NATIONAL ACADEMY OF SCIENCES
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NATIONAL RESEARCH COUNCIL

REPORT IN BRIEF

International Science in the National Interest at the U.S. Geological Survey

Science at the U.S. Geological Survey (USGS) is intrinsically global, and from early in its history the USGS has successfully carried out international projects that serve U.S. national interests and benefit the USGS domestic mission. Opportunities abound for the USGS to strategically pursue international science in the next 5–10 years that bears on growing worldwide problems having direct impact on the United States—climate and ecosystem changes, natural disasters, the spread of invasive species, and diminishing natural resources, to name a few. Taking a more coherent, proactive agency approach to international science—and building support for international projects currently in progress—would help the USGS participate in international science activities more effectively.

From its inception in 1879 to the present, the U.S. Geological Survey (USGS) has responded to national needs in topics that span the Earth sciences, including geology, hydrology, and various aspects of environmental science. The research, mapping, and monitoring carried out by the Survey play an essential role in issues of public importance such as water quality and public health, the provision of energy, mineral, and water resources, risk reduction from natural hazards, and the conservation of natural habitats.

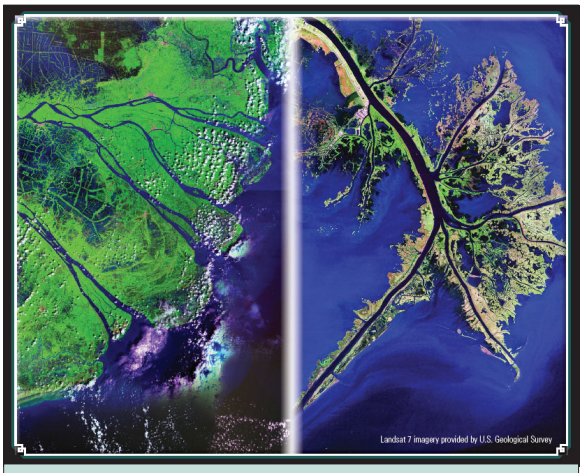

Figure 1. Research on major river delta systems around the globe has allowed USGS scientists to develop a better understanding of the U.S. Mississippi Delta (right) and the Mekong Delta (left) in southeast Asia. Source: USGS

The USGS is the principal science agency of the Department of the Interior. Though grounded in its domestic mission, the USGS throughout its history has also taken on international projects that serve U.S. national interests, at the request of the Congress, other federal agencies, non-governmental and private organizations, and foreign institutions. This international work fulfills needs that may arise when a major resource or ecosystem spans an international boundary, when changes to the availability of a resource may occur outside U.S. borders, and when information relevant to resource management or conservation is only available through international collaboration or studies. The international work carried out by the USGS also helps support science diplomacy, the use of scientific cooperation to promote international understanding and prosperity. Despite an established history of remarkable accomplishments in international science, USGS scientists, collectively and individually, face a variety of challenges in engaging in overseas activities and collaborations.

Ongoing International Scientific Activities at the U.S. Geological Survey

Each of USGS' seven mission areas (see Box 1) is involved in significant international activities

that serve USGS and U.S. government interests. Projects include satellite monitoring of drought and flooding in foreign countries, tracking of the spread of disease and invasive species, monitoring earthquake and volcanic activity around the globe, and mapping and sampling foreign mineral, energy, and water resources. A number of projects also help mitigate humanitarian crises through technical assistance in natural disaster response and in local capacity building. Activities in Afghanistan described in Box 2 exemplify local capacity building.

Box 1. USGS Science Strategy

The USGS is charged by the Department of the Interior to respond to evolving national priorities with sound, unbiased scientific advice. To help fulfill this charge, the science strategy of the USGS recognizes that Earth behaves as a system, and the USGS has organized its work into seven mission areas: (1) climate and land-use change; (2) core science systems; (3) ecosystems; (4) energy and minerals; (5) environmental health; (6) natural hazards; and (7) water.

Strategic International Science Opportunities for the USGS

As population grows and human-caused impacts on the environment increase, the consequences of global change will likely shape USGS strategy and lead to new opportunities for the Survey to conduct international science. The report's authoring committee identified several potential new international endeavors that are particularly compelling, and could benefit the USGS' strategic science directions and/or US government international priorities in coming years (see Table 1). Taking a proactive approach to developing and executing self-generated international projects, as well as those that result from external requests, would help position the USGS to anticipate and respond more effectively to requests for international input and assistance, and to anticipate new international Earth science problems as they arise.

The strategic scientific opportunities shown in Table 1 were identified specifically to target problems or questions that can benefit USGS and its ongoing domestic activities and increase the Survey's ability to meet the needs of the nation. Most of the study ideas lend themselves well to collaboration among several of the Survey's mission areas and represent activities that clearly build upon existing international science activities, or represent new scientific opportunities for the USGS.

Impediments to More Effective USGS Participation in International Science Activities

USGS scientists face a variety of challenges in engaging in overseas activities and collaborations. For example, although current strategic plans at the USGS and the Department of the Interior acknowledge the importance of international work, plans do not explicitly address USGS participation in international science activities. As a result, the diverse international projects carried out by USGS scientists are not part of an agency-wide vision, endorsed at a high level, for international science.

Furthermore, the mission of the Department of the Interior influences the maintaining of focused attention

Table 1.

Opportunities that Complement Existing International Science Activities
Global natural hazards planning and response
Energy and mineral resource assessments
Enhanced water sustainability research in desert and tropical areas
New Opportunities
Use of climate and land-cover science to inform for decisions on climate adaptation and natural resource management
Understand the influence of climate change on ecosystems, populations, and disease emergence
Clarification and development of invasive species work using trade patterns, refugee situations, and changing climate and environment for initial prioritization
Quantitative health-based risk assessment employing hazard identification, exposure assessment, dose-response assessment, and risk characterization
Ecological and quantitative human health risk assessment analysis, based on contaminant exposure levels
Research in water contamination and supply
Water and ecological science in cold regions sensitive to climate change
Comprehensive enhancement of, and accessibility to, essential topographic and geologic map information

Box 2. USGS Projects in Afghanistan

USGS scientists in Afghanistan, in cooperation with Afghan scientists and institutions such as the Afghanistan Geological Survey and the Afghanistan Ministry of Mines and Industry, have conducted a multi-component, interdisciplinary project to assess Afghanistan's natural resources, to develop its geospatial infrastructure, and to build capacity and institutions essential to the effective transfer of skills. Most USGS science mission areas were involved in some part of this project. The work was supported in part by USAID and the Department of Defense. Examples of activities include:

Figure 2. Mountains south of Kabul, Afghanistan, photographed during fieldwork for the mineral assessment portion of the project. Source: USGS

Minerals: Between 2005 and 2007, USAID funded a cooperative study between the USGS Minerals Resources Program and the Afghanistan Geological Survey to assess non-fuel mineral resources of Afghanistan as part of the effort to aid the country's reconstruction. Scientists from the two surveys worked together to collate information about known mineral deposits and collect new data to assess the possibility of undiscovered mineral resources.

Natural hazards: As Afghanistan's infrastructure is rebuilt and modernized, critical facilities and major construction projects can be located and designed to take into account the potential adverse effects of natural hazards such as earthquakes, which are an ever present threat in Afghanistan. USGS Earthquake Hazards Program researchers compiled data on the location, size, and frequency of past earthquakes in Afghanistan, and examined satellite and aerial imagery, to identify potentially active faults and create preliminary earthquake hazard maps.

on the USGS' domestic role. Although the benefits of USGS international science to the nation's interests can be readily documented, they have not in general been consistently communicated within the Department of the Interior, or to the public.

Some USGS mission areas appear more positively disposed to conduct international work than others. These differences among mission areas could be due to a variety of issues including perceived constraints on international work due to a focus on the Survey's domestic mission, the relatively small number of congressional mandates clearly calling for the USGS to conduct international work, and the absence of an agency-wide plan for international science. Building an institutional culture that supports and rewards participation in international projects on the same merits as domestic work could help encourage greater involvement in international science.

Effective engagement in international science activities also requires coordination with foreign partners. Some existing international coordination mechanisms offer the opportunity to engage more effectively with foreign partners, and the USGS could take greater advantage of these international coordination mechanisms to benefit international collaborations.

The availability of resources is a further challenge to USGS international science and requires USGS scientists and administrators to balance international work with maintaining the appropriate level of resources to support USGS' domestic activities. Because international science can directly benefit the USGS domestic mission, the Survey might consider judiciously supporting selected overseas work with some of its appropriated funds, adding to the support provided for international projects requested by external partners.

Figure 3. The adult lionfish is an invasive species whose population has rapidly spread throughout the Atlantic Ocean, Caribbean, and the Gulf of Mexico, severely impacting native fish populations and coral reefs. The USGS Southeast Ecological Science Center has been involved in mapping and understanding the impacts of the lionfish.
Source: USGS/James Morris Jr.

Envisioning the Future of International Research at USGS

A global, integrated understanding of the Earth sciences is of fundamental importance to enhance U.S. public health and safety and to support economic development. The USGS has a significant role to play in contributing information and knowledge to address Earth science issues arising within and beyond U.S. borders. Developing a strategic plan for international science will help ensure that the USGS is prepared to participate more effectively

in international Earth science to meet national needs. The report's authoring committee has outlined several factors for the USGS to consider as it strengthens its international activities:

- As a first step to strengthen and enhance USGS international science activities, USGS leadership, in collaboration with the Secretary of the Interior, should fully embrace and commit to international science as a fundamental part of the USGS' aim "to help our Nation and the world" and should be open and clear about this work—both within the USGS and externally.

- The USGS should play a more proactive role in international Earth science, building upon its present strengths and science directions. In developing this expanded role, the USGS should assess how it can serve as a collaborative, international leader to strategically address worldwide problems that impact national interests, such as shortfalls in natural resources, the loss of biodiversity, and the increasing threat of pandemics.

- The Survey leadership should continue advancing the integration and coordination of activities across the seven mission areas, and consider using international science opportunities to motivate further scientific integration within the USGS.

- A Survey-wide plan for international work would allow the USGS to fully embrace international activities. Such a strategy, developed by the integrated efforts of the Director of the USGS, the leaders of the seven mission areas, and the Office of International Programs, could include guidelines or mechanisms that would:
  - foster activities and collaborations
  - identify and prioritize key international opportunities
  - formulate a consistent approach to international activities across all science areas
  - enhance multinational coordination between USGS and other foreign Earth-science agencies
  - explore opportunities to collaborate internationally
  - encourage and reward international research activities and publication of research
  - fast-track the execution of international agreements

- To increase public awareness of the value to the Nation of USGS international scientific activities, the USGS should promote more effective communication and outreach about non-sensitive international work. An interesting, user-friendly website focusing on global Earth science and featuring brief descriptions of the Survey's current and recent international activities and collaborations, with reference to more detailed information elsewhere on the USGS website, would allow for greater public appreciation and understanding of these global activities.

Read or purchase this report and locate information on related reports at
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EXPERT CONSENSUS REPORT

The National Academies appointed the above committee of experts to address the specific task requested by the U.S. Geological Survey. The members volunteered their time for this activity; their report is peer-reviewed and the final product signed off by both the committee members and the National Academies. This report brief was prepared by the National Research Council based on the committee's report.

For more information, contact the Board on Earth Sciences and Resources at (202) 334-2744 or visit http://dels.nas.edu/besr. Copies of *International Science in the National Interest at the U.S. Geological Survey* are available from the National Academies Press, 500 Fifth Street, NW, Washington, D.C. 20001; (800) 624-6242; www.nap.edu.