

Panel on the Way Forward for GLOBE Management
DRAFT Findings and Recommendations

Preamble

GLOBE is a maturing program with a worldwide community of implementing partners, teachers, students, and scientists, and must operate to support their activities. GLOBE also must function as a support for educational improvement, increased environmental awareness, and the collection, archiving, and sharing of research-quality data collected and reported by students and other learners around the world.

In 2003, NASA and the University Corporation for Atmospheric Research (UCAR) entered into a cooperative agreement for operation of the GLOBE Program. The current agreement ends in February 2014, and this provides an opportunity to update the management arrangements for support of GLOBE. Improved technology associated with the Internet offers new possibilities for the organization and operation of the program.

In 2011 the GLOBE community endorsed a strategic plan for GLOBE. This plan was developed under the leadership of Dr. Andy Tasker and included a commitment to broaden and enhance the role of the international community in the direction of GLOBE. Recognizing this aspiration and the increased contributions to program implementation by GLOBE country and in-country partners, the US federal agency sponsors commissioned this Panel and charged it with investigating possibilities for the future management and implementation of the Program based on the needs and capabilities of the GLOBE community. Our observations and findings are presented herein. We hope that they will influence the governance arrangements and financial support for the program by the US federal agency sponsors and shape the opportunities for other governments, agencies, and organizations to provide additional program support in the future.

The Panel on the Way Forward for GLOBE Management has been formed with membership composed of representative participants and interested scientists and educators. The Panel began its work with a review of the essential nature of GLOBE and, based on this analysis, has shaped its findings to enhance the role of the community in setting the future course for the Program.

The Panel has felt that community understanding and support of these recommendations is a critical first step in this process. Accordingly, this document

is a draft provided to the GLOBE community for review, discussion, and input before these recommendations take their final form and are provided to the current sponsor agencies – NASA, NSF, and NOAA.

Observations

The Essence of GLOBE

For students or learners in general, GLOBE provides a platform to build the capacity to do scientific research investigations – to be a scientist. GLOBE supplies a way for students and others to gather research-quality data for the purpose of understanding the world, to organize data into useful and coherent informational patterns, and to apply information to real questions and problems. Scientific habits of mind are built through inquiry-based instruction leading to the eventual production of a student research product, generally the presentation of a hypothesis, research methods, data, analysis, and conclusions. Through GLOBE students are valued for their contribution to the larger environmental research enterprise and are part of a truly unique international partnership to learn about Earth.

For teachers and educators, GLOBE involves working with an international community of teachers, scientists, students and others to achieve inquiry-based instruction and provides an avenue for teacher professional development. Student ability to think like a scientist and do science generally requires development over several years and GLOBE provides some scaffolding through its materials for teachers to use in supporting this student growth. While GLOBE is not a curriculum, it is widely adaptable into many different curricula covering multiple subjects applicable to primary and secondary grade levels and beyond. Information located in the Teacher's Guide and elsewhere on the website meets the educational standards of the many participating US states and partner countries. Through GLOBE, learners gain an understanding of why the scientific method and data are important and how they can be used to study and understand the Earth as a system.

For scientists, including professionals and citizens, GLOBE is a shared source of research-quality environmental data produced following a set of consistent measurement protocols using instruments that meet established specifications. These data are broadly applicable to research investigations ranging from the local to the global. GLOBE offers a meaningful way for scientists to interact with and mentor teachers and students and provide expertise to them. Scientists also benefit from experiences with teachers and addressing the questions of students.

For the international community, GLOBE provides a framework where students, teachers, educators, and scientists can engage in connecting, sharing, and collaborating with a worldwide community of partners focused on a better scientific understanding of the Earth system. Countries join through a government-to-government agreement with the United States. The high level of this agreement demonstrates mutual respect and guarantees that investment in GLOBE means ownership and continuity. In particular, spatial and temporal data, educational materials, experiences, and student and professional results can be shared and publicized.

The unifying characteristics of GLOBE are learning through doing research, a focus on the environment, authenticity, continuity, a publicly accessible shared database, a website that supports dialogue and communication, and mutual responsibility, investment, and ownership of the program by an international community of participants.

Program structure and implementation

The international character of GLOBE is a major distinguishing strength.

Country participation in GLOBE through government-to-government agreements is generally useful, and the involvement of US embassies helps sustain program support. The official agreement facilitates implementation, builds trust, and encourages the sponsors to continuously supply financial, logistical, and moral support.

For now, program continuity and continued success require a US Government-funded capability to implement the common program elements.

It is generally felt that the participation of the US Government research agencies adds international credibility to GLOBE.

It is important for GLOBE data to be easily accessible and for GLOBE to participate in initiatives supporting a comprehensive view and understanding of Earth.

Regular and intercomparable assessment and evaluation will help fine tune GLOBE activities and rectify program shortcomings. The results of these regular

evaluations can serve as guidelines for continuous dialogue among community members and as a method for improving the quality of service.

GLOBE will benefit from collaboration with ongoing citizen science programs. Citizen scientists can support GLOBE through contribution of data taken following GLOBE protocols, shared interest with local schools, and mentoring and support of teachers and students. GLOBE can benefit the citizen science community through provision of its protocols and educational materials, and its international experience with schools and the use of science measurements in education.

GLOBE requires scientist involvement in a wide range of activities and levels. Scientists:

- Provide rigor for protocols, projects, and campaigns;
- Work with teachers;
- Provide expert advice and insight into the use of data;
- Review data quality;
- Mentor, coach and inspire communities, teachers, and students;
- Judge student products;
- Provide science content for GLOBE materials;
- Explain the “big questions” and break them into manageable chunks;
- Put GLOBE in local as well as regional and global context.

While it has proven difficult for GLOBE data alone to lead to peer-reviewed research publications, these data are valuable when used with other datasets and provide insights into particular data-sparse places, local contexts, and events. GLOBE observations include measurement types that are not routinely taken. They are also useful for data mining. As a motivation for scientist involvement, GLOBE data collection so far has been inadequate, but there is a feedback loop as scientist interest enhances data collection and increased amounts of reported measurements enhances the value of these data and scientist interest.

Financial support from the US NSF NASA and other organizations has motivated scientist participation. GLOBE supports professional growth through work with teachers, students, and the international community. Working to support science learning at the K-12 level contributes to deep thinking about the scientific method and the inquiry process. The GLOBE learning community provides appreciation and validation of scientists’ contributions. The program also offers rich opportunities for fulfilling project and mission education and outreach requirements and demonstrating broader impact of government funded projects. Individual researchers’ motivations and commitments to education, outreach, and

community engagement (as well as interdisciplinary and international collaboration) should not be discounted, and may in fact be increasing within the younger generation of scientists.

In the United States, the National Research Council framework for primary and secondary school science education states that all students should learn science through eight science practices that will form the basis of the nation's Next Generation Science Standards. Educational implementation of GLOBE incorporates all eight of these science practices.

As science education reform efforts in some countries have moved towards inquiry-based approaches to life, physical, and Earth sciences, GLOBE provides exemplary strategies in all these areas for primary and secondary level educators.

Through GLOBE participation, educators and learners are better prepared to help raise community environmental awareness and to contribute to strategies on sustainability and climate change adaptation. Doing so can provide mechanisms to make GLOBE even more relevant in the future, and attract support from government agencies, international organizations, and NGOs involved in these issues.

DRAFT Findings

Common Program Elements

The following elements of GLOBE must be kept common across the worldwide program:

Established protocols, instrument specifications, and certification of acceptable vendors and products

Scientists to establish protocols, instrument specifications, and measurement campaigns and to review data quality on an ongoing basis

A data and information system including:

- a database of science and administrative data

- basic tools for data base access, data visualization, and participant collaboration

- on-line publishing of student projects and artifacts

- means for sharing learning activities, other educational resources, experiences, results, evaluations, and techniques

Trainer and Master Trainer criteria, certification, and review

Elements for program-wide evaluation and assessment
Country-level help desk support
GLOBE worldwide student and teacher meetings known as GLOBE Learning Expeditions (GLE's)
Policies on the operation of the Program
Standards for identification of activities, materials, or measurements as GLOBE
Facilitation of communication among students, teachers, and scientists locally and globally
Establishment of partnerships with other programs that involve multi-national portions of the GLOBE community

Country-Provided Program Elements

The following elements of GLOBE should be the responsibilities of participating countries:

Teacher recruitment, hands-on training in GLOBE, and continued mentoring and support
Recruitment and support of scientists to contribute to GLOBE
Funding for in-country activities and services
Development and support of local protocols and supporting materials that meet GLOBE standards
Development and support of trainers and master trainers through conduct of training events that provide the opportunity for certification
Participation in the governance and oversight of GLOBE common elements and their operation and implementation
In-country program implementation and curriculum integration
Making GLOBE relevant to local and national environmental concerns and educational priorities
Provision of website and other GLOBE content in local language(s) in service to communities, particularly non-English speakers
Evaluations of in-country participation, student learning, teacher effectiveness, and fulfillment of national objectives
National-level opportunities for students to present and share their work (GLE's)
Posting information about national "big science" activities (e.g. measurement campaigns)
Establishment of in-country partnerships with other programs and institutions or Partner-to-Partner collaboration with other countries

Formation of a GLOBE Board of Governors

There should be a GLOBE Board of Governors (the Board) recognized by program sponsors as representing participating countries and the GLOBE community to:

- Oversee implementation of the common GLOBE program elements and infrastructure and the work of the GLOBE worldwide support organization(s) including determination of community priorities for this support.
- Establish GLOBE policy including criteria for: participation by scientists, educators, trainers, and teachers; new protocols, learning activities, and research campaigns; publishing on the worldwide GLOBE.gov website; and other activities to be associated with the GLOBE name, brand, and logo.
- Approve all new common program elements and activities including protocol additions and changes, concomitant instrument specifications, and equipment vendor certification; selection of measurement campaigns; and location and scheduling of worldwide GLE's and other meetings.
- Appoint the chairs and members of the five advisory committees: Science, Education, Training, Technology and Operations, and Communications and Outreach.
- Report its actions and communicate specific requests to program sponsors for actions to be taken by the organization(s) designated by program sponsors for the support of the GLOBE common elements.

Board membership should be broadly representative of the participating international community and of the several communities within GLOBE, including teachers, trainers, alumni, country and in-country partners, scientists educators, and other supporters. There should not be quotas for how many Board members come from specific backgrounds particularly since many individuals are parts of multiple communities. The size of the Board should be kept small enough that decisions can be reached efficiently.

Membership on the Board should be open to anyone nominated by a GLOBE Country. Members should be from participating countries. It is desirable to have the overall membership of the Board include representation from this full range of

groups and multiple countries, but there should be no quotas for the number of representatives from any group, country, or region.

Nominations to the Board should be made by the participating countries. Members should be elected from the nominees by vote of all GLOBE participants other than students. Nominations should include a concise resume, nomination statement, and candidate statement posted on the GLOBE.gov website.

The Board should be assisted by advisory committees on science; education; training; technology and operations; and communications and outreach. The members of these committees shall be drawn from individuals nominated by countries. The chairs should be appointed by the elected members of the Board and join the Board as voting members. The other members of the advisory committees should be appointed by the full Board.

Meetings of the Board and Advisory Committees should be conducted in English with non-English speakers responsible for any translation required for their participation. The agendas and minutes of Board meetings should be shared with the GLOBE community on a timely basis.

The Board should provide program sponsors with its decisions and recommendations to use in directing the GLOBE support function.

A proposed model for the GLOBE Board of Governors is provided in the appendix.

Support for the Common Program Elements

GLOBE should be sustained by one or more office(s) that support the Common Program Elements listed above – GLOBE Support Office(s). This support should include:

- operation, maintenance, and continuous improvement of the GLOBE website and database;
- publishing of scientific and educational content on the website including current versions of the existing Teachers Guide content and similar material in support of any new protocols; material produced by office staff; and appropriate content developed and supplied by GLOBE Partners, Scientists, other contributors;

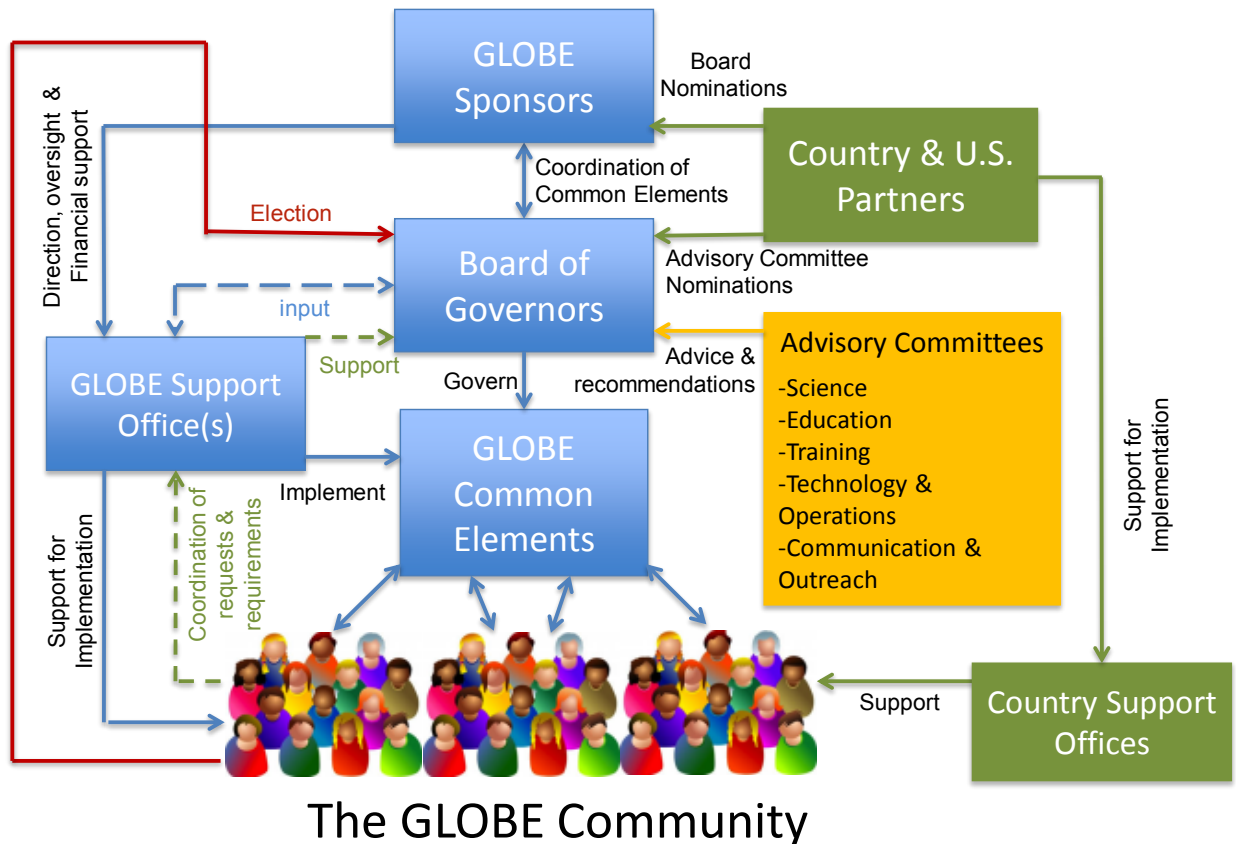
- conduct of program-wide assessments and evaluations including the collection of metrics by the information system;
- coordination and implementation support of all worldwide program activities including field campaigns, contests, GLEs, student research conferences, and other meetings;
- training both in person and online, including records of training events, certification of Trainers and Master Trainers, maintenance of a registry Trainers and Master Trainers and their capabilities; publication of training opportunities; and distribution of training materials;
- communication with and among GLOBE countries;
- implementation of partner agreements with other programs;
- operation of a help desk in support of the GLOBE countries;
- outreach and recruitment;
- worldwide communication of program accomplishments, including GLOBE Stars, within and outside of the GLOBE community;
- meetings of the Board of Governors, conduct of Board business, and policy implementation; and
- program sponsor requirements.

Regional elements should be part of the GLOBE Support Office(s). The number and composition of these elements should be determined by the countries through the Board of Governors. These elements should be designed and operated to meet the specific needs of countries within a region. Use of and participation in regional elements should be voluntary. The process by which location, funding, and staffing of regional elements should be defined by the Board and made clear to all countries.

The Board should explore ways to increase support for the Common Program Elements in the future.

Governance

GLOBE Governance



Sustaining and Building GLOBE

The quality of the GLOBE Program should be strengthened through increased and enhanced participation. All participating countries and the common GLOBE elements should work together to accomplish this.

Success for the GLOBE Program requires stability where policy modifications are made to respond to changing participant requirements. In addition it is important for the integrity of the services provided by the GLOBE Support Office(s) to be maintained.

Data inter-comparability over time and space must be maintained.

A hybrid training model making appropriate use of on-line and hands-on training should be developed and used in GLOBE. It should include training and certification in some protocols that may be completed and verified on-line. On-line training capabilities should be added to the common infrastructure of GLOBE.

GLOBE systems, instrumentation, and educational materials should be kept current, as technology for taking, recording, reporting, and using GLOBE data continues to advance. GLOBE protocols and information system should take advantage of these developments as they occur.

Barriers to participation and contributions by citizen scientists and others that can help GLOBE should be minimized. Protections required of any program engaging children should be maintained.

While discussions of GLOBE and standard GLOBE nomenclature refer to teachers, schools, and students, GLOBE should include informal education, non-school institutions, and home schooling communities. Lifelong learners can also be helpful in maintaining observations when schools are not in session. While this broader view of participation has been permitted, it should be strengthened through recognition of non-school institutions and situations including provision of GLOBE ID's.

The products of student research – research reports – represent a major accomplishment of students, teachers, and GLOBE. These should be published through GLOBE and widely disseminated. Their quality and quantity should be used as a significant measure of program success. They should be supported in part through a hierarchy of science fairs; student research symposia; and local, national, and international GLOBE Learning Expeditions and competitions.

GLOBE should seek ways to demonstrate that student data are of research quality. This includes both systems to check data and comprehensive scientist review of data sets. GLOBE should also provide references to scientific documents including professional research publications and environmental decisions that have included use of GLOBE data.

GLOBE must attract scientist participation recognizing that scientists' motivations vary with interests, employment, and stage of career. Opportunities should be provided for a wide range of types and levels of involvement.

GLOBE should provide each participating country the opportunity to share and collaborate directly with any and all other countries and build science, education, and friendship relationships.

Assessment and evaluation should be part of the on-going process of the GLOBE program. GLOBE should provide references to education research publications where the research has included the GLOBE Program.

Program management should be transparent for standard activities that do not require confidentiality. Drafts of policies and other key documents, all arguments for and against any proposal, and final decisions by the Board should be readily available to all members. This will reduce duplication of efforts and contribute to improved involvement in GLOBE.

Recognition and appreciation of active participation by teachers, schools, other organizations, and countries should be communicated and should reflect the total scope of program involvement and go beyond the Honor Roll.

To the extent practical, staffing of the common element support functions for GLOBE should reflect the international nature of GLOBE and be drawn from multiple countries.

Specific recommendations for GLOBE in the US

In the US there should be a clear country coordinator entity covering country-level responsibilities as distinct from those of the GLOBE support office(s) linked to the common GLOBE program elements. Models of how effectively some states have organized their partnerships into statewide collaborations should be shared broadly so that other states may consider such approaches; the US country coordinator should help facilitate such an effort. In addition, state adoption and implementation of the coming Next Generation Science Standards, as well as the already-approved Common Core State Standards in mathematics and language arts and literacy, will provide a shared focus, and partners and state consortia of partners would benefit from national level assistance.

Appendix

GLOBE Board of Governors

The interests and guidance of the GLOBE Community shall provide overall direction to the GLOBE Program through a GLOBE Board of Governors advised by five Advisory committees: Science, Education, Training, Technology and Operations, and Communication and Outreach.

Responsibilities

Oversee implementation of the common GLOBE program elements and infrastructure and the work of the GLOBE worldwide support organization(s) including determination of community priorities for this support.

Establish GLOBE policy including criteria for: participation by scientists, educators, trainers, and teachers; new protocols, learning activities, and research campaigns; publishing on the worldwide GLOBE.gov website; and other activities to be associated with the GLOBE name, brand, and logo.

Approve all new common program elements and activities including protocol additions and changes; selection of measurement campaigns; and location and scheduling of worldwide GLE's and other meetings.

Appoint the chairs and members of the five advisory committees: Science, Education, Training, Technology and Operations, and Communications and Outreach.

Receive and consider reports and recommendations from its advisory committees, country coordinators, country points of contact and other partners.

Report its actions and communicate specific requests to program sponsors for actions to be taken by the organization(s) designated by program sponsors for the support of the worldwide common elements of GLOBE.

Membership

The Board shall consist of 17 individuals with 12 elected by GLOBE participants. Anyone who qualifies for a GLOBE ID on the GLOBE website except students is eligible to vote. The appointed chairs of the five advisory committees shall

constitute the five additional voting members of the Board. In addition, the Manager(s) of the GLOBE Support Office(s) shall be a non-voting member(s) of the Board.

Membership on the Board shall be open to anyone nominated by a GLOBE Country except employees of the GLOBE Support Office(s). Members shall be from participating countries. It is desirable to have the overall membership of the Board include representation from this full range of groups and multiple countries, but there shall be no quotas for the number of representatives from any group, country, or region.

Terms of Office

The terms of office shall be three years, renewable once, and begin on _____ following the election.

Those who have served two or more terms shall be eligible for election again after two years off the Board; those who have served for less than two full terms shall be eligible again after one year off the Board.

Terms shall be staggered so that the terms of one-third of the elected members expire every year. Any vacancies that occur before terms expire shall be filled through the regular election process but shall only be for the remainder of the unexpired term.

Nominations

For each yearly election, each participating country may nominate up to three individuals for election to the Board. Nominees must be from a GLOBE member country but need not be from the nominating country. An individual may be nominated by more than one country.

Countries making a nomination are responsible for securing the signed agreement of the nominee to serve if elected and a candidate statement by the nominee. The country or countries making a nomination shall provide a nominating statement for each nominee.

At least six weeks prior to the annual election, nominations shall be communicated to the office designated by the program sponsors by either the Country Coordinator or Government Point of Contact. Each nomination shall be accompanied by:

- the nominating statement of up to 250 words;
- the candidate's signed commitment to serve if elected;
- the candidate's bio of up to 500 words; and
- the candidate's statement of up to 250 words.

Nominations and all accompanying documents shall be in English.

The office designated by the program sponsors shall make available electronically through GLOBE.gov all nominations, nominating statements, candidate statements, and nominees' bios at least four weeks prior to the opening of the election.

Elections

Elections shall be held annually, voting shall be open for two weeks, and voting shall be by electronic means through the GLOBE.gov website. If a second round of voting is required, it shall be open two weeks later for a two-week period.

Each GLOBE participant with an ID and My Page on the GLOBE.gov website may vote for as many candidates as there are openings.

If an election includes vacancies for terms of less than three years, three-year vacancies shall be filled by those receiving the most votes followed by two-year vacancies, and then one-year vacancies. No candidate may be elected with fewer than 5% of the votes cast. If there are unfilled vacancies following the first round of voting, a second ballot shall be held. For the second round of voting, there shall be only three times as many nominees as there are vacancies remaining to be filled. The nominees shall be those candidates not elected who received the most votes on the first round.

Resignation

Any board member may resign at any time by giving written notice to the Board Chair and to the sponsors. Such resignation shall take effect at the time of receipt of the notice, or at any later time specified therein.

Meetings

The Board shall meet in person at least once per year, and this meeting shall happen in conjunction with the GLOBE Annual Conference or other annual event.

Members' travel to this meeting shall be supported as part of the common activities of the Program. The schedule of regular meetings to be held during the coming year shall be set at this meeting and published on GLOBE.gov.

All other meetings of the Board may be virtual, and discussions and votes may be conducted by electronic means. Through GLOBE.gov, agendas for meetings shall be made available in advance and minutes of all meetings, including all records of members votes, shall be made promptly following meetings.

The Board shall designate its Chair and Vice Chair from among its elected members and specify their terms of office. The Chair and Vice Chair serve at the pleasure of the Board. The duties of the Chair are to develop agendas for Board meetings in consultation with all members and program sponsors, conduct Board meetings in an orderly fashion, and ensure that meeting minutes are produced for distribution in a timely fashion and are accurate reflections of the transaction of Board business. Should the Chair be unable to perform the duties of this office, the Vice Chair shall assume these duties until the Board has designated a new Chair.

Unscheduled Board meetings may be called by the Chair, by any four members of the Board, or by the sponsoring agencies.

Quorum

Eleven of the 17 Board members shall constitute a quorum for the conduct of Board business.

Establishment of the Initial Board

The six members of the GLOBE International Advisory Committee (GIAC) shall become members of the initial Board and serve for terms of three years minus the number of whole years they will have served on GIAC as of _____. If a member of GIAC chooses not to serve, their alternate for this region shall serve in their place for this term. If the alternate chooses not to serve, the position will be vacant and filled at the next election.

The remaining 6 vacancies shall be elected through the nomination and election process described above.

Terms of elected members shall be established so that, taking into consideration the terms of the GIAC members, there are four members with three-year terms, four members with two-year terms, and four members with one-year terms.

The initial Board is charged with proposing the rules and procedures for the conduct of Board business to be submitted to the sponsoring agencies for approval.

Decisions of the Board shall be by majority vote of those present.

Agendas for Board meetings shall be posted on GLOBE.gov prior to the meetings. Minutes of Board meetings shall be posted on GLOBE.gov following meetings.

GLOBE Advisory Committees

GLOBE countries shall provide the Board names and resumes of qualified candidates for the advisory committees and the Board shall choose the chairs and members of the advisory committees from the candidates provided.

Science Advisory Committee

The primary responsibility of the Science Advisory Committee (SAC) is to ensure that the GLOBE program is based on sound science and is promoting sound science in the activities of the program. The SAC has the responsibility to recommend and comment on:

- ways to encourage scientist participation in GLOBE;
- scientific themes for field campaigns (“athons” as in MUC-a-thons);
- adoption of new protocols, instrument specifications, and certification of acceptable vendors after reviewing their evaluation to ensure, for example, that they meet their targets for accuracy and precision;
- the retirement or modification of specific protocols after reviewing their evaluation to ensure, for example, that they meet their targets for accuracy and precision;
- procedures for evaluating data quality in the GLOBE data base;
- setting criteria for GLOBE branding;
- scientist participation in GLOBE annual meetings;
- the quality of the scientists' “blog”
- scientific content of training material and website; and
- ways to improve the availability of data for scientific research.

Membership of the SAC should include members of the Earth System Science community representative of the different fields of activity that have been defined for the Science Committee.

Education Advisory Committee

The GLOBE Education Advisory Committee provides best practice advice about education. This committee is focused on the educational content of the GLOBE Program. Areas of expertise include knowledge of the GLOBE vision for education and of current science education standards and trends.

Responsibilities:

- Play an advisory role in the educational integrity of all GLOBE content and activities.
- Vet inter-country, educational collaborations among different GLOBE entities: schools, partners, countries.
- Review integration of education needs and concerns with other operational aspects of GLOBE.
- Review educational assessment and evaluation and provide recommendations
- Recommend strategies for bringing GLOBE to the attention of the educational community

Membership guidelines:

Primary membership should consist of a diverse combination of the following: teachers, educators, education researchers, and administrators of primary, secondary, and teacher-training institutions. Additional membership might consist of representatives from informal science education, science partners, technology specialists or others who can help keep education-focused work connected to the other aspects of GLOBE.

Training Advisory Committee

The GLOBE Training Advisory Committee reviews the materials and activities pertaining to the training of GLOBE science protocols and provides advice on training.

Responsibilities:

- Review and advise on the criteria required to become a GLOBE Teacher, Trainer, and Master Trainer
- Review and advise on the standards required to maintain the quality of training and activities by Master Trainers and Trainers through online, face-to-face, and hybrid means.
- Interact with other advisory committees to ensure standards and update standards as needed, and to facilitate continuous communication.

Membership guidelines:

Master Trainer or demonstrated mastery in a critical area of training, including expertise in one or more science content areas; expertise in inquiry-based pedagogy; understanding challenges of classroom implementation; or training of adults in person and online. At a minimum, the committee should have representatives covering all spheres of the Earth system— hydrosphere, pedosphere, atmosphere, biosphere, and cryosphere.

Technology and Operations Advisory Committee

The GLOBE Technology and Operations Advisory Committee reviews cutting edge technology for potential adoption in support of GLOBE science, education, outreach, training, field campaigns and assessment activities; looks for potential changes; and makes recommendations on adoption of new technology and retirement of systems as needed. The Committee also reviews and recommends policies related to log-ins, social networking, and project posting and identifies short-term and long-term Program needs for technology.

Responsibilities:

The Technology and Operations Advisory Committee reviews and makes recommendations on:

- Content Management System, software, equipment
- Communications technology including blogs and social networking
- Static pages such as the Teachers Guide
- Science and administrative databases, data entry, data access, and data tools
- Use of hand-held devices and other hardware in the taking and reporting of measurements
- Data visualizations

- Student project and artifact space, and the means for uploading, reviewing, and commenting on student projects and artifacts
- Help request system
- Online teacher training modules
- Electronically supported assessment and evaluation tools

Membership guidelines:

Members of the Technology and Operations Committee should be familiar with current technology (e.g., hand-held devices, databases, social networking) and have experience working with applicable technology.

Communication and Outreach Advisory Committee

The Communication and Outreach Advisory Committee provides recommendations on programs and activities that have an external focus with the objective of improving the visibility and global reach of GLOBE. The Committee reviews and makes recommendations on GLOBE communications plans. The committee's scope includes all communication content concerning GLOBE programs, projects, activities, and strategies for use of GLOBE participants including GLOBE Alumni.

Responsibilities:

Key areas of activity include review of and recommendations for communication content and strategies for:

- recruitment and retention of schools, teachers, scientists & partners
- policies on the use of the GLOBE name
- publicizing the accomplishments of GLOBE facilitation of communication among students, teachers, and scientists locally and globally

Membership guidelines:

The Communication and Outreach Committee should include representatives of the different fields of activity that have been defined for the Committee (including public relations and Web publishing), as well as members of the GLOBE community involved in the activities of the Committee.

Glossary

Country Coordinator: a person or organization that is appointed by the government point of contact (as per the bilateral agreement) to run the day to day functions of the GLOBE program within the country. This includes recruiting teachers and schools and supporting the initiatives of these schools and teachers.

Data visualization: presentation of data as maps, graphs, or charts.

Educators: professionals trained or experienced in the theory or practice of education such as professors, teachers, lecturers, and school administrators.

Field Campaigns: worldwide or regional projects that provide student research experiences to explore and learn about Earth through a network of students, teachers, and scientists. GLOBE field campaigns are grounded in real science embedded in an inquiry-based, collaborative approach.

GLOBE Alumni: students who have graduated from secondary school and have the desire and commitment to participate in the activities of the GLOBE Program on a new level.

GLOBE Learning Expedition (GLE): a student and teacher conference created by GLOBE to showcase student research that includes the use of GLOBE data. It is also an opportunity for interaction that can lead to collaboration with others from the international and national GLOBE community. It is furthermore an opportunity to make lifelong friends and have fun while learning about Earth.

GLOBE Teacher: generally a primary or secondary school teacher, and in some cases at the post-secondary level who has been trained in at least one GLOBE protocol and has received a GLOBE ID. This includes home school and alternative education teachers in informal education programs such as museums, outdoor environmental programs, or national, state, or local parks.

Government Point of Contact (POC): an individual identified in the bilateral GLOBE agreement between a country and the United States; a POC is responsible for policy-level communications with the GLOBE Program and provides high level oversight of GLOBE in the country.

Help desks: entities that provide assistance to segments of the GLOBE community on implementation of GLOBE, answer participant questions, and facilitate the resolution of issues within the Program by referring them to the appropriate individuals, teams, committees, country coordinators, or the Board.

Partner: any organization or individual who has entered into a formal agreement for participation or cooperation in GLOBE.

Regional support office: a base from which support is given to the countries in a region and to regional cooperative structures. This support may include: logistics; training opportunities and coordination; web content and services; translation into non-English languages that span the region; regional initiatives; pursuit of funding opportunities; and science content. A help desk may be included.

Science Protocol: an integrated set of instructions and specifications on how to collect measurements and record metadata. This includes: site selection and definition; instrument preparation and calibration; number, timing, and frequency of individual measurements to be collected at a site. By following the protocol, students are able to collect research quality data.

- **Established protocol:** a protocol that has undergone the formal GLOBE approval process and is approved by scientists; made available through the GLOBE web site; included in the GLOBE data base and supported through the GLOBE web site for data entry, visualization, and retrieval; and is applicable to many parts of the world.
- **Local protocol:** a protocol that has been vetted by one or more GLOBE countries, meets the criteria for use of the GLOBE name, and is used in one or more countries, but has not been vetted through the formal GLOBE approval process.

Scientist: an individual who has a higher degree, often a PhD, in one or more of the fields of science, technology, engineering, or mathematics, or the equivalent experience or training, and is engaged, or was engaged, in a career that generally involves basic or applied scientific research.

- **GLOBE Scientist:** a scientist who advises on the scientific content of GLOBE programs and/or participates as an advisor or mentor of GLOBE teachers and students.
- **Student Scientist:** a student who is using the scientific method to study Earth.

Student artifacts: products created by GLOBE students other than science reports, such as GLOBE songs, videos, and drawings.

Trainer: an individual who has been certified to train GLOBE teachers in one or more measurement protocols in accordance with the GLOBE Trainer Certification Policy. These individuals possess knowledge, skills, and experience in science, education, training adults, and GLOBE and have demonstrated the ability to train correctly and effectively.

- **Master Trainer:** an individual who has been certified as meeting the requirements to qualify as a Trainer in one or more measurement protocols in accordance with the GLOBE Trainer Certification Policy and as being qualified to observe and assess Trainer and Master Trainer candidates and provide recommendations as to whether candidates should be certified. These individuals possess more knowledge, skills, and experience in science, education, training adults, and GLOBE than Trainers and have demonstrated the ability to train correctly and effectively.