

A REVIEW OF
GLOBAL LEARNING &
OBSERVATIONS TO BENEFIT
THE ENVIRONMENT
(GLOBE)

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Office of Science and Technology Policy

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EXECUTIVE SUMMARY

The Global Learning and Observations to Benefit the Environment (GLOBE) program was first announced on Earth Day, April 22, 1994. The fundamental idea of GLOBE was to engage students in science through participation in scientific activities in their local environments. This idea was realized with the launch of the GLOBE interagency program on Earth Day the next year.

In its early years, GLOBE's pooling of resources among the agencies expanded GLOBE's reach. From 1995-2002 GLOBE drew from the Department of State (DOS), Environmental Protection Agency (EPA), National Aeronautics and Space Administration (NASA), National Oceanic and Atmospheric Administration (NOAA), and National Science Foundation (NSF) resources and engaged primary and secondary students in hands-on data collection and analyses of the environment and the earth system. From 2003-2009, DOS, NASA, and NSF continued GLOBE's vision to foster an international community of students, teachers, scientists, and citizens working together to better understand the earth's environment.

GLOBE's initial robust interagency effort suffered in subsequent years from declines in agency participation. In 2002, NOAA and EPA stopped participation in GLOBE and NSF reduced its participation level. NASA continued participating, but changed their approach from one that was government-run to a multi-institutional team chosen through an open competitive process under NASA oversight. The strong national and international GLOBE community that emerged during GLOBE's early years buttressed the impact of these declines in agency participation levels and GLOBE continued to grow.

Congress asked the Office of Science and Technology Policy (OSTP) to conduct a thorough review of the program. This review is focused on GLOBE's viability and interagency management and is not an assessment of GLOBE's educational achievements and outcomes.

The administration is considering modifications to GLOBE's current and near term activities. These include incorporation of new technologies, integration of climate education with agency environment and climate change programs, expanded outreach, and sustained interagency GLOBE involvement from NOAA, NASA, NSF and other agencies.

Strong formalized interagency leadership of GLOBE is critical to its future success. To achieve this, the two primary agencies, NASA and NOAA, must share in GLOBE's leadership. This could be achieved via an interagency Executive Management Board (EMB) that would coordinate and manage interagency GLOBE activities. To ensure shared leadership, NASA would retain the trademarks, international agreements, and oversight of

the GLOBE program Office (GPO) through its existing cooperative agreement. NASA and NOAA would co-chair the new Board. Each agency would self-select their representatives to the EMB.

GLOBE REVIEW

Background

The Global Learning and Observations to Benefit the Environment (GLOBE) program is a worldwide, hands-on, primary and secondary school-based science and education program. GLOBE supports students, teachers, and scientists in collaborations using inquiry-based investigations of the environment and the earth system. GLOBE currently works in close partnership with the National Aeronautics and Space Administration (NASA), National Oceanic and Atmospheric Administration (NOAA), and National Science Foundation (NSF) in studies and research about the dynamics of Earth's environment.

The conference report for the Consolidated Appropriations Act, 2010, which includes funds for GLOBE in the NOAA and NASA appropriations, directed the Office of Science and Technology Policy (OSTP) to conduct a review of the GLOBE program (see inset). The conference report specified that the review include recommendations on ways to improve the program's viability, and that it examine the merits of transitioning GLOBE program responsibility from NASA to NOAA. This report includes a history of GLOBE, a summary of the national and international reaches of GLOBE, a summary of the current program plan and program management, and OSTP recommendations related to the viability of the program.

***Consolidated Appropriations Act,
2010 Division B Statement of
Managers***

“The conferees direct the Office of Science and Technology Policy to conduct a thorough review of the program and to report within 60 days of enactment of this Act on recommendations to improve the program's viability. The report shall include an examination of the merits of transitioning responsibility for the program from NASA to NOAA.”

Program History

Announced in 1994, GLOBE began operations on Earth Day 1995. Today, the international GLOBE network has grown to include representatives from 112 participating countries and 136 U.S. partners coordinating GLOBE activities that are integrated into their local and regional communities. There are more than 50,000 GLOBE-trained teachers working in over 20,000 schools around the world. To date, GLOBE students have contributed more than 20 million measurements to the GLOBE database for use in their inquiry-based science projects.

1994 – 2002: EARLY GLOBE

GLOBE was originally funded and managed as an interagency effort involving NOAA as the lead agency, providing funds and personnel, NASA providing funds and personnel, EPA providing funds for part of this period and personnel throughout, and NSF providing competitive funding directly to GLOBE principal investigators – scientists and educators – including support for an annual GLOBE evaluation. In addition, the State Department provided strong support for the international component of the program through in-kind contributions. Total program funding during this time period ranged from ~\$8 to 15 million per year as an interagency effort.

The program was managed by a multiagency team, with the support of contractors. For a significant portion of this period, the program leadership included senior career officials and one policy official.

Over this time period, GLOBE had both science and education objectives. Engaging students in hands-on science was a cornerstone of the program along with extensive use of the internet and World Wide Web for data reporting by schools, visualization of these data in maps and graphs, and dissemination of information and materials. A primary objective was to ensure that program participation benefited the students and did not simply treat them as technicians, collecting information for GLOBE scientists with little educational gain. To address this objective, GLOBE invested significant resources encouraging student inquiry efforts. As the program matured, GLOBE broadened the set of supported measurements while shifting from encouraging school participation in all data collection protocols, to more locally relevant subsets of the measurements and coordinated campaigns involving teamwork by multiple schools.

With a strong emphasis on scientifically valid data collection by GLOBE schools, one of the major indicators initially selected to assess the program was the number of peer-reviewed publications produced by scientists. In hindsight, this was an unrealistic metric. There continues to be support for engaging students in genuine, locally relevant research for teaching science and for promoting environmental stewardship. As a primary and secondary school-based program, the main metrics should be student achievement, particularly in STEM education. The publication of research papers using GLOBE data, while desirable, constitutes a secondary metric.

2002 – 2009: NEXT GENERATION GLOBE

In 2002, Congress discontinued NOAA funding for GLOBE, which effectively ended NOAA's participation with the program. EPA also discontinued support at the same time. NASA, at the request of NOAA, assumed leadership of the program in 2003 and has

continued to provide funding on an annual basis since then. All of the international agreements with GLOBE countries and GLOBE trademarks were transferred from NOAA to NASA. NSF continued to participate through its own competitive awards (with other agencies supporting NSF's review process), and the Department of State (DOS) continued its in-kind support. In FY2003, NASA and NSF signed an Interagency Agreement that provided the basis for continued collaboration in developing the vision for and implementation of the GLOBE program.

Consistent with the 2002 President's Management Agenda of the previous administration, NASA issued a competitive cooperative agreement notice for the implementation of the GLOBE program. In 2003, NASA selected the University Corporation for Atmospheric Research (UCAR) in partnership with Colorado State University to assume primary responsibility for the administration and program management of GLOBE. This was a five-year cooperative agreement, renewable to 10 years upon positive outcome of an independent external review of UCAR's program management.

This next phase of GLOBE was then implemented through this cooperative agreement between NASA and UCAR. The GLOBE program Office (GPO) was established in Boulder, CO. The GPO staff were experts in education, science, international partnership development, customer service and information, and database technologies. NASA, NSF, and key members of UCAR management provided high-level policy guidance to the GPO. Activities at the GLOBE program Office are guided by a framework document, The Next Generation GLOBE (NGG), outlining the program's strategic goals and associated objectives.

NGG is the program's vision for GLOBE to 2013. It is based on self study findings, and community stakeholder input that began with a community meeting in January 2004 and ended with a meeting of outside experts in December 2004. Input was also solicited from members of the GLOBE community, the GPO staff, UCAR administrators, NASA and NSF program officers, and experts from education, science, government agencies, and industry.

The GPO developed and supported the worldwide infrastructure for participating schools, scientists, and communities. Based on input from the GLOBE partners, GLOBE's focus became a cooperative effort of schools in partnership with colleges and universities, state and local school systems, and non-governmental organizations. GPO priorities included training that helped schools, teachers, and students connect to cutting-edge science projects; support for collaborative student research on the environment; identification of regional or community generated projects of highest priority to the GLOBE community; and strategies for program growth and long-term program sustainability. The numbers of schools, teachers, master trainers, and student data reported

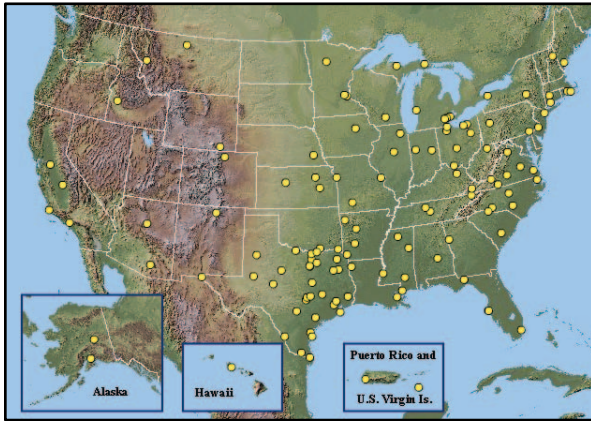


Figure 1. Location map of U.S. GLOBE partners

generally surpassed the corresponding numbers during 1994-2002. Internationally, GLOBE expanded partnerships between the United States and over 100 countries that managed and supported their national and regional program infrastructure and activities.

The vision of this next generation is to connect the GLOBE community with top scientists and cutting edge earth systems science research programs. Achieving this vision requires improvements to the GPO's

management approach. To this end, the GPO established new approaches to program implementation: regional consortia, project-based management, and the development of the GLOBE Schools Networks (GSN).

The GPO facilitated the formation of consortia of countries to collaborate on regional GLOBE implementation. These new GLOBE regional consortia improved the way in which GLOBE links schools with scientists and projects by forming a GLOBE International Advisory Board (GIA). Membership on the GIA, chaired by the GLOBE Director, includes representation from Federal agencies. With NASA and NSF membership on the GIA, top U.S. scientists and programs are linked to specific regions and their GLOBE schools. Regional consortia also assumed some of the responsibilities of the GPO in creating and supporting the program's activities in each region.

The GPO implemented a project-based management approach for organizing educational and scientific activities as well as managing staff work. Such an approach allowed GLOBE to focus its resources on a limited number of high quality earth systems science projects. This approach included forming interdisciplinary teams responsible for planning, implementing, and evaluating a single school's project working with an integrated earth systems science program.

In NGG, the GPO undertook, with partners, the development of the GSNs. GLOBE established showcase programs in schools that were tied to NSF's earth system science projects. They established criteria for a school to be designated a "GLOBE School" within a specific project. Participating schools received exclusive benefits for participation and, in exchange, these schools committed to conducting specific research activities. Some criteria for participation in a GSN were universal – such as a commitment to inquiry-based science instruction – while other criteria for participation differed due to the varying needs and

scientific foci of the project. At the same time, GLOBE provided basic services for GLOBE schools that wanted to make use of existing GLOBE materials and protocols and did not want to commit to participating in a specific project.

One of the differences between the early GLOBE and the NGG program was de-emphasis of the data collection component that was scientific-project driven. As a consequence, the GLOBE program's Teacher Guide (<http://www.globe.gov/tctg/tgtoc.jsp>),

GLOBE Milestones

- *1996 UNESCO - GLOBE agreement.*
- *1999 UNEP - GLOBE agreement.*
- *2000 15,000 teachers trained*
- *2004 Goldman Sachs Foundation Prize for excellence in International Education.*
- *2006 Joined National Geographic Society program "My Wonderful World"*
- *2007 GLOBE partnered with the National Science Teachers Association.*
- *2009 A total of 112 countries joined GLOBE*

which was developed in the early GLOBE years as the primary resource for protocols on how to collect and analyze GLOBE data, was no longer updated. This shifted the GLOBE program from an emphasis on student involvement in hands-on science to one more focused on tailored experiential learning. A secondary impact of this change was that tools for student research using GLOBE data (such as data, maps, graphs, data access, and reporting utilities) have remained essentially unchanged over the past five years.

Based on an independent review (Yoder et al., 2008) of the GPO performance, NASA continued the cooperative agreement with UCAR. Another external review (Bybee et al., 2008) of a new 5-year proposal from UCAR resulted in NASA awarding a new cooperative agreement to UCAR for a second 5-year period, starting in FY2009. Through a subcontract provided by UCAR, the University of Texas at Tyler in 2009 became the home for the GLOBE International Division, the North America Regional Office, and the International Help Desk that serves the GLOBE community. This review included an expectation that, during this second 5-year period, GLOBE would increase its non-Federal funding to make the program more sustainable.

In 2009, NASA Earth Science Division selected four NASA earth scientists to participate in GLOBE. These scientists (three from Goddard Space Flight Center and one from NASA Langley Research Center) were chosen through a competitive process directed to the NASA Centers. The scientists are key advisors in the planning of GLOBE's research questions and are frequent contributors to the GLOBE blog. The NASA Earth Science Division supports the participation of these scientists in addition to funding the GPO.

Today the GLOBE program continues to enter into partnerships with U.S. organizations. These partnership groups recruit GLOBE schools, train GLOBE teachers, and mentor GLOBE students in their areas. There are 136 active U.S. partners, located in states and territories (Figure 1). Internationally, GLOBE is implemented through bilateral agreements

between the United States and governments of partner nations in 112 countries on six continents.

Goals, Key Attributes & Scope of Activities

The overall goals of GLOBE are to enhance the environmental awareness of individuals throughout the world; contribute to understanding the Earth; and help all students reach higher levels of achievement in science, technology, engineering, and mathematics (STEM).

To achieve these programmatic goals, the GPO sets its own implementation goals. Its first, and most important goal is to create and implement a dynamic model for 21st century environmental science education that engages students and teachers in collaborative cutting-edge research. The GPO's second goal is to create a more sustainable GLOBE program by 2013 with public-private partnerships.

The GPO plans are to:

- train teachers to help students improve their achievement in science and math, and in the use of computer and network technology;
- help teachers and students achieve state and local education goals and standards;
- increase students' awareness of their environment from a scientific viewpoint, without advocacy relative to issues;
- improve students' understanding of science through hands-on activities – taking measurements, analyzing data, and participating in research in collaboration with scientists;
- enable student contributions of data for scientific research; and
- help expand the pipeline of potential future scientists and researchers for industry, academia, and government.

The most recent GLOBE program review (Yoder et al., 2008) identified the need to clarify GLOBE's approaches and attributes for inquiry-based science education. The attributes include the selection of science questions, the specific focus of the science topics, the purpose of scientific inquiry, and how GLOBE data are used and archived. A range of approaches can be undertaken for each attribute (Figure 2). For example, scientific inquiry can be focused on learning outcomes or on learning science content. Science questions can be scientist or student defined. The review recommended that GLOBE clearly identify the program's approach and desired outcomes for each attribute.



Figure 2. Examples of the range of options for GLOBE attributes that underpin inquiry-based learning. For example, science topics can either be globally or locally defined and data can be collected for scientific studies or for the benefit of student inquiry.

Broader Impacts

One of the most significant broader goals of the GLOBE program is related to advancing U.S. diplomacy through international efforts (see Figure 3 for a map of GLOBE partner countries). The GLOBE International Division mentors, brokers activities, and provides general support to GLOBE’s international community members.

These activities are overseen by the GPO Director of the International Division of GLOBE, responsible for ensuring that the development and ongoing support of all GLOBE partner countries are integrated with GLOBE education, science, and other programmatic activities. International activities are conducted through regional consortia following advice from the GIA.

Each regional consortium leads communication and brokering activities within their respective regions. The GIA covers six different regions (see Table 1) and provides advice to GLOBE on student-teacher-scientist partnerships, regionalization, and issues concerning

programmatic sustainability around the world. The GIA meets twice each year to discuss the program with GPO management. Table 1 shows the history of the International Advisory Committee from 2006 to present, including terms and transitions.

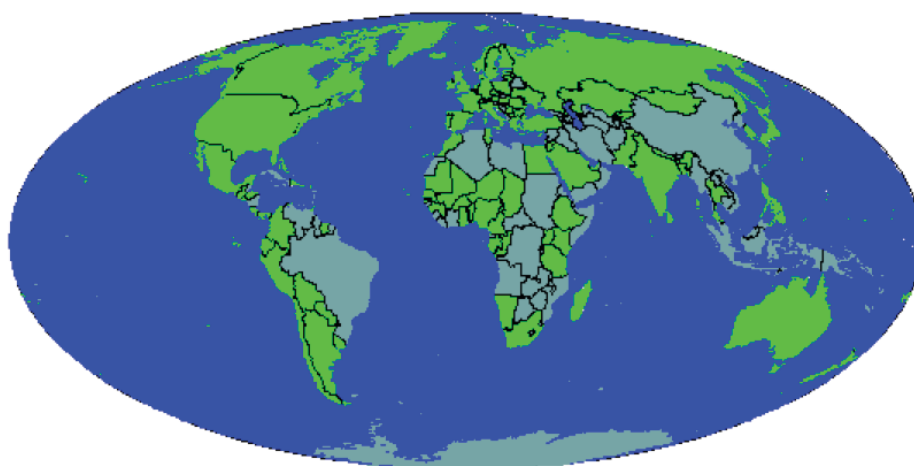


Figure 3. GLOBE partner countries are shown in green.

In 2009 GPO interactions with country partners through the regional consortia was formalized, resulting in a reduction of GPO staff and increased capacity in the regions. Due to time zone differences and the difficulties involved in contacting community members in each region, regional offices took on more responsibility for GLOBE activities. All 6 regions now have established leaders. Desk officers, located in the regions, lead regional coordination activities.

Table 1. GLOBE International Advisory Committee current & past membership

REGION (COUNTRIES)	CURRENT REPRESENTATIVE	TERM (YEAR)	PAST REPRESENTATIVE
Africa (22 countries)	Mr. M. Brettenny (South Africa)	2006-2010	Mrs. M. Besong (Cameroon) 2006 - 2008
Asia-Pacific (16 countries)	Mr. R. Mehta (India) CHAIR, 2008 - 2010	2008-2010	--
Europe-Eurasia (40 countries)	Dr. A.Tasker (UK) Ms. D. Votápková (CR)- Acting	2008-2010 2010	Mr. K. Hetland (Norway) 2006 -2008
Latin America-Pacific (18 countries)	Prof. M. Galloni (Argentina)	2006-2013	--

REGION (COUNTRIES)	CURRENT REPRESENTATIVE	TERM (YEAR)	PAST REPRESENTATIVE
Near East-North Africa (13 countries)	Mrs. Z. Ahmed (Bahrain) CHAIR, 2006 - 2008	2006-2010	--
North America (2 countries)	Ms. M. Willis (Texas)	2010-2011	Dr. M. Odell (Texas) 2006 – 2008 Dr. P. Ruscher (Florida) 2009-2010

Near-Term Plans

GLOBE plans through 2013 emphasize a new Student Climate Research Campaign (SCRC), which is focused sequentially on global warming; the carbon and energy footprint; climate and human health; and ecosystems, agriculture, and biodiversity. The broad SCRC objectives are to:

- involve more than 1 million students in climate research by making measurements of, for example, local air temperature, examining these measurements over long time periods, and comparing them with other regions and historical records;
- provide a mechanism by which students can explore and understand their local climate and the science of global climate;
- empower students, teachers, and community members to take informed action on climate-related environmental issues; and
- create a compelling model for innovative student research and environmental science education for the 21st century.

The SCRC will be designed to allow for varied levels of involvement. The GLOBE community will be able to participate for short periods of several days or weeks, or up to the entire two-year period. SCRC activities are open to all grades. Curriculum and research materials will be designed for middle, secondary, and tertiary-level students.

The SCRC focus on Earth’s climate system will educate students about the scientific research process by having them examine their local climate and extend those investigations to the global scale. The SCRC plans to help students understand the complexity associated with climate, the climate system, and climate change. Where appropriate, resources developed through the NSF-funded projects are being incorporated.

The SCRC web presence is being developed during the planning stages and will continue as the campaign launches in September 2011. The research investigations will require students to collect, analyze, and visualize data. Technology currently being developed for this project includes:

- data entry, report submission, and student log-in web interfaces;
- online evaluation tools;
- an updated GLOBE database;
- web-based access to curriculum and professional development materials;
- a content management system; and
- measurement systems and software that use cell phones and PDAs.

Existing protocols are an important element of the SCRC, but new protocols are needed and will be developed to fully implement this initiative.

Scientists are an integral part of the SCRC. Scientists' expertise in their areas of specialization, and their strong general science background, are valuable resources to teachers and students. For this project, the primary role of the scientists will be to explain the scientific research process and share and discuss their experiences with students. A key element of the SCRC is the collection of data. The SCRC team will identify agency databases and mechanisms for improving teacher access. The SCRC project will be assessed, on an ongoing basis, following pre-defined evaluation metrics.

GLOBE will also implement GLOBE 2.0, an online support for collaborative, field-based investigations by students and teachers at local, regional, and global scales. This includes earth system science teaching and learning resources; online data, next generation data tools, and services (e.g., GIS, mapping, graphing, modeling, remote sensing); online collaboration tools and services; online inventories of student projects and events; and embedded evaluations.

NSF supports scientist-driven projects in GLOBE. NSF currently supports four 4-year Earth System Science Projects (ESSPs) that were selected at the end of FY2006. These awards are scheduled to reach the end of their original project duration in July 2010, but are eligible for 1-year extensions through Grantee-Approved No-Cost Extensions. NSF has asked the 4 ESSPs to submit requests for supplemental funding to ensure complete integration of their materials into GLOBE operations, particularly at the international level, and incorporation of relevant resources into the forthcoming GLOBE SCRC. NSF GLOBE funds will also be used to support additional teacher professional development activities,

enhancing connections among the four projects, and adaptation of project materials and resources that serve the goals of the SCRC.

Program Management

INTERAGENCY MANAGEMENT & COORDINATION

At its start, GLOBE was an interagency effort involving NOAA as the lead agency, NASA, EPA, NSF, and the DOS. A GLOBE Leadership Council was formed, chaired by the Vice President, and included the heads of NASA, NSF, EPA, and the Chair of the Council on Environmental Quality, the Director of OSTP, the Deputy Secretary of Education, and the Under Secretary of State for Global Affairs. This Council made decisions about GLOBE's overall goals, scope and program focus areas.

On a day-to-day basis, the program was managed by an interagency team led by NOAA. Funding for the program was included in the budgets of NOAA, NASA, and NSF. Each agency implemented appropriate parts of the GLOBE program through its staff, contractors, and grantees, under the direction of a GLOBE management team and consistent with budget plans developed for each fiscal year. State Department contributions were in-kind support of the international efforts. All GLOBE activities were managed by an interagency team. Since its inception, federal investment in GLOBE has ranged from \$6.1 to \$15.8 million per year.

In FY2003, the management structure changed when NOAA, through congressional action, withdrew from GLOBE. NASA agreed to provide overall program management of GLOBE and support programmatic and some educational activities, including NSF-related projects. NSF agreed to support the science aspects of GLOBE and some educational activities, including support of NASA-related projects.

Since FY2003, an ad hoc team of agency representatives, led by NASA, has coordinated GLOBE activities among DOS, NASA, and NSF.

GLOBE PROGRAM OFFICE

The GPO management and administrative teams provide support and oversight of program development, communication, accounting, administrative, evaluation, and reporting functions. The GPO currently manages GLOBE following the NASA-UCAR cooperative agreement and the NGG community recommendations. UCAR provides financial and management oversight of the GPO.

The GPO management objectives are to:

- provide quality and timely service to ESSP partners and scientists; U.S. partners; international partners; and sponsors;
- provide budget oversight and management of GPO resources;
- integrate ESSP products, tools, and services into the worldwide GLOBE community and the SCRC;
- manage and support the modernization and maintenance of the GLOBE web site and database for the worldwide GLOBE community; and
- provide support for planning, pilot testing, evaluating, and scaling up activities and events associated with the SCRC.

The GPO follows UCAR business, human resource, and legal policies and procedures (see: <http://www.fin.ucar.edu/>). UCAR business services include oversight of budgetary and accounting functions, grants and contracts, legal, technical, property, and personnel to ensure compliance with government regulations. The GPO also manages and coordinates student and teacher support to the four ESSPs.

The GPO has 27 full-time staff (www.globe.gov/content/globe_staff?lang=en). This includes a management team of six persons (including the Director) representing each major program/business area in GLOBE: program implementation, the climate research campaign, technical operations, student research, international, and administration. The management team is responsible for decision making, overall program direction, priority setting, and resource allocation. Managers work regularly with program sponsors, the GIA and key collaborating organizations to keep the program focused on strategic goals and priorities, and within budget. The GPO management team makes decisions on which activities and services to support based on the following criteria:

- degree of alignment with the GLOBE mission elements;
- student achievement in grades K-16;
- environmental awareness and stewardship (students, teachers, general public);
- level of contribution to understanding the Earth;
- degree of alignment with GPO goals;
- student learning through inquiry-based research (e.g., ESSPs, SCRC, and community-projects);
- regionalization/internationalization of the program;

- sustainability;
- degree of alignment with the Next Generation GLOBE community recommendations;
- impacts (both positive and negative) on GLOBE users, current and potential sponsors, and GPO staff;
- impacts on other GLOBE activities; and
- cost.

ORGANIZATION & MANAGEMENT CHALLENGES

The challenges of GLOBE organization and management are associated with coordinating interagency activities, multiple budgets, disparate metrics, a wide range of national and international partners, and the involvement of a non-profit corporation.

Those interagency efforts generally considered to be successful require two ingredients: dedicated leadership within the agencies and formal commitments. The ad hoc team currently participating in GLOBE is dedicated and provides this key ingredient, but several of the formal agency commitments have expired.

The GLOBE program office is currently managed through a cooperative agreement. There is no formal broad interagency management committee that provides guidance, direction, and assessments. For example, with GLOBE's new climate research focus, these activities should be coordinated with the U.S. Global Change Research Program (USGCRP).

Recommendations on Viability, Future Program Goals, & Activities

For FY2010, the project activities outlined under the section titled "Near-Term Plans" should continue. These activities should emphasize, as a priority, an inquiry-based educational approach that also integrates regular and rigorous evaluations to assess and report on the program's impact.

The new project, Student Climate Research Campaign, which is focused on climate research, appears to be well-aligned with other government priorities in energy and the environment and should continue. To ensure that this program is solidly founded in current science, a scientific advisory group should be formed, preferably from U.S. scientists whose work contributes to and is included under the USGCRP. As part of this collaboration between the USGCRP and the SCRC, this new scientific advisory group should develop and implement three to four activities each year that bring together USGCRP scientists and SCRC partners (students and teachers). These activities should highlight climate change

research conducted by students that raises the visibility of both programs. The SCRC, and any future GLOBE projects, should incorporate new technologies and software, such as those deployable on cellular and other common handheld devices.

The GLOBE community should update the strategic plan and develop a complementary implementation strategy. The GLOBE community should clearly define the program's core attributes, focusing on the following issues: how science questions are selected; the specific focus of each science topic; the purpose of scientific inquiry; and how GLOBE data are used and archived.

The updated strategic plan should also address the issue of how best to integrate GLOBE activities with the USGCRP and other programs in earth systems science and education. The extent to which GLOBE contributes to the USGCRP should be addressed through interaction with the USGCRP Education Interagency Working Group, and in consultation with the USGCRP principals. The plan should incorporate regular agency reviews of their environment and climate observation and measurement programs to identify GLOBE student and teacher opportunities. Also, the strategic plan should set out how agencies might more fully integrate GLOBE into their existing agency education programs.

The GPO sustainability goal should be reviewed to assess whether or not it can be achieved.

Interagency Management

GLOBE's management has changed significantly over its history. The early years were managed by a group of leaders from several agencies, located in one office, and the GLOBE activities were run from within the agencies. Currently, an ad hoc agency team provides advice to the lead agency (NASA), which then coordinates other agency activities from an externally managed program office.

Retaining the existing NASA management system, conducted through their cooperative agreement with UCAR, would provide the minimal disruption to current GLOBE activities. Nevertheless, this approach does not appear to be optimal and the following list of changes would help to improve the program's management.

- NASA would remain the lead GLOBE coordinating agency that oversees the cooperative agreement with UCAR for the GPO and the GLOBE trademarks and the international agreements.
- An Interagency GLOBE Executive Management Board would be formed under the auspices of the National Science and Technology Council. The Executive Management Board would include agency representatives from NASA, NOAA,

NSF, DOS, EPA, and the Department of Education (ED). Board meetings would also include representation from OSTP. The Board would be co-chaired by NOAA and NASA.

- The Executive Management Board would meet at least every two months in the first year to update the strategic plan, develop an implementation strategy, establish a rigorous and regular assessment approach for GLOBE, engage other agencies in GLOBE, focus on raising GLOBE's profile, and establish a GPO subcommittee of the Board that maintains good communication between the GPO and the Board and conducts an annual review of the GPO.
- Board decisions would be made by consensus. The Co-chairs of the Executive Management Board would be responsible for calling and leading the Board meetings, establishing the agendas with input from the agencies, and summarizing and reporting on the decisions of the Board.
- OSTP would review this new management approach in 2012, prior to the end of the cooperative agreement between NASA and UCAR and make recommendations for further management change, should they be warranted.

Acronyms

DOS	Department of State
ED	Department of Education
EPA	Environmental Protection Agency
ESSP	Earth System Science Projects
GIA	GLOBE International Advisory Committee
GLOBE	Global Learning and Observations to Benefit the Environment
GPO	GLOBE program Office
GSN	GLOBE Schools Networks
NASA	National Aeronautics and Space Administration
NGG	Next Generation GLOBE
NOAA	National Oceanic and Atmospheric Administration
OMB	Office of Management and Budget
OSTP	Office of Science and Technology Policy
SCRC	Student Climate Research Campaign
STEM	Science, Technology, Engineering, and Mathematics
UCAR	University Consortium for Atmospheric Research
USGCRP	United States Global Change Research Program

References¹

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Bybee, Rodger W. (Chair), 2008. NASA External Review of a GLOBE Proposal, The Globe Program 2008-2013: Collaborative Environmental Research at Local to Global Scales: A Report Submitted by the Proposal External Review Committee.

¹ These references can be made available upon request.