USGCRP.

The Program's stakeholders are critical to success. USGCRP agencies interact with a wide variety of groups around the world including international, national, state, tribal, and local governments, businesses, professional and other nonprofit organizations, the scientific community, and the public. Each contributes to USGCRP's ability to carry out its mission. Through dialogue with the agencies, stakeholders communicate their information needs to the Program, helping to shape Program directions and priorities and collectively advance the understanding of global change. In turn, USGCRP strengthens its ability to better communicate global change information to stakeholders to advance their ability to make informed decisions about the changes and challenges they face.

Framework for the New USGCRP

Interlinking goals, unifying themes, and activities that allow simultaneous progress on multiple goals provide the framework for an integrated USGCRP. This framework emphasizes the interdisciplinary approach that is needed for future success and provides direction for expanded areas of the Program.

A detailed discussion of USGCRP objectives and activities linked to the four goals below follows in Chapter III. The goals are designed to build from and support each other in achieving an integrated program.

Goal 1. Advance Science: Advance scientific knowledge of the integrated natural and human components of the Earth system. This goal encompasses the research, including integrated observations and modeling, that is necessary to better understand the behavior and interactions of different aspects of the Earth system (including the human component) and their response to global change. This goal builds on USGCRP's strong research tradition and provides the foundation for the other three goals, which in turn will help shape future research priorities.

Goal 2. Inform Decisions: Provide the scientific basis to inform and enable timely decisions on adaptation and mitigation. USGCRP and member agencies will emphasize translating research (from Goal 1 and other sources) into formats and results that are policy relevant, useable, and accessible to decision makers. The Program also is expanding the ability to provide global change information and tools that the public and private sectors need to make decisions**.**

Goal 3. Conduct Sustained Assessments: Build sustained assessment capacity that improves the Nation's ability to understand, anticipate, and respond to global change impacts and vulnerabilities. USGCRP will conduct and participate in national and international assessments to evaluate the current state of the science and likely future scenarios of global change and their impacts, and evaluate how effectively science is being used to support the Nation's response to change. It will also build a standing capacity to conduct national assessments and support those at regional levels. Together, Goals 2 and 3 will evaluate progress in responding to change and identify science and stakeholder needs for further progress. The Program will use this regular assessment to inform its priorities.

Goal 4. Communicate and Educate: **Advance communications and education to broaden public understanding of global change and develop the scientific workforce of the future**. USGCRP will make its research results available to stakeholders and provide information to citizens in ways that are relevant to their lives and needs. The Program and USGCRP agencies will adopt, develop, and share best

practices in communication that enhance stakeholder engagement. Educational efforts will support development of a scientific workforce able to use global change knowledge in their careers to support the Nation's response to global change.

Unifying Themes

There are a number of ideas that track across multiple goals of the Strategic Plan, and provide unifying themes and focus for the Program:

Providing Knowledge on Scales Appropriate for Decision Making. A key unifying idea of this Strategic Plan is to acquire and use scientific knowledge about global change at the spatial and temporal scales on which planning, management, and policy decisions are made. Improvements in global and regional scale models are necessary to meet this need. The Program will develop additional capacity for modeling Earth's climate system on seasonal, annual, and decadal scales, in a context that includes both natural and human systems needed for decision making. Models will address gradual changes in means, as well as potentially larger variations in the resulting distribution of extreme events, and even greater changes associated with thresholds and tipping points. The Program will coordinate research on regions where the effects of global change will be most acutely felt or where feedback effects are most significant.

Incorporating Social and Biological Sciences. This Strategic Plan highlights the importance of increased integration of the physical, social, and biological sciences to better understand the impact of global change on ecosystems and the services they provide, as well as how humans drive and respond to global change. Integrated biological research at the population, species, community and ecosystem levels is critical to understanding, for example, the impacts of global change on ecosystem services and biodiversity. Contributions from social and behavioral sciences are essential to identifying the spatial distribution of people and global change issues, understanding decisions, managing risks, and formulating policy options in the face of incomplete information. This new knowledge must go beyond the direct application, such as understanding decisions, to the broader scientific knowledge that relates the cognition and behavior of individuals, families, and businesses to their environmental setting. Harnessing the benefit of such integration will require attention to the observational and information management needs in the biological and social sciences as they tie to global change. This Strategic Plan also notes the workforce challenges and opportunities for better incorporation of social scientists into the Program.

Enabling Responses to Global Change via Iterative Risk Management. USGCRP has an important role to play in providing information useful for iterative risk management. Iterative risk management is an adaptive process of identifying risks and response options, advancing a portfolio of actions that emphasize risk reduction across a range of likely future conditions, and revising responses to reflect new knowledge. In particular, USGCRP's role will be to support research and development that provides the knowledge needed to improve response options to global change. As options are selected and implemented, the Program will monitor and assess progress being made through the Nation's response efforts and the science needed to support further progress. The scientific expertise mobilized by USGCRP will develop the knowledge necessary to prepare and evaluate responses to change, and to evaluate consequences, both intended and unintended.

Cross-Linking Activities

In addition to themes that link the goals and objectives of this Strategic Plan, there are activities that simultaneously benefit multiple goals. The topics listed are discussed under specific objectives in Chapter III, but connectivity across the goals is briefly highlighted here.

Enhance Information Management and Sharing. Creating and sharing knowledge, data, and projections of likely future conditions is essential to researchers, resource managers, decision makers, educators, and the public. The Program will leverage information tools, services, and portals from the USGCRP agencies to develop a global change information system, a "one-stop shop" for accessing global change data and information (**Box 23**). Through its members, the Program will also develop a virtual environment for collaboration among researchers and educators, providing enhanced capabilities in areas such as data assimilation, community models, and visualization.

Enable a High Capability for Integrated Observations and Modeling. Integrated modeling and observations are essential approaches for USGCRP. Together, they provide the scaffolding needed to develop scenarios of likely future conditions, characterize their uncertainties, understand changes over time, and investigate the likely consequences of action (and inaction) in response to global change. The USGCRP strategy for sustaining key observational capability will emphasize continued investment in, and development of, observations in societal benefit areas that are most important for answering critical questions in global change research. These benefit areas are at the intersection of climate change with agriculture, biodiversity, disasters, ecology, energy, human health, oceans, water, and weather. The USGCRP agencies will work with the National Research Council and other CENRS entities such as U.S. Group on Earth Observations (**Box 18**) in developing plans to sustain these essential observations, fill critical observational gaps in key regions and disciplines (including biological and societal), improve data quality where necessary to improve fundamental process understanding and model predictability, and reduce uncertainties.

Box 7. Department of Defense and the Use of Climate Change Science

USGCRP-produced information was cited in the U.S. Department of Defense's (DoD) 2010 Quadrennial Defense Review as a primary source of information on expected climate change that would affect the DoD by shaping its future operating environment, roles, and missions. In addition, assessments conducted by the intelligence community indicate that climate change could have significant geopolitical impacts around the world by contributing to poverty, environmental degradation, and the further weakening of fragile governments. Although climate change alone does not cause conflict, it may act as an accelerant of instability or conflict and may place a burden to respond on civilian institutions and militaries around the world. The intelligence community also judged that more than 30 U.S. military installations faced increased risk from rising sea levels. Finally, extreme weather events may lead to increased demands for defense support to civil authorities for humanitarian assistance or disaster response both within the United States and overseas.

The U.S. Navy and Coast Guard are actively cooperating on Arctic issues. The U.S. Coast Guard participates in Arctic Domain Awareness flights that take place every two weeks from mid-spring to mid-fall. The flights collect scientific information on carbon dioxide and methane in the atmosphere, as well as monitor maritime traffic in the U.S. Arctic maritime environment.

Figure: Photo taken September 23, 2010, from loading ramp of a U.S. Coast Guard C-130 over the Beaufort Sea. Image courtesy of CDR B. McBride.

Increase Proactive Engagement and Partnerships. To maximize the benefit of USGCRP, the Program will strengthen its partnerships across multiple levels of government, including engaging a broader cross section within USGCRP agencies and with agencies currently outside of USGCRP, where department and agency missions directly relate to Program activities. USGCRP also will build appropriate relationships with private foundations, nongovernmental organizations, and business sectors to inform USGCRP planning, and extend the reach and utility of its research and capabilities. The Program will establish a framework that engenders effective dialogue with policy and decision makers in both public and private sectors.

Leverage International Leadership. In the Global Change Research Act, Congress recognized the importance of international cooperation to global change research and mandated a role for USGCRP in the international community. The Program engages in international cooperation because it enhances and complements the strengths, interests, and needs of USGCRP and its partner agencies. The challenges and opportunities that USGCRP faces are global in scope and are larger than what the United States can achieve on its own. International engagement is important in all fields of science, but it is indispensable for the science of USGCRP. Global observing systems are essential to global change research and require international partnerships. Field-based campaigns often require international partnership. USGCRP works with sister interagency entities such as the U.S. Group on Earth Observations (USGEO) and the Interagency Working Group on Digital Data which help set the standards and coordination of Earth observation data in a long-term, durable, and usable fashion. U.S. and international efforts together provide the information and capabilities needed by scientists and institutions in developing countries as they respond to global change. More detailed information about coordinating USGCRP global change research activities with other nations and international organizations is provided in Chapter IV.

Develop the Scientific Workforce for the Future. Research to support adaptation and mitigation strategies, its translation for decision makers, and assessment of its effectiveness are all areas requiring specialized skills and a trained workforce. USGCRP agencies will use their relationships with academia to promote the interdisciplinary education at undergraduate and graduate levels needed for a professional and technical workforce in areas directly related to global change.

The next chapter provides a detailed look at the four goals and their objectives. It outlines key areas of research and new capabilities for the next decade to support the country's response to global change. Chapter IV discusses USGCRP coordination with other nations and international organizations. Chapter V outlines guidelines the Program will use in implementing these priorities over the next ten years.