GLOBE
Country Coordinator Implementation Guide

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This Country Coordinator Implementation Guide has been developed as a resource guide to assist GLOBE Country Coordinators in the operations and implementation of The GLOBE Program in their countries. The guide contains six sections:

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Section 1: Implementation

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This Country Coordinator Implementation Guide has been developed as a resource guide to assist GLOBE Country Coordinators in the operations and implementation of The GLOBE Program in their countries. Section 1: Implementation contains:

1. GLOBE Agreement and Roles of the Government Point of Contact and Country Coordinator
2. Types of Country Coordinators
3. GLOBE Sponsors, GLOBE Program Office, GLOBE Implementation Office, GLOBE Working Groups, GLOBE Regional Coordination Offices and GLOBE Welcoming Process
4. School Selection and Support
5. Costs of Implementing GLOBE
6. Private Sector Support for GLOBE International Partners
7. Organizations Involved in GLOBE Activities
8. GLOBE Best Practices
9. Impact of The GLOBE Program

1. GLOBE Agreement and Roles of the Government Point of Contact and Country Coordinator

Under the GLOBE Agreements, NASA is responsible for providing the program infrastructure, and GLOBE partner countries are financially and managerially responsible for GLOBE activities in their country. Countries decide how to implement GLOBE to meet their educational, environmental and/or other national objectives, define the scope of and budget for their program, choose schools that will participate in the program and work with the schools on implementing GLOBE in the classroom. Following signature of the agreement, GLOBE Countries name a Government Point of Contact who is responsible for policy-level communications with the NASA GLOBE Program Office Director and provides high level oversight of the GLOBE Program in their country.

The Governmental Organization responsible for GLOBE in a country selects and appoints the GLOBE Country Coordinator (CC). The GLOBE CC is responsible for day-to-day management of the program in that country, usually including recruiting schools, organizing teacher training sessions, mentoring teachers, program oversight, etc. Most CCs have other responsibilities in addition to GLOBE. They appoint Deputy or Assistant CCs to support implementation of these activities and to ensure continuity when the CC departs. The Deputy or Assistant CC also ensures representation at events like annual GLOBE Regional Meetings if the appointed CC is unable to do so. Some countries also have designated more

than one individual to manage GLOBE, either to support different geographic regions or different education levels. In both of these cases, the country will designate one individual to submit country reports and surveys to The GLOBE Program.

The initial step for implementing GLOBE in a country is for the CC and others to be trained as GLOBE Trainers as soon as possible after signing the bilateral agreement. New countries are encouraged to volunteer to host the next annual GLOBE Regional Meeting (RM). Training opportunities for the CC and teachers exist since training will be included in the RM or after as arranged. CCs often cooperate with local scientists and teachers to enlarge their country training team. This enables the CC to provide training to GLOBE teachers in his/her country. In order to ensure the accuracy of the GLOBE data for use by GLOBE students conducting research as well as by the world science community, each GLOBE school must have a GLOBE teacher trained in guiding students in taking GLOBE measurements. CCs and their teams will be trained on the conduct of GLOBE environmental measurements according to the measurement protocols developed by GLOBE scientists, the reporting and use of GLOBE data, the use of GLOBE educational materials and learning activities, and the use of the GLOBE Website. Contact the Regional Coordination Office (RCO) for your region (See paragraph 3—*GLOBE Sponsors, GLOBE Program Office, GLOBE Implementation Office, GLOBE Working Groups, GLOBE Regional Coordination Offices and GLOBE Welcoming Process*) for upcoming GLOBE Trainer opportunities in your region or the GLOBE Community Support Team at globehelp@ucar.edu for other GLOBE Trainer opportunities.

The CC selects GLOBE schools and, in collaboration with the training team, trains at least one teacher in each of the schools in GLOBE protocols and various aspects of The GLOBE Program (see Section 3: Science). The CC provides assistance to the schools in the acquisition of resources that they need to participate in the GLOBE Program. (See paragraph 4—*School Selection and Support*). The CC also keeps the GLOBE schools updated on program matters, answers their questions, and addresses their concerns. The workload can be intensive, especially when the country is beginning its participation in the program and is training teachers; the efforts generally transition to ongoing support for each school after the school is trained and has initiated GLOBE activities.

CCs have a variety of special administrative Website tools to manage GLOBE workshops, schools and users that enable the implementation of GLOBE, including certification of GLOBE teachers, student accounts and data entry. (See Section 5 – Technology Systems)

The role of the CC is of critical importance to the overall success of a country's GLOBE Program. The CC acts as the point of contact for all GLOBE schools in the country. This is necessary for many reasons but mainly so that the CC is aware of questions and/or problems schools are facing in their implementation of GLOBE. With this awareness, the CC can identify issues facing his/her schools and develop strategies to avoid similar problems in the future. The CC also can help develop solutions specific to the education system in their country. It is often quicker and more efficient and relevant to obtain answers locally or nationally than from the GLOBE Implementation Office (GIO). This procedure for addressing schools' problems and concerns provides an opportunity for interaction between

the CC and GLOBE schools and helps to establish relationships between the various individuals involved in the country's GLOBE Program.

The CC is responsible for completing the annual GLOBE Partner Survey. This survey has been designed so that it is aligned with the 2018–2023 Strategic Plan. The information contained in this survey also helps the GIO in modifying its services provided to partners. CCs receive a link to the annual survey from the GIO in late December of each year. CCs also are responsible for completing the annual Country Report that provides additional information to GIO as well as other GLOBE countries in the region to facilitate sharing of best practices and development of collaborative activities. CCs are responsible for providing their Country Report to the RCO in their region at the beginning of each year; the Country Report is a requirement for receiving support to attend the annual GLOBE Regional Meetings (See paragraph 3—*GLOBE Sponsors, GLOBE Program Office, GLOBE Implementation Office, GLOBE Working Groups, GLOBE Regional Coordination Offices and GLOBE Welcoming Process*).

Over the history of the Program, CCs have adopted a variety of mechanisms for providing ongoing support to and communicating with their GLOBE schools. National GLOBE Websites, blogs and Facebook pages, other social media accounts (i.e. Twitter and Instagram), monthly newsletters, news briefs, email user groups, and WhatsApp groups are examples of communication tools successfully used by CC to keep their GLOBE community updated.

Regular CC communication with the RCO to share achievements, pictures of workshops and other activities helps the RCO to share the country achievements on various platforms and also to gauge how the RCO can better support the CC. Following is a summary of CC responsibilities:

Responsibilities of GLOBE Country Coordinators

School-Based

1. Identify schools that will participate in The GLOBE Program
2. Ensure that GLOBE schools conduct the fundamental activities of GLOBE schools (take GLOBE environmental measurement, report data, and receive and use GLOBE visualization, graphs and datasets, using GLOBE educational materials under the guidance of GLOBE-trained teachers)
3. Attend annual GLOBE Regional Meeting to become a GLOBE Trainer (and as necessary identify and support training of qualified GLOBE trainers) and provide GLOBE training to at least one teacher in each GLOBE school
4. Create teacher training workshops and GLOBE teacher accounts for trained teachers following the workshops using the GLOBE Website
5. Ensure that GLOBE instructional materials related to measurement procedures and data reporting protocols are utilized in GLOBE schools, and that broader GLOBE educational materials are appropriately translated, adapted, reproduced and distributed to all GLOBE schools

6. Ensure that the measurement equipment used by GLOBE schools to take GLOBE environmental measurements meets GLOBE specifications
7. Ensure that teachers and students at GLOBE schools calibrate GLOBE measurement equipment according to procedures provided in GLOBE instructional materials
8. Ensure that GLOBE schools have the necessary computer and communications systems to allow Internet/web access in order to report GLOBE environmental measurements and to receive and use GLOBE environmental images; if such computer and communications systems are not available in schools, make agreed alternative arrangements for such reporting and receipt
9. Make full use of data technology now available for data entry such as the GLOBE Website and apps
10. Assess needs to provide follow-up training and/or support for teachers
11. Develop and use an effective communications infrastructure (for example, newsletter, listserv, etc.) to support GLOBE teachers and their students

Programmatic

1. Complete the Annual GLOBE Partner Survey conducted each year to support evaluation of the overall GLOBE Program
2. Complete and submit the annual Country Report of activities distributed by the Regional Coordination Offices (RCOs) to be shared at the annual GLOBE Regional Meeting each year
3. Name and integrate a Deputy or Assistant CC
4. Keep up-to-date all contact and country information posted on the GLOBE Website
5. Keep up-to-date with developments in the program, the Website and data systems, as well as changes to protocols and instrumentation
6. Communicate with Citizen Scientists and Citizen Science organizations who contact the CC
7. Be engaged in the implementation of the GLOBE Strategic Plan (2018–2023) to strengthen the program in their country
8. Be involved in GLOBE Program processes as required (the nomination of candidates for the GLOBE Working Groups, training certification, etc.)
9. Regular communication with the RCO

Additional capabilities available:

- Post national news and events on country page (on the GLOBE Website)
- Blog
- Write up and submit GLOBEStar and STEM Stories

2. Types of Country Coordinators

Government Organizations: Frequently, the government agency responsible for GLOBE will select a CC from within one of its ministries or departments. In some countries, the Ministry of Education acts as the CC because this Ministry is responsible for all in-school programs, for example Bahrain, Croatia and Israel. In other countries, the GLOBE CC is from the Ministry of Environment because this agency has the role of overseeing environmental education, such as in India, North Macedonia and Uruguay. GLOBE has also been implemented by the Ministry of Science and Innovation because of the importance of introducing technology in the classroom, as in the case of Thailand. In South Africa, an implementing agency with a similar mandate—South African Agency for Science and Technology Advancement—is the implementing agency.

Space Agencies: National space agencies are serving as GLOBE Country Coordinating organizations in France (Centre National d'Etudes Spatiales—CNES), Brazil (Brazilian Space Agency—AEB), and Kenya (Kenyan Space Agency). In Australia, the Australian Space Agency has designated the Commonwealth Scientific and Research Organization (CSIRO) as the CC organization.

Non-Governmental Organizations (NGOs): The CC need not be from the government. Although the government agency that signs the GLOBE agreement is responsible for selecting a CC, in many cases, a CC is chosen from outside the government. In these cases, the government often selects an NGO with which it has existing relationships and/or an NGO which is known to already have relationships with schools. For example, in Suriname, the NGO Green Heritage Fund Suriname had an established relationship with the Ministry of Education. In the Czech Republic, the NGO TEREZA was selected to act as the CC because of its experience and strong reputation for high quality environmental education programs for students. In Nepal, a local NGO named Environmental Camps for Conservation Awareness (ECCA) was selected to implement GLOBE partly because of its experience in working with remote communities. In The Netherlands, a new NGO was established for the purpose of coordinating GLOBE—the GLOBE Netherlands Foundation.

Universities: Individuals from universities are also commonly selected to serve as GLOBE CCs. This strategy has worked well in countries where the universities selected have the ability to provide scientific training and support to schools or computer and Internet support. In Argentina, Canada, Finland, Greece, Japan and Malta, universities were selected as the Country Coordinating organizations.

Teachers: Occasionally, teachers with significant environmental education or Internet training are selected as the GLOBE CC for an entire country. For example, Cyprus and Norway appointed teachers as their CCs. Teachers have been extremely effective CCs when they have the support of their own school administration in addition to the GPOC.

3. GLOBE Sponsors, GLOBE Program Office, GLOBE Implementation Office, GLOBE Working Groups, GLOBE Regional Coordination Offices, and GLOBE Welcoming Process

The GLOBE Program is led by the National Aeronautics and Space Administration (NASA) and supported by the National Oceanic and Atmospheric Administration (NOAA), the National Science Foundation (NSF) and the Department of State. The GLOBE Program Office (GPO) is located at NASA HQ in Washington DC. The GLOBE Implementation Office (GIO) provides high-quality support to the worldwide GLOBE community to promote increased and enhanced participation in GLOBE. Sponsored through a NASA cooperative agreement award to the University Corporation for Atmospheric Research (UCAR) in Boulder, Colorado, USA, the GIO collaborates with the GLOBE Working Groups in the areas of science, education, evaluation, technology and diversity, equity and inclusion to support community initiatives, the development of new science and education content, and other tools. To contact GIO, call 1-800-858-9947 or send an email at globehelp@ucar.edu.

The purpose of the GLOBE Working Groups (WGs) is to enhance the role of GLOBE CCs, U.S. Partners and GLOBE scientists and educators in shaping the future of The GLOBE Program and supporting the development and implementation of GLOBE worldwide. Five GLOBE WGs (Diversity, Equity and Inclusion – DEI , Education, Evaluation, Science, and Technology) have been created comprising community members. The WGs can have up to seven members; all efforts are made to have each of the six GLOBE regions represented in the groups. The one remaining slot can be filled by At-Large members from any of the regions. If CCs believe there are topics that the groups should discuss and bring forward to the management of the program, they should contact their regional representative. If a region does not have a representative at the time, CCs should feel free to contact the WG Chair. Information on WG Chairs and Members can be found at http://www.globe.gov/globe-community/globe-working-groups.

Africa	Asia and Pacific	Europe and Eurasia	Latin America and Caribbean	Near East and North Africa	North America

The GLOBE Program has divided the participating countries into six regions (shown in the above map).

Each region has a Regional Coordination Office (RCO) and Regional Coordinator who helps support the Program in its respective region. Duties of the RCO include:

- Basic support services to all community members in the region
- Sustainability through identification and generation of external funding from sources within and outside of the region.
- Translation of relevant GLOBE and GIO communications and regionally-produced materials in the languages of the region if needed, and dissemination of information to community members.
- Recruitment of community members in existing countries and identification and assistance of recruitment of new countries in the region in collaboration with the GIO
- Logistical organization of regional student research campaigns and events, including the annual Regional Meeting, as outlined and agreed upon by the regional governance board or advisory committees if they exist.
- Building and collaboration with the region's GLOBE Alumni and Scientist Network.
- Record keeping and evaluation reporting as required by GIO

The RCOs are:

Africa RCO

- Mark Brettenny, Coordinator
- GIA Environmental Resource Development and Training
- Mossel Bay, South Africa
- Email: africa.region.globe@gmail.com

Asia and Pacific RCO

- Desh Bandhu, Coordinator
- Indian Environmental Society
- New Delhi, India
- Email: ap.region.globe@gmail.com

Europe and Eurasia RCO

- Dana Votapkova, Coordinator
- TEREZA Educational Center
- Prague, Czech Republic
- Email: ee.region.globe@gmail.com

Latin America and Caribbean RCO

- Mariana Savino, Coordinator
- Universidad Austral, Escuela de Educacion
- Buenos Aires, Argentina
- Email: lac.region.globe@gmail.com

Near East and North Africa RCO

- Salma Al Zubi, Coordinator
- Al Tarfiaa Organization
- Amman, Jordan
- Email: nena.region.globe@gmail.com

North American Regional Office (NARO)

- Karl C. Clarke, Coordinator
- GIO Office
- UCAR
- Boulder, CO, USA
- Email: naro.globe@gmail.com

A Welcoming Process to GLOBE!

When a country joins GLOBE, the NASA GLOBE Program Manager sends a welcome letter to the country Government Point of Contact (GPOC). Following this, GIO organizes a virtual meeting with the RCO to introduce the CC to the overall GLOBE organization, community, policies and regularly held events. GIO also guides the CC in the first stages of launching the program in the country, including but not limited to obtaining training and establishing its web presence on the GLOBE Website. GIO familiarizes the CC with the functionality and content of the GLOBE Website and provides the CC GLOBE materials and resources. The CC is requested to develop an implementation plan based on this information and the country's goals and objectives for discussion with GIO in a second virtual meeting.

GIO announces the new partnering country to the GLOBE community, and the RCO introduces the CC to the CCs in the region. It also briefs the CC on the functions of the RCO

and activities in the region and helps the CC make contacts as appropriate with other CCs who may have shared interests in various projects or activities.

Details on this process are in Section 4: Community, paragraph 2—*GLOBE Training and Support*

4. School Selection and Support

Each country is responsible for selecting its schools that participate in GLOBE. It is the responsibility of the CC to train or ensure the training of at least one teacher in every GLOBE school who is certified to supervise GLOBE activities at their school. Frequently, the schools selected to participate in GLOBE receive assistance from the CC in acquiring scientific instruments, computer equipment or Internet connectivity, either via the provision of government resources or by securing resources from other sources.

Throughout GLOBE's history, there have been a variety of ways in which CCs have selected schools and resources have been obtained by GLOBE schools. While some of the examples below are no longer current, they serve as useful illustrations for how GLOBE has been established and sustained.

Geographic Regions: Some countries choose schools by geographic region. GLOBE schools can be selected by state or province to either facilitate distribution throughout the country and/or serve as GLOBE hubs for other schools in the state or province in coordination with the provincial and local environmental offices. Spain identified a GLOBE contact in each of its Autonomous Communities to be trained as a GLOBE Trainer to train and follow-up with schools in their community. Initially, South Africa selected five to ten schools in each province, and at least five of the schools in each South African province were historically disadvantaged schools with limited resources which received support from the then Department of Arts, Culture, Science and Technology for their GLOBE activities.

Competition: Countries have established competitive means for schools to apply to become GLOBE schools. Under this mechanism, only qualified entrants based on established criteria become GLOBE schools. For example, in Greece, schools from a wide geographic region and from all levels of education applied and competed against a set of established criteria. Several hundred schools applied, and 24 schools were initially selected.

Self-Select: Many countries advertise the GLOBE Program, and schools that express an interest in participating are invited to join the program. For example, The Netherlands and Finland have used this approach.

Availability of Resources: Some countries provide resources to schools, and others select schools that can support their own participation in GLOBE. In Portugal, the Ministry of Environment supported the purchase of instruments and equipment for its first six GLOBE schools. In other countries, such as Turkey, schools were selected based on their access to existing resources such as computers, Internet connectivity and scientific instruments. And, some countries have received support for their GLOBE activities from the private sector (See paragraph 6—*Private Sector Support for GLOBE International Partners*).

Relationship with Non-Governmental Organizations and Universities: In countries where NGOs and universities serve as the GLOBE CCs, schools that have existing relationships with these organizations, or are located nearby, are frequently selected to become GLOBE schools. For example, the Czech Republic CC TEREZA had relationships with schools and children's groups around the country prior to assuming leadership of GLOBE, and these schools were initially selected to participate in the GLOBE Program. U.S. Peace Corps Volunteers teaching English as a foreign language were also trained along with their host-country counterparts, and this led to additional schools. India also focused on the implementation of GLOBE in schools located near certain NGOs that were selected by the Ministry of Environment and Forests to help with the implementation of GLOBE.

Environmental Clubs: Some GLOBE Partners utilize existing after-school environmental clubs to expand the GLOBE Program. Japan, for example, chose to implement GLOBE in both schools and in Eco Clubs. In Ukraine, GLOBE activities have been done as part of after-school environmental clubs.

5. The Costs of Implementing GLOBE

Under the GLOBE Agreements, NASA is responsible for providing the program infrastructure, and countries are financially and managerially responsible for GLOBE activities in their country. There are a number of categories of costs for countries to implement these activities, all of which may not be solely applicable to The GLOBE Program. The costs depend on how the country chooses to implement the program and the level of resources currently available in its schools. For example, if a country decides to select schools to participate in GLOBE which already have computers and Internet connectivity, then it need not include the expense of computers and Internet into the GLOBE costs. Also, if the schools utilize various scientific equipment they already have, or schools choose to make some of the scientific instruments by hand, then GLOBE instrument costs can also be reduced dramatically. That being said, below are the potential categories of costs related to implementation of GLOBE activities in-country:

Support for a Country Coordinator: Almost all of the CCs have had other responsibilities in addition to their GLOBE responsibilities. Increasingly, countries also are supporting Deputy or Assistant CCs to help the CC with implementation and to ensure a smooth transition when the CC departs. The salary of the CC and Deputy or Assistant CC, therefore, may be necessary for the country to include in the costs of GLOBE implementation. However, if the person(s) selected assume the GLOBE positions as a part of their already established duties, then this cost need not be considered as part of the implementation costs.

Building a sustained GLOBE Program and Developing a GLOBE Community: The initial CC's work is initiating the program; i.e., the CC attends a workshop to be certified as a GLOBE Trainer, selects GLOBE schools, trains teachers in those schools, and may help those schools acquire the necessary equipment to participate in GLOBE. Their implementation activities shift in focus after the teachers are trained: the CC supports schools by translating GLOBE materials and aligning them with the curriculum, keeping them up to date on program matters, and answering their questions and/or addressing

their concerns. Beyond these, there are many strategies that have been successfully implemented to achieve a successful and sustained program. Each country decides how to implement GLOBE to meet its own objectives, and the costs will depend on the strategies it pursues. Examples of successful CC activities in this phase are building a sustainable GLOBE community comprising scientists, community groups, etc.; organizing events such as GLOBE conferences, learning expeditions, student research competitions and teacher workshops; visiting GLOBE schools to assist teachers and students on their GLOBE activities; administration of a Website in the national language; and supporting and motivating GLOBE cooperation nationally, regionally and internationally.

Computers/Laptops/Electronic Notebooks and Internet connectivity: The costs vary from country to country and depend on the number of new devices and Internet connections in which the country wants to invest and how many are necessary to meet the country's implementation objectives. While it is highly desirable that each GLOBE school has a device with an Internet connection, it is also acceptable for a country to arrange to collect data in any way, so long as the CC sends, or arranges to send, the data to GLOBE through the Internet. In some countries, this has been facilitated through the ministries, U.S. Embassies, Peace Corps Volunteers, private businesses wishing to support GLOBE, or other such institutions or individuals. With the advent of the GLOBE apps, schools can now use various mobile devices to enter data.

Scientific instruments: The cost of scientific instruments varies greatly. The GLOBE Website provides specifications for the instruments required to take environmental measurements in the following scientific discipline areas: Atmosphere, Biosphere, Hydrosphere, and Pedosphere (Soil). It should also be emphasized that schools do not need to collect data in all of these areas but rather focus on the measurements that can most easily fit into either their curriculum, their local environmental concerns, or in the local or regional projects in which they are participating. Schools may choose to begin implementation of GLOBE by evaluating how GLOBE protocols and learning activities fit into their curriculum and/or other objectives. Therefore, schools may begin with a small subset of protocols thereby requiring fewer instruments. Schools may share certain equipment that does not need to be used on a daily basis (e.g. GPS units, soil augers, etc.). In some countries, for example the Czech Republic, schools can borrow equipment from the CC for a certain period of time for free. The GLOBE Program's portfolio of protocols also includes those that do not require taking measurements/doing observations with expensive instruments. There are a number of items that can be handmade or can be substituted with already available equipment. For some protocols, the school may need only simple tools such as rulers, or they can create their own tools according to the instructions in the GLOBE Teachers Guide (e.g. clinometer). To take the soil moisture measurements, a school could purchase a balance for weighing soil and an oven for drying it, or the school could use a balance and a drying oven already available at the school or at a nearby school or university. Thus, the difference in cost for GLOBE instruments between the least and the most expensive approach can be large.

Instruments necessary for classroom science instruction are often purchased within the country or the region. However, these local and regional instrument suppliers are not always

listed on the GLOBE Website. GLOBE has created Regional Equipment Suppliers pages where countries can have local or regional instrument suppliers listed. The instruments supplied by these instrument companies have not been evaluated by The GLOBE Program but rather have been recommended by GLOBE CCs in the region as having instruments that meet GLOBE specifications. To see regional lists of instrument suppliers, visit:

- **Africa:** https://www.globe.gov/web/africa/home/globe-equipment-suppliers
- **Asia and Pacific**: https://www.globe.gov/web/asia-and-pacific/home/globe-equipment-suppliers
- **Europe and Eurasia:** https://www.globe.gov/web/europe-and-eurasia/home/globe-equipment-suppliers
- **Latin America and Caribbean:** https://www.globe.gov/web/latin-america-and-caribbean/home/globe-equipment-suppliers
- **Near East and North Africa:** https://www.globe.gov/web/near-east/home/globe-equipment-suppliers
- **North America:** https://www.globe.gov/web/north-america/home/globe-equipment-suppliers

Teacher training: There are two potential costs in this category. First is the cost to send the CC (and/or other trainers if they so choose) to a GLOBE workshop. The cost for this depends on the workshop location. These workshops may be held in various regions of the world throughout the year and are organized by the RCOs or other CCs. Associated costs might include transportation, lodging, a registration fee (covering the costs associated with the local host and meals during the workshop), and meals outside of the workshop hours. Second is the cost to train at least one teacher in a face-to-face training from each school chosen by the country to participate in The GLOBE Program. Again, this cost varies depending upon the approach used and size of the country. Sometimes, the country includes GLOBE training in workshops that are already being provided to its teachers at a central location; this negates the need for additional travel to a separate GLOBE workshop and therefore reduces the training costs. CCs may decide to begin training teachers in a local area, thereby eliminating the need for lodging and meals outside of the workshop hours since local participants could travel home after the workshop. It is also possible to train teachers in a small subset of protocols in order to give them a "taste of GLOBE"—interested teachers could then return during a subsequent workshop. Some countries train teachers at their schools which would also eliminate transportation and external meal costs. Creativity and flexibility are two key ingredients in organizing a GLOBE workshop—participants, agenda, location—these are all areas that can be tailored to the specific situation.

Some RCOs have a dedicated pool of trainers who may be willing to travel to a country to train bigger groups. In this case, the cost of getting them to the country and in-country costs are the responsibility of the country.

Training materials are available on the GLOBE Website.

GLOBE also has online Protocol eTraining for teachers. CCs can incorporate Protocol eTraining into their training strategy for new teachers, and their existing GLOBE teachers

can expand their GLOBE protocol knowledge. Protocol eTraining can reduce the costs of training GLOBE teachers. Information on Protocol eTraining modules and assessment tests can be found in Section 4: Community Section.

During the COVID pandemic, CCs began organizing virtual online trainings, sometimes with RCO support, when it was not possible to meet face-to-face. In addition to using the Protocol eTraining modules, videos and interactive sessions were incorporated into the trainings. As we are slowly moving out of the COVID pandemic, we are beginning to see hybrid trainings where virtual elements are incorporated into the program. Utilizing virtual and hybrid trainings have helped reduce the cost of trainings.

6. Private Sector Support for GLOBE International Partners

To date, we have seen several different scenarios for private sector support of The GLOBE Program internationally: Grants, In-kind Contributions, Adopt-a-School Programs, Sole and Joint Sponsorship, Funding Teacher Training, Teacher/Student Support and Community Support. Following is a brief description of each with examples that have occurred over the lifetime of the program.

Grants: National, regional and global environmental and educational grants are available through a number of sources. When GIO and the RCOs learn about these grants, they inform the community as quickly as possible through various communications. For example, the Europe and Eurasia RCO sent the European Union (EU) Erasmus Plan funding announcement for cooperation in Europe to CCs and teachers in the region. The Africa RCO compiled and distributed a list of potential funders that could partner with GLOBE countries in the region. YLACES (Youth Learning as Citizen Environmental Scientists), based in the United States, offers awards, scholarships, grants, and support – all to assist and reward the implementation of inquiry-based, experiential science education where students do science and contribute to understanding of our environment through recognition and financial reward programs, and many YLACES grants have supported GLOBE activities worldwide. Grant calls do not need to be solely focused on science and environmental education. In some countries, CCs are successful in getting funding which has a different focus that GLOBE can complement. Some examples are international collaboration, development of ICT skills, support of underprivileged communities, active citizenship, English language skills development, cross-community cooperation, girls' empowerment, and health and sanitation.

In-kind Contributions: Companies have provided computer hardware and other equipment to schools to enable their participation in GLOBE. For example, AT&T donated computers to 10 GLOBE schools in Benin; DEC provided computers to several participating GLOBE schools in the Czech Republic; GBM, an IBM subsidiary, donated computers and Internet connections to GLOBE schools in El Salvador; Microsoft donated Internet connections for schools in Egypt; Huger Electronics provided automated weather stations to Germany's GLOBE schools; and Dynamic Network Technologies, an Internet provider in Chisinau, Moldova, provided Internet connectivity for all GLOBE schools for one year. Also, Bank Windhoek donated computers to several Namibian GLOBE schools with

UUNET Internet Africa, which provided a dedicated lease line for three years for the use by Namibian GLOBE schools.

Adopt-a-School Programs: Companies have provided all the support necessary for a school to participate in GLOBE, i.e., funding scientific equipment, computers, Internet connections and teacher training. For example, in Egypt, IBM Egypt and ORASCOM Foods (an Egyptian company) each adopted a school and, in addition, played a continuing "mentoring" role with the students. Ben & Jerry's supported GLOBE schools in Israel. HSBC Bank (Malta) purchased equipment kits for individual schools.

Sole and Joint Sponsorship: Companies decide they want to make a broader investment in the country's GLOBE efforts by becoming a sole or joint sponsor of the program for a defined period of time. Alcoa supported GLOBE Europe and Eurasia activities for several years. Unilever, KPMG, Panasonic and IKEA were partners of GLOBE Czech Republic for a couple of years, each supporting GLOBE activities in general including national coordination of the program.

Funding Teacher Training: Companies provide funding and in-kind support for GLOBE Teacher Training Workshops and other events in their region. For example, Mobil Oil provided support for a GLOBE Training Workshop in Kazakhstan, including computer hardware, communications and networking capabilities, and scientific instruments. In addition, Central Asian Business Systems, a subsidiary of IBM, lent computers for use during the Kazakhstan International Training Workshop, as did Mercantile (an online service provider) in Kathmandu, Nepal. Teacher training workshops were also supported in South Africa by PetroSA and M&R Development Enterprise.

Teacher/Student Support: The SAS and Coca-Cola Environmental Foundation contributed over $5,000 for GLOBE school-to-school collaboration between Norway and Estonia. An Oman oil company sponsored teachers and students from Oman to attend the Mount Kilimanjaro Learning Xpedition on September 24 to October 1, 2015. PetroSA, AVK Valves, M+R Development Enterprise and the service provider, Big Expeditions, also provided support to Kilimanjaro Xpeditions including support for local learners.

Community Support: Science and/or mathematics teacher organizations, either national or regional, as well as community organizations such as Rotary Clubs (www.rotary.org) and Lions Clubs (www.lionsclubs.org), are often looking for ways to support youth and/or education in their communities. For example, GLOBE Argentina signed a regional Memorandum of Understanding with Rotary. Other examples of Rotary support are:

- Nepal's Environmental Camps from Conservation Awareness received support from the Rotary Club of Ballarat Inc and Rotary Club of Patan
- Rotary International granted funds for the development of the GLOBE Niger Classroom Guide and the GLOBE Teacher Workshop in 2007. (http://www.globe.gov/news-events/globe-stars/starsdetail/10157/2007-niger-teacher-workshop)

- The Rotary Club of East Port of Spain supported Trinidad and Tobago to add Emergency Care and Disaster Preparedness to Program Training (http://www.globe.gov/news-events/globe-stars/starsdetail/10157/2010-trinidad-and-tobago-emergency-care_
- The Israeli CC received an award from Rotary for his GLOBE work: http://www.globe.gov/web/guest/news-events/globe-news/newsdetail/globe/rotary-club-honors-globe-project-national-coordinator-in-israel

Additionally, Embassy spousal groups and American Chambers of Commerce may be interested in supporting GLOBE activities—whether at the country level or in support of a particular school.

7. Organizations Involved in GLOBE Activities

Many Governmental and Non-Governmental Organizations (NGOs) have provided support for GLOBE activities in countries throughout the world where GLOBE meets program objectives for the host country. Below are examples.

U.S. Embassies have provided small grants and other forms of support. These have included direct financial support for organizing trainings/equipment and national student competitions and contests, organizational support (for example, translations, interpretation), and diplomatic support including highlighting the program activities in a country (school visits, supporting of the Program launch, recognizing the most active schools, etc.). In 2018, the U.S. State Department, NASA, GIO and YLACES began collaborating on the GLOBE Plus Post initiative that provides U.S. Embassies the opportunity to submit proposals for additional support for GLOBE activities in their host country. Since the start of the initiative, there have been over 20 GLOBE Plus Posts. Contact the GLOBE International Coordinator (globeint.coord@gmail.com) for the GLOBE Point of Contact in the U.S. Embassy in your country.

The U.S. Peace Corps staff and volunteers in Benin, the Czech Republic, Kazakhstan, Niger, Republic of Macedonia, Peru, Romania, the Russian Far East, and many other countries where Peace Corps Volunteers have served or are serving, have assisted in the implementation of the program both nationally by supporting the CC in implementing the program and locally by working with teachers in individual schools.

In 2016, NASA and the Peace Corps signed a Letter of Intent to strengthen this collaboration.

The GLOBE/Peace Corps Alignment document outlines some of the ways Peace Corps can and is using GLOBE, as well as how GLOBE science protocols align to the Peace Corps.

Peace Corps
Contact the Peace Corps via the U.S. Embassy in-country
Website: www.peacecorps.gov

The U.S. Agency for International Development (USAID) has also helped to implement GLOBE in countries where USAID has perceived GLOBE as being consistent with its goals for the country. For example, USAID in Benin helped organize and conduct teacher-training workshops, funded translation of the GLOBE CCs Guide into French and provided Internet

ready computers at the USAID office for GLOBE student data transmission. USAID provided facilities for International GLOBE Training Workshops, including computers and Internet connections. Finally, USAID funded the Beninese GLOBE CCs participation in GLOBE annual conferences from 1997—2001, funded Beninese GLOBE teachers' participation in GLOBE training workshops in other African countries (e.g. Senegal) and funded the Beninese CC and two students' participation in GLOBE's first international student-teacher conference, the GLOBE Learning Expedition, in Helsinki, Finland, in July 1998.

USAID's GREENCom provided staff support and training for the GLOBE CC and teachers in Jordan and Russia. USAID's Leland Initiative, which worked to bring the Internet to Sub- Saharan Africa, used GLOBE as a direct application of Internet technology and worked together with GLOBE on training workshops in Sub-Saharan Africa. USAID's United States—Asia Environmental Partnership (US–AEP) program also provided support in some GLOBE countries to implement GLOBE and promote environmental awareness.

In 2019, SERVIR West Africa organized a Train-the-Trainer session on GLOBE Hydrosphere protocols. Also in 2019, GLOBE participated in a regional scientific cooperation meeting at the invitation of the USAID Middle East Regional Cooperation Program which organized the meeting for researchers in the region.

The USAID has program sectors that align with GLOBE's programmatic activities and science protocols. Some of the ways USAID can and is using GLOBE are listed in this alignment document.

USAID—U.S. Agency for International Development
Contact the USAID Office via the U.S. Embassy in-country.
Web site: www.info.usaid.gov/about/

The United Nations has various programs that have cooperated with GLOBE and GLOBE CCs. In December 1994, the United Nations General Assembly passed a resolution encouraging all nations to participate and all UN organizations to support GLOBE activities around the world. Since that time, The GLOBE Program established formal relationships with the United Nations Educational, Scientific and Cultural Organization (UNESCO), the United Nations Environmental Programme (UNEP), and the United Nations High Commissioner for Refugees (UNHCR) to engage in mutually beneficial activities.

The GLOBE Program and the United Nations Environmental Programme (UNEP) agreed to cooperate on environmental education and training and the collection of environmental data. Through this partnership, GLOBE and UNEP shared educational materials and promoted collaboration of UNEP regional offices with GLOBE countries in their regions. In addition to being a general resource for environmental education, UNEP provided GLOBE CCs access to their networks of scientists. This led to GLOBE/UNEP collaborative activities in Poland and Kenya. Building on this initial collaboration, NASA and UNEP signed an agreement in 2019 to work together on the promotion and implementation of GLOBE and UNEP activities including cooperation on environmental education and training, citizen science and the collection and distribution of environmental data. Information on the collaboration is detailed on the UNEP section of the GLOBE Website.

UNESCO and GLOBE cooperated on a pilot initiative to monitor World Heritage Sites.

UNHCR used GLOBE as a vehicle for environmental education in refugee camps in Africa, and supported GLOBE in Kenya and Senegal in camps as well as in schools neighboring the refugee camps and in urban schools with high refugee populations.

EcoSchools, run by the Foundation for Environmental Education, and GLOBE are collaborating on the integration of the two programs in schools. Information on how the programs are aligned and case studies of how schools have integrated the program are detailed on the GLOBE Website. In addition, EcoSchool National Operators in Ireland and Malta are GLOBE CCs, and the Slovenian EcoSchool National Operator is involved in the implementation of GLOBE in schools.

The World Meteorological Organization (WMO) collaborates with GLOBE on common goals, including increasing environmental awareness throughout the world, developing scientific understanding of the global environment, and supporting achievement in science and mathematics education around the world. In 2007, the World Meteorological Organization and the National Aeronautics and Space Administration (NASA) agreed upon Terms of Reference to allow the commencement of GLOBE and WMO collaboration on common goals. These goals include increasing environmental awareness throughout the world, developing scientific understanding of the global environment, and supporting achievement in science and mathematics education around the world.

GLOBE also has established both formal and informal relationships with NGOs to support and promote each other's activities where the programs' goals overlap. Current collaborating organizations can be found at: http://www.globe.gov/globe-community/collaborating-organizations.

8. GLOBE Best Practices

Based on feedback from CCs, GLOBE has identified six areas of successful implementation in the following categories: Curriculum Integration, Data Reporting, Regional Collaboration, Working with Scientists, Securing Private Sector/Foundation Support and School Selection/Recruiting Schools. While some of the examples below are no longer current, the following information illustrates examples of successful implementation strategies in these areas throughout the history of GLOBE.

Curriculum integration to accepted standards in each country:

Keys to success: Providing teachers the tools and information needed to integrate GLOBE into required teaching material; sharing with teachers how GLOBE can also fit into non science courses, such as social studies, foreign languages, etc., and sharing success stories so that others can follow schools' successful integration examples; using GLOBE for cross-cultural communication/learning; making GLOBE materials available to as many teachers as possible; and clearly outlining exactly where GLOBE fits into the curriculum.

Belgium—GLOBE is explicitly mentioned as compulsory for geography in grades 9 and 10.

Colombia—Since 2018, the Ministry of Science, Technology and Innovation has integrated the GLOBE Program with the Ondas program's research route as a valuable tool to promote children and adolescents' interest in research and the development of attitudes and skills that allow them to actively participate in a culture of science, technology and innovation. Ondas is a research training program aimed at children and adolescents, which through the articulation with the GLOBE Program seeks to strengthen the line of research in natural sciences.

Croatia—Measurements, observations and GLOBE protocols are introduced in elementary school Science and Geography subjects as well as the scientific research process and GLOBE methodology. GLOBE activities are also part of the cross-curricular Sustainable Development subject (elementary and secondary schools)

Czech Republic—Schools in the Czech Republic use GLOBE to integrate and connect various aspects of their curricula, mostly in Science, Geography and Environmental Education. GLOBE is used to promote communications among schools both nationally and internationally. Each teacher matches GLOBE materials with his or her school/subject curriculum. GLOBE Czech Republic includes tips for curriculum integration into the Czech version of the GLOBE Teacher's Guide.

Finland—GLOBE supports the Finnish goals of hand-on science and analysis, the teaching of foreign languages and cooperative learning. The national curriculum in Finland is decentralized, which allows GLOBE schools flexibility on how they incorporate GLOBE materials.

Japan—In order to improve school retention, GLOBE Japan took steps to better assist their teachers in intergrading GLOBE into their curricula. Successful examples of integrating GLOBE into different curricular subjects are widely disseminated. Teachers are also encouraged to utilize the newly implemented "Period for Integrated Study," a flexible period devoted to the inquiry process and to problem-based learning, for implementing GLOBE in their classroom. Successful examples of such implementation are also made available to all GLOBE teachers. Efforts are made to encourage teachers to engage their students in research projects that utilize GLOBE data.

Finally, in an effort to reduce the barrier the English language poses to many Japanese schools, the GLOBE Teachers Guide, as well as the GLOBE data entry and data visualizations web pages, have been translated into Japanese.

Jordan—Friends of the Environment (FOE) established "GLOBE ROOMS" in GLOBE schools where teachers and students kept their GLOBE materials. Teachers of various disciplines used the materials in GLOBE ROOMS to highlight aspects of their curriculum. For example, chemistry teachers used GLOBE because they can apply it to their local environments. Students find the hands-on GLOBE materials more meaningful than only reading about science in textbooks.

North Macedonia—GLOBE protocols were introduced as compulsory for biology in 7th grade.

Nepal—The Nepalese found that GLOBE protocols positively correlated with the science and environmental books of their schools' level four and higher. Nepal's implementing

agency, Environmental Camps For Conservation Awareness (ECCA), made a chart showing exactly where and how the correlations work so that schools and teachers quickly understood how GLOBE fits into the curriculum.

Philippines—GLOBE Philippines developed GLOBE EduShare Program, a moodle® based online learning management system to serve as an online learning platform for GLOBE protocols and to convert GLOBE protocols into modules or modular form for easy integration into school curricula.

Data Reporting:

Keys to success: Having more than one GLOBE trained teacher in each GLOBE school; getting support of school administrations by including them in GLOBE conferences and workshops; holding refresher workshops for previously trained teachers; visiting GLOBE schools and helping them enter data for the first time; promote use of The GLOBE Program app, GLOBE Observer by GLOBE students and citizen scientists.

Argentina – Incorporates use of The GLOBE Program app, GLOBE Observer into its school implementation activities to increase data reporting and awareness of the program. The Country Coordinator conducts teacher workshops on using the mosquito habitat mapper tool to detect larvae breeding sites and organized a contest on cloud observations using the app in collaboration with the U.S. Embassy. GLOBE Argentina plans to continue promoting the use of the app by students and citizen scientists.

Benin and Ghana—The Beninese and Ghanaian CCs traveled around their respective countries visiting GLOBE schools, meeting with school administrators to secure their support for the Program and helping teachers build confidence and overcome any challenges or insecurities they have with data reporting. Refresher workshops were held on specific topics. Most schools have more than one GLOBE teacher so that they can support each other with implementation.

Croatia—Croatia was the first country to invite school administrators/principals to participate in GLOBE workshops and meetings. This approach secured support from many of these administrators, which helped ensure that GLOBE teachers were given what they needed to incorporate GLOBE into their lessons. It also helped secure financial resources for the school to support the Program.

Czech Republic, Estonia, Malta, Slovak Republic and other countries— invite local scientists to their workshops so that teachers can understand the importance of student data for scientific research.

Paraguay—As part of a citizen science program, tackling the virtual education problem during the COVID-19 pandemic, Paraguay created free subscription boxes delivered to numerous institutions nationwide. The GLOBE Program's app, GLOBE Observer and cloud protocol are part of the subscription box items delivered to students with low or no internet

connectivity across the country enabling them to conduct GLOBE activities despite having no internet connection.

Uruguay—In Uruguay, the CC visits the schools in order to support GLOBE teachers (and new teachers who have required it) to introduce the Program in the school, help them with the use of instruments, show them how to take measurements properly, register data in the data sheets and teach them options to enter data and how to do it. The CC also provides instruments by lending them to the teachers for research projects or for a campaign and refreshes them on protocols and learning activities to understand certain topics.

Regional Collaboration:

Keys to success: Regional Partners working together to reach common goals; having a self identified "lead" country in the region that reaches out to neighboring countries with ideas for collaboration; developing a regionally relevant theme; holding regional conferences and workshops.

Regional Boards – GLOBE Partners in Europe created the European Country Coordinator Committee in 1996 to encourage regional collaboration among Partners throughout Europe. Since that time, GLOBE Europe—the first regional GLOBE Board—was formed. It has enabled partners in the region to exchange information and ideas about GLOBE activities throughout the region, plan regional collaboration and events, and develop proposals for funding for regional activities.

Country-to-country partnerships—For example, Israel and Malta have been collaborating on common projects based on GLOBE, involving students and teachers not only for scientific collaboration but also for intercultural learning and friendship development.

Joint Regional Campaigns/ Projects/ Challenges/ Competitions—organized either by RCO or a CC as a strong leader. The common topic is the most important key to success – such as Phenology Campaign, Air Pollution Campaigns, Water Bodies Challenge, etc.

African Region—Mt. Kilimanjaro Expeditions were organized several times since 2009 for students, teachers, scientists and alumni from all GLOBE regions who have participated in person or virtually. Participants engaged in taking GLOBE measurements and learning about the many independent ecosystems within the six biomes on the mountain: Alpine Desert, Cultivated Areas, Heath Zone, Moorland, Rain Forest, and the Summit as they climbed to the summit and back. The last Mt. Kilimanjaro Expedition was organized in 2015.

European Phenology Campaign—The GLOBE community in Europe has been engaged in the seasonal tree observations for several years now. Students observe the same tree species (budburst, leaf growth, leaf color change) and with the help of teachers, they share their observations on the online forum, through presentations on webinars etc. They collaborate with other schools from various countries. In 2021, there were 190 schools involved. The campaign led to substantial hike in data collection and school collaboration across Europe. The Website is active: https://www.globe.gov/web/european-phenology-campaign/overview

Argentina, Peru and Uruguay—Conducted a collaborative research study in 2014/15 using GLOBE protocols and data to investigate the impact of the El Nino Southern Oscillation (ENSO) on the three countries. This research involved three different levels of education teachers, trainers and CCs. In 2021, these countries organized the "Observation of Butterflies and Environmental Variables" campaign which took place September 1 – November 30. The campaign grew out of the "Citizen Science and Butterfly Monitoring" virtual workshop in summer 2021 with 108 participants from six LAC countries.

Argentina, Brazil and Paraguay—Conducted a triple border workshop within the framework of the GLOBE Zika Education and Prevention Project in 2018 to address the areas most affected by diseases transmitted by mosquitoes. As part of the second stage of the project, the Amazon Triple Border Workshop was held in Leticia, Amazonas in 2019 with the participation of students, teachers and community leaders from Colombia, Brazil and Peru.

Estonia—Organizes annual GLOBE Regional Learning Expeditions (GRLE) for students, teachers and scientists. In 2015, it was largely organized by GLOBE Alumni and was a celebration of GLOBE's 20th anniversary. The 2022 GRLE marks the 25th anniversary of annual expeditions in Estonia.

India—Organized a GLOBE Citizens Conference in 2015 attended by participants from Thailand, Taiwan and India. Students made presentations on their GLOBE research activities and participated in field investigations and cultural visits.

Oman—Organized an international student environment GLOBE Camp in March 2015. Approximately 120 students from more than 30 schools from Oman, Saudi Arabia, Bahrain, Lebanon, United Arab Emirates, Jordan and Pakistan participated.

Taiwan Partnership—Organized GLOBE Science Festival for Asia Pacific Region in July 2017 in Taipei in collaboration with the American Institute in Taiwan. 34 GLOBE participants from India, Mongolia, the Philippines and Thailand attended, and eleven GLOBE student research projects were presented. Students also participated in field investigations and cultural visits.

Tanzania, Kenya and Uganda—GLOBE Africa developed a biannual Lake Victoria Learning Expedition that involved sites in these three Lake Victoria basin GLOBE countries. GLOBE students in Mwanza, Tanzania, Homa Bay (expedition basecamp) and St. William Osodo Secondary School, Kenya, and Entebbe, Uganda, performed hydrology studies. Lake Victoria is Africa's largest lake, and the people of Tanzania, Kenya and Uganda rely on its waters for its huge fishing industry. But water pollution, over fishing and ecological destruction (through invasive species) are causing worries about its future. GLOBE students and citizen scientists in the region were able to contribute scientifically through data collection and research on the Lake. This effort has evolved into the Water Bodies Collaboration initiative which now involves schools from other GLOBE regions.

Working With Scientists:

Keys to success: Inviting university research scientists to help train at in-country teacher-training workshops; asking scientists to serve as mentors to GLOBE students and teachers; getting scientists involved in implementation of GLOBE.

Arctic POPs Project—Norwegian scientists from the Norwegian Institute of Atmospheric Research (NILU) designed a Persistent Organic Pollutants (POPs) protocol for GLOBE schools throughout the Arctic (Canada, Denmark, Finland, Iceland, Norway, Russia, Sweden and the United States). The measurements provided the environmental research community a useful data set covering new POP levels in the Arctic.

Czech Republic: The GLOBE Program in the Czech Republic established a Scientific Board in 1996. Eleven scientists and professionals from different natural sciences have joined the Board. The Board works with both teachers and students to interpret data and process the results. Scientists are also invited to co-train at GLOBE trainings.

Germany: Scientists from the University of Koln translated the protocol eTraining modules into German and used them for conducting lectures for their pre-service teacher trainings.

Poland: The GLOBE Program in Poland established an Advisory Board in September 1999. The main task of the board was to carry out lectures during workshops and to supervise content- related issues of the program. GLOBE Teachers and students address questions to the members of the board. The board worked on adjustment of the GLOBE program to the Polish curriculum.

Thailand: Two schools in Thailand worked closely with NASA soil scientists on the GAPS modeling project. University science faculties are involved with GLOBE-Thailand and include GLOBE in their Teacher-Training Program. GLOBE Thailand conducted a workshop involving 10 GLOBE schools and local GLOBE scientists to share ideas about encouraging student research and student-scientist collaboration research.

Uruguay-Paraguay: Since the planning of the project about butterflies and the environmental variables described above, the CCs contacted some specialists in the region to engage them in the project. Biologists (entomologists) from Uruguay and Paraguay participated in webinars and provided information on the identification of species and have been a great support for the project and the teachers.

Securing Private Sector and/or Foundation Support:

Keys to success: Being proactive; inviting companies and foundations to GLOBE related events to see the program first-hand; developing relationships with decision makers in the organizations; finding matching support from government or other agencies; partnering with other GLOBE countries to strengthen proposals and resources; and to appeal to organizations that fund regional activities (Also see paragraph 6—*Private Sector Support for GLOBE International Partners*).

Cyprus—GLOBE in Cyprus is currently implemented under the auspices of the Cypriot Ministry of Education and Culture. While the Ministry provided funds for purchasing equipment for public schools that joined the Program, the GLOBE CC sought private sources of funding. He was successful in securing funds from the Cyprus Telecommunications Authority, a major private Internet provider for the country. The funds were used to support an international GLOBE Train-the-trainer Workshop for Europe and the Middle East held in Nicosia, Cyprus, in 2002.

India—GLOBE in India was successful in securing funds from the World Bank. The funds supported their initiative to train 800 schools in eight states throughout India.

Norway—The SAS and Coca-Cola Environmental Foundation contributed over $5,000 for the GLOBE Arctic POPs Project.

GLOBE Europe—GLOBE CCs from the Czech Republic, Estonia, Holland, Norway, Poland and the United Kingdom were successful in securing a grant (Minerva) under the European Union's Socrates Education Programme. Minerva is aimed at open and distance learning, linking information and communication technologies in education. The Greek CC collaborated with five CCs in Europe to submit the proposal "PULCHRA: Science in the City: Building participatory Urban Learning Community Hubs through Research and Activation" to the European Union's Horizon 2020 call. The proposal was successful, and the project was launched in 2019.

School Selection/Recruiting Schools:

Keys to success: Competition, pilot programs, and geographic distribution. (See paragraph 6—*"School Selection and Support"*).

Greece—GLOBE schools in Greece initially were selected through a nation-wide competition. Objective criteria were set in order to best evaluate the proposals submitted by interested schools. The selection process identified 24 schools to reflect a wide geographic coverage of Greece. The schools selected represented all major levels of the Greek Education system (i.e., the primary, secondary levels, and the technical secondary level). Government funds were used to establish Internet access, and to purchase computers and equipment for all public schools. Private schools were responsible for their own expenses.

India—Prospective GLOBE schools were personally approached by the coordinating agencies with information about the GLOBE program. This was followed up with workshops for the Principals of these schools where detailed presentation about salient features of the program were made by the coordinating agencies. The benefits that were likely to be acquired by the schools were also explained to the Principals. Alternatively, the coordinating agencies sent detailed letters to the School Principals outlining the salient features of The GLOBE Program and invited them to join it. Once the schools expressed interest, they were enrolled in the program, and the Principals were advised to nominate one or more Teachers who were interested in conducting the scientific measurements and to co-ordinate this program in school.

United Kingdom—United Kingdom conducted a one-year pilot on GLOBE with about a dozen schools to determine if and how GLOBE fit into the curriculum before they decided to offer GLOBE to the participating UK schools.

9. Impact of The GLOBE Program

The international GLOBE network has grown to include representatives from 126 participating countries and 131 U.S. Partners coordinating GLOBE activities that are integrated into their local and regional communities. Due to their efforts, there are tens of thousands of GLOBE-trained teachers representing schools around the world. GLOBE students have contributed over 220 million measurements to the GLOBE database for use in their inquiry-based science projects.

The impact of GLOBE can be recorded in a number of different ways. The numbers of workshops and teachers trained, the data collected and entered by students and Citizen Scientists into the GLOBE databases, the number of students' and scientists' research reports, and the number of publications are all quantitative metrics. Qualitative examples of this impact include STAR and STEM Stories, videos including community member testimonials, and the variety of events where the community comes together to share their stories based on their activities and achievements.

Section 2: Education

Section 2: Education

This Country Coordinator Implementation Guide has been developed as a resource guide to assist GLOBE Country Coordinators in the operations and implementation of The GLOBE Program in their countries. Section 2: Education contains:

1. GLOBE Education Resources
   a. Teachers Guide
   b. Learning Activities
   c. Elementary GLOBE
2. Research and Resources
3. International Virtual Science Symposium (IVSS)

1. GLOBE Education Resources

Teachers Guide

The set of GLOBE measurements reflects the Program's commitment to provide the education community with a rich suite of protocols that meet their various curriculum needs while also providing scientifically useful environmental data. The student data can be used to address local needs and interests, contribute to the global study of the Earth system, and support student research projects. All schools are encouraged to participate in any or all of the wide range of GLOBE environmental measurements that fit their research needs. Such broad participation results in a comprehensive dataset which is more useful scientifically and educationally because the different measurements complement one another and provides a more complete characterization of the local environment. However, schools do not need to collect data in all of these areas but rather focus on the measurements that can most easily fit into either their curriculum, their local environmental concerns, or in the local or regional projects in which they are participating.

The GLOBE Teacher's Guide is a collection of scientific background information, data-collection protocols, and learning activities categorized by Earth sphere: Atmosphere, Biosphere, Hydrosphere and Pedosphere (Soil). It also contains specifications for the instruments required to take environmental measurements.

GLOBE Science Protocols

Earth is a complex, dynamic system we do not yet fully understand. Our planet is changing on all time and space scales, and we hope to engage students in exploring Earth systems locally, regionally, and globally, to contribute to understanding Earth system interactions. We need to understand the Earth's spheres as a single connected system. GLOBE protocols fall within four spheres, and GLOBE Protocol Bundles have been assembled to understand how they together form an interconnected system (Earth as a System).

1. **Atmosphere:** Explore different aspects of our planet's weather and climate
   - Students monitor atmospheric conditions every day. All measurements may be taken at a site adjacent to the school. Many measurements are taken within one hour of local solar noon, although some measurements may be taken at other times throughout the day. Instruments that measure daily high, low, and current temperatures, and amounts of precipitation are installed at this site. Other instruments are brought to the site as needed while some instruments are used in the classroom.
2. **Biosphere:** Explore cycles of plant life
   - Students assess the land cover of a 15 km by 15 km area (their GLOBE Study Site) centered on their school. Ultimately, they track changes to land cover over time by comparing satellite imagery acquired in different years.
3. **Hydrosphere:** Explore water properties including impacts on animal life (mosquitos and macroinvertebrates)
   - For all protocols except freshwater macroinvertebrates, students take weekly measurements of surface water properties at a near-by water body (river, stream, bay, ocean, lake, pond, etc.) that serves as their hydrology study site. Students may also collect data about the types and abundances of freshwater macroinvertebrates, marine invertebrates and mosquitoes.
4. **Pedosphere (Soil):** Explore the physical and chemical properties of soil
   - Students measure soil moisture and temperature at a study site near their school. Students characterize the top meter of soil at this and other sample sites, use an infiltrometer to measure the rate at which water soaks into the soil and a frost tube that provides climate information about frozen soils.
5. **Earth as a System:** Understanding how the Atmosphere, Biosphere, Hydrosphere, and Pedosphere together form an interconnected system with many interactions. Figuring how each sphere interacts with one another allows us to make more accurate predictions within each individual sphere.
   - Students explore complex Earth phenomena by using protocol bundles which incorporate protocols from across all four spheres in order to understand how the Earth operates as a system: Agriculture Bundle, Air Quality Bundle, ENSO Protocol Bundle, Mosquito Protocol Bundle, Ocean Bundle, Rivers and Lakes Protocol Bundle, Soil Bundle, Urban Protocol Bundle, Water Cycle Bundle, Water Quality Bundle, and Weather Bundle.

Learning Activities

In the Teacher's Guide, teachers can access GLOBE Learning Activities to help students learn more about GLOBE protocols and instruments. GLOBE Learning Activities are a great, action-oriented way for students to approach scientific concepts. Teachers can use them to complement lesson plans or modify them to fit within their time, resources, or learning objectives. GLOBE has developed several learning activities that support and enhance student observation activities in the four spheres and Earth as a System.

Atmosphere

In this sphere, there are activities on: Aerosols, Air Temperature, Barometric Pressure, Clouds, Precipitation, Relative Humidity, Surface Temperature, Water Vapor, and Wind.

Biosphere

In this sphere, there are activities on: Arctic Bird Migration, Biometry, Carbon Cycle, Green-Up / Green-Down, Land Cover Classification, Phenological Gardens, and Seaweed Reproductive Phenology.

Hydrosphere

In this sphere, there are activities on Alkalinity, Conductivity, Dissolved Oxygen, Freshwater Macroinvertebrates, Nitrates, pH, Salinity, Water Temperature, and Water Transparency.

Pedosphere (Soil)

In this sphere, there are activities on Bulk Density, Soil Characterization, Soil Fertility, Soil Infiltration, Soil Moisture, Soil Particles, and Soil pH.

Earth as a System

Includes activities on global connections, regional connections, and local connections, as well as seasonal changes (phenology).

Elementary GLOBE

Elementary GLOBE's books and modules introduce students in grades K–4 to the various aspects of Earth system science. Using a storybook approach, the modules utilize a science-based, fictional narrative to engage students in the scientific method. The modules also challenge them to extend their lessons into the natural world through observation and measurement of their surrounding environment.

Each module of Elementary GLOBE includes:

- A science-based, fictional storybook in which kids explore an aspect of the Earth system using their scientific skills.
- Three learning activities that further explore the lesson content and help students develop sound science and engineering approaches to complex problems.
- A glossary and teacher's notes that provide educators with the necessary background information to further assist their students with each module.

The Teacher Implementation Guide

The Implementation Guide includes:

- An overview of Elementary GLOBE
- The connections the curriculum makes to literacy and other areas of the elementary curriculum
- The usage of science journals

- Scientific inquiry in the elementary curriculum
- Standards alignment

Translated Versions

GLOBE strives to provide translations of our materials in the official U. N. languages. Currently, our resources are available in:

- Arabic
- French
- German
- Norwegian
- Spanish

To download a translated version, click on the corresponding language:

العربية| Français | Deutsch | Norsk | Español

Not all storybooks and activities have been translated into every language. If you'd like to add your language to this list, contact globehelp@ucar.edu for more information about translation approval.

Modules

Air Quality — "What's Up in the Atmosphere?"
Students will investigate why aerosols and other types of air pollution affect the color of the sky. They'll also learn how to describe the sky color and the underlying conditions in the atmosphere. Visit the Air Quality Module.

Climate — "What in the World is Happening to our Climate?"
Students will learn about regional climate variations and how climate change is affecting our world. Then, they will brainstorm ways to solve climate change. Visit the Climate Module.

Clouds — "Do You Know That Clouds Have Names?"
Students will explore how different types of clouds can be described via analogy. As they start understanding how to observe clouds, they will create models of the different cloud types and contrails. Visit the Clouds Module.

Earth System — "All About Earth"
Students will examine how water, air, soil, and living creatures interact within the Earth system. They will also learn the importance of each role to the planet's ecology.
Visit the Earth System Module.

Seasons — "The Mystery of the Missing Hummingbirds"
Students will discover how hummingbirds deal with seasonal changes. To broaden their scope, they will use science journals to describe the changes in their own local environment as it cycles through the different seasons. Visit the Seasons Module.

Soils — "The Scoop on Soils"
Students will investigate why different locations have different soil characteristics. They will also learn how to describe the matter found within the soil and explain why it is so important to plants and animals. Visit the Soils Module.

Water — "Discoveries at Willow Creek"
Students will learn how to describe a creek by making observations, taking measurements, and investigating its macroinvertebrates. To accomplish this, they will be introduced to measurement tools like rulers and magnifying glasses. Visit the Water Module.

2. Research and Resources

Research

GLOBE has a long history of sharing impact and science findings through peer-reviewed publications. The peer-review process ensures that published articles represent the best scholarship currently available. Each article that is submitted to a peer-reviewed journal is sent to other scholars in the same field in order to get their opinion on the quality of research, the relevance to the field, and its appropriateness for inclusion in the journal.

The first publication, which explored the idea of the program, was published in 1993, before GLOBE's official beginning. Since then, the use of GLOBE data has been published in many peer-reviewed journals and as scholarly works, such as theses and dissertations. Reading through these publications can provide important background for classroom projects, as well as methods for using GLOBE in the classroom. The links on the GLOBE Publications webpage provides a bibliography based on the year of many of these publications, or you can search the database for a specific paper or conference proceeding.

GLOBE also has a history of students doing their own research, through different GLOBE symposia. You can search through all student reports on the Student Research page on the GLOBE Website.

Resources

Teaching resources: In addition to the Teacher's Guide, GLOBE provides a number of resources to help teachers to engage their students in a collaborative approach to scientific exploration of Earth.

Student resources: GLOBE provides students the opportunity to participate in the scientific research process and provides details on the nine steps in the scientific process, the GLOBEScience Process, a research report format, and **data exploration learning activities**. Other resources available to enhance a student's GLOBE experience include: STEM Career Speakers, Games and GLOBE Student Blog.

Higher education resources: Resources are available for university faculty for using GLOBE for pre-service teachers and other undergraduate students.

Resources for training and implementation activities

Countries have the flexibility to organize training workshops to meet their own requirements for GLOBE. Country Coordinators (CCs) and staff of trainers need to continue to work with teachers after their initial training in order to present other protocols and/or activities that support their educational objectives. Following are resources that support CCs' teacher training and GLOBE implementation activities.

Teacher training: To enter GLOBE data, teachers must complete necessary protocol training. Teachers attend GLOBE workshops to receive person-to-person training that involves hands-on conduct of the protocols by the trainee. Training is delivered by GLOBE Trainers. Teachers can also complete required online protocol eTraining modules and assessment tests on the GLOBE Website as approved by their CCs. CCS increasingly have been employing a hybrid approach to teacher training, with teachers completing some eTraining modules prior to a training workshop and then completing additional modules after the completion of the workshop.

Trainer training: It is important to have GLOBE Trainers leading GLOBE workshops who are knowledgeable in the GLOBE program with a firm understanding of protocols, procedures, quality of data being collected and recorded, and who can guide teachers how to implement GLOBE in their educational setting. These GLOBE Trainers must be able to educate as well as support teachers to ensure GLOBE protocols are properly being conducted. Currently there are two certified types: GLOBE Trainers and GLOBE Mentor Trainers. The GLOBE Program has developed a GLOBE Trainer Process that provides opportunities for individuals worldwide to become GLOBE Trainers.

School implementation: Schools are expected to implement GLOBE protocols using instruments meeting GLOBE specifications and collect and report the data. The protocols and associated material science background information, learning activities, instrument specifications, and data entry forms and sheets, are included in the print (when available) and Web versions of the Teacher's Guide or in Supplements to the Guide.

Systems support: GLOBE maintains an archival database that serves as a repository for all data measurements (GLOBE Data Archive) and provides several methods for data entry as well as data visualization tools through the GLOBE Website.

Translated Materials: Many GLOBE materials have been translated into over 15 languages and can be found here. GLOBE welcomes translations of GLOBE materials; CCS should contact globehelp@ucar.edu for more information about translation approval.

The GLOBE Program's app, GLOBE Observer (GO): The app enables users to make environmental observations that complement NASA satellite observations to help scientists studying Earth and the global environment. Citizen Scientists in countries that have joined GLOBE can download and use the app to record data measurements for clouds, mosquitos, land cover, and trees. By using the app, they are joining the GLOBE community and

contributing important scientific data to NASA and GLOBE, their local community, and students and scientists worldwide.

GLOBE International STEM Network (GISN): The GLOBE International STEM Network (GISN) is the bridge connecting the researchers of today with those of tomorrow. An international coalition of science, technology, engineering, and mathematics (STEM) professionals, members of the GISN work to promote Earth science and education in schools and classrooms. These professionals can act as student mentors for research projects, volunteer as judges for school and virtual science fairs, or serve in other educational capacities with students, teachers, and STEM professionals.

GISN members mentor students and teachers, present scientific ideas, and/or collaborate on scientific research. Each relationship between a STEM member and a GLOBE school is unique and is determined between them. This relationship can be established in different ways. Here are a few reasons why STEM professionals participate in GLOBE:

Mentor and Inspire: GISN member working with GLOBE have a strong desire to mentor and inspire young minds by interacting with the next generation.

Education and Community Outreach: The GLOBE Program offers an ideal means to partner science and education. The hands-on nature of GLOBE allows students to become involved in authentic scientific research. Since GLOBE relies on a network of partners to implement the program, it is possible to find partners eager to work with scientists' projects or to become partners themselves. These partnerships involve a variety of groups such as satellite missions, university departments, zoos, science centers, and museums.

Research Quality Data: All data are collected following scientifically valid protocols, and research scientists work to ensure the accuracy and consistency of all measurements. All data reporters have already undergone or will undergo protocol training.

Spatial and Temporal Coverage: GLOBE has a scientific database extending over 25 years with data in most Earth system science research areas that can be used to supplement standard research data. As of 2022, over 220 million environmental measurements have been collected by students around the world.

Field Campaigns: GLOBE students can collect data related to scientists' research expanding their observation network. GLOBE students are currently partnering with several NASA Earth science satellite missions and providing measurement data to the missions.

Contribute to Science Education: GLOBE students want to be a part of real world, cutting edge science that matters to them, their community and scientists. GISN members contribute to science education in a unique way that can have a lasting impression on student interest in science as well as scientific literacy.

International Reach: The international nature of GLOBE provides a unique opportunity for GISN members to add an international, or even global, component to their research.

Name Recognition: Established in 1994, GLOBE is an internationally recognized and respected program in the realm of science education.

3. International Virtual Science Symposium (IVSS)

The International Virtual Science Symposium (IVSS) provides students with the chance to share their research, discuss that research with their peers, earn virtual badges, and receive feedback from a team of STEM professionals. An annual, GLOBE-organized event, the IVSS is hosted entirely online and is open to students from around the world. Each event focuses on a new theme, fostering a wide variety of student-led research from year to year.

Students share their projects with the IVSS team by submitting them through the student report upload tool on the Student Research Reports page. If students are having trouble figuring out where to start with their research, they can check out walkthroughs that can help guide them through the steps in the scientific process and the research report format.

Students can also browse firsthand accounts from GLOBE students on our student blog page. They will discover how IVSS alumni navigated the submission process and learn more about the important lessons they learned along the way.

To see what students have worked on in the past, check out previous GLOBE symposia. You can also view our collection of IVSS statistics to find out more about participating countries across the globe.

In addition to the IVSS, there are regional and local events that are held to encourage students to use GLOBE data in research on their local environment. For example, in the Near East and North Africa region, student competitions have been held during Earth Day events and Regional Meetings, Croatia organizes annual student competitions, and Student Research Symposia are held in the U.S.

Section 3: Science

Section 3: Science

This Country Coordinator Implementation Guide has been developed as a resource guide to assist GLOBE Country Coordinators in the operations and implementation of The GLOBE Program in their countries. Section 3: Science contains:

1. Summary of GLOBE Science Spheres and Protocols
2. Protocol Deactivation and New Protocol Processes
3. Science Objectives and Use of GLOBE Data
4. GLOBE's Approach to Ensuring Data Quality
5. Measurements and Instruments
6. Instrument Specifications and Suppliers
7. GLOBE International Science Network (GISN)
8. Science Opportunities

1. Summary of GLOBE Science Spheres and Protocols

The GLOBE Program provides protocols developed by the scientific community and specifications for the instruments required to take environmental measurements in the following scientific discipline areas: Atmosphere (Atmosphere Investigation Area), Biosphere (Land Cover/Biology Investigation Area), Hydrosphere (Hydrology Investigation Area), Pedosphere (Soil Investigation Area). To gain a better understanding of how the Earth works as a unified system, groups of protocols, called bundles, have been assembled by the Science Working Group to promote understanding of how the Atmosphere, Biosphere, Hydrosphere, and Pedosphere together form an interconnected system with many interactions.

The GLOBE Program supports students, teachers and scientists to collaborate on inquiry-based investigations of the environment and the Earth system, working in close partnership with two U.S. agencies: the National Aeronautic and Space Administration (NASA) and their Earth science missions and the National Science Foundation (NSF). This gives the entire GLOBE community access to professional scientists around the world and exposes students to programs that are on the cutting edge of Earth system science research. GLOBE promotes focused activities and campaigns around the NASA Earth science missions and has established the GLOBE International STEM Network (GISN), an international network of scientists and other STEM professionals that work with GLOBE students around the world conducting science.

Globe Science Protocols

Earth is a complex, dynamic system we do not yet fully understand. Our planet is changing on all time and space scales, and GLOBE hopes to engage students in exploring Earth systems locally, regionally, and globally to contribute to understanding Earth system interactions. We

need to understand the Earth's spheres as a single connected system. GLOBE protocols fall within four spheres, and GLOBE Protocol Bundles have been assembled to understand how they together form an interconnected system (Earth as a System).

1. **Atmosphere:** Explore different aspects of our planet's weather and climate
   - Students monitor atmospheric conditions every day. All measurements may be taken at an appropriate study site adjacent to the school. Many measurements are taken within one hour of local solar noon, although some measurements may be taken at other times throughout the day. Instruments that measure daily high, low, and current temperatures and amounts of precipitation can be installed at the study site. Other instruments may be brought to the study site as needed, and other instruments are used in the classroom.
2. **Biosphere:** Explore cycles of plant life
   - Students assess the land cover of a 15 km by 15 km area (their GLOBE Study Site) centered at or near their school. Ultimately, they track changes to land cover over time by comparing ground-based measurements to satellite imagery data acquired in different years.
3. **Hydrosphere:** Explore water properties including impacts on animal life (mosquitos and macroinvertebrates)
   - For all protocols except freshwater macroinvertebrates, students take weekly measurements of surface water properties at a near-by water body (river, stream, bay, ocean, lake, pond, etc.) that serves as their hydrology study site. Students may also collect data about the types and abundances of freshwater Macroinvertebrates, marine invertebrates and mosquitoes.
4. **Pedosphere (Soil):** Explore soil physical and chemical properties
   - Students measure soil moisture and temperature at a study site near their school. Students characterize the top meter of soil at this and other sample sites, use an infiltrometer to measure the rate at which water soaks into the soil and a frost tube that provides climate information about frozen soils.
5. **Earth as a System:** Understanding how the Atmosphere, Biosphere, Hydrosphere, and Pedosphere together form an interconnected system with many interactions. Figuring how each sphere interacts with one another allows us to make more accurate predictions within each individual sphere.
   - To study Earth as a System, GLOBE Protocol Bundles have been assembled to investigate system interactions more holistically by measuring various interactions in the local community. Students explore bundles like the Agriculture Bundle, Air Quality Bundle, ENSO Protocol Bundle, Mosquito Protocol Bundle, Ocean Bundle, Rivers and Lakes Protocol Bundle, Soil Bundle, Urban Protocol Bundle, Water Cycle Bundle, Water Quality Bundle, and Weather Bundle.

You can find the GLOBE Science Protocols and Bundles on the GLOBE Website.

Location

Summary: At all sites where GLOBE measurements are taken, the latitude, longitude, and elevation are determined to within 30 meters.

Description: Students determine latitude, longitude, and elevation using hand-held Global Positioning System (GPS) receivers.

Instrument: GPS receiver

2. Protocol Deactivation and New Protocol Process

The objective of deactivating protocols is to conserve financial resources and help focus community efforts on a slightly narrower set of protocols that best meet the community's needs. The Science Working Group (SWG) evaluated existing protocols to determine if any should be deactivated. SWG developed criteria based on science, education, implementation, and society (environmental awareness) criterion. They then assessed each protocol against these criteria, presented initial results at the 2020 GLOBE Annual Meeting, gathered perspectives during a community comment period, revised their findings, and documented their recommendations.

The process for deactivation includes 1) clear community notification, 2) removal of data entry options for deactivated protocols (and associated maintenance in DIS and for data retrieval options), and 3) a way to keep the deactivated protocols and datasets on the GLOBE Website so that they are available to the community. Deactivation does not need to be permanent—GLOBE can update and reactivate them if it is in the community's best interest.

The following protocols are planned to be deactivated and are marked by asterisks in this document: Surface ozone, lilac phenology, ruby throated hummingbird, mosquito larvae (in Teacher's Guide), soil moisture sensor, and optional salinity titration.

The SWG currently is reviewing and updating the "Guidelines for Proposing New GLOBE Measurement Protocols."

3. Science Objectives and Use of GLOBE Data

The table below was generated earlier in the program to list some of the ways in which GLOBE student data have been used by previous Principal Investigators (PIs) or could be used by future PIs as well as scientists external to GLOBE. Additionally, environmental data almost always have additional uses beyond those originally planned. Some of these uses arise long after the data are collected. Therefore, taking Earth science data has both current and future value.

GIO plans to update this table to reflect the current sphere groups and include all current protocols.

INVESTIGATION	PURPOSES OF DATA
Atmosphere	Help scientists improve weather forecasting, predictions of climate change, and interpretation of satellite observations.
Aerosol	• Provide calibrated ground-based observations to help assess the performance of space-based instruments and to fill in the global views of aerosol distributions provided by satellite remote sensing; • Detect the presence of dust, smoke, soil particles, and other aerosols and help scientists track their movement around the world.
Air Temperature, Liquid and Solid Precipitation, and Relative Humidity	• Provide a denser network of observations than is available using only official weather stations; • Provide finer resolution data crucial for investigating localized variations (e.g., urban heat islands, microclimates); • Augment data needed for regional forecasts and climate records in areas of the world where there are few official weather stations.
Clouds and Contrails	• Help tie new measurements of clouds by automated sensors to long-term historical data records of ground-based observations; • Help to identify cloud type more accurately than is possible by remote sensing; • Contribute to determination of how cloud climatology may be changing (a major issue in assessing climate change); • Contribute to improved interpretation of satellite observations of Earth's radiative balance; • Provide one of the only sources of ground-based observations of contrails, which are challenging to detect by remote sensing due to their small width.
Combined Atmosphere, Surface, & Soil Temperature	• Help scientists calculate the rate of heat exchange between the atmosphere and the soil, and the potential for decomposition and soil weathering (see also entries for Atmosphere Temperature & Soil Temperature).
**Ozone	• Identify areas of high and low ozone concentrations and the times of year and weather conditions when they occur; • Help scientists interpret satellite observations of tropospheric ozone; • Provide quantitative measurements of ozone to help local agencies determine the extent of widespread pollution episodes.
UV-A	• Provide calibrated ground-based observations to help assess the performance of space-based instruments and to fill in the global views of UV distributions provided by satellite remote sensing; • Provide time series and high spatial density views of the effects of clouds on the distribution of UV-A radiation on the ground.
Water Vapor	• Provide calibrated ground-based observations to help assess the performance of space-based instruments and to fill in the global views of water vapor distributions provided by satellite remote sensing; • Provide time series of water vapor to supplement non- geosynchronous space-based observations, especially in places where other ground-based instrumentation does not exist.

INVESTIGATION	PURPOSES OF DATA
Biosphere	Help scientists study the terrestrial components of the energy, water, carbon, nitrogen, and other cycles of the Earth system. Help in the understanding of local climate and watersheds.
Biometry	• Help scientists determine the amount of biomass present; • Help validate land cover classifications of sample sites.
Change	Determine land cover change in support of the study of changes in local climate, watersheds, and the cycles of the Earth system.
Fire Fuel: Fuel loadings	• Determine the spread rate and intensity of wildland fires; Calculate the amount of smoke emissions from the fire; • Compute the amount of carbon added to the atmosphere due to a fire; • Calculate the carbon reserves in the dead biomass.
Fire Fuel: Fuel characteristics	• Calculate fuel consumption and soil heating; • Estimate habitat for organisms depended on coarse woody debris; • Compute tree mortality from fire.
Mapping	Guide systematic observation of land cover classification.
Sample Site	Classify land cover for comparison with maps derived from satellite remote sensing.

INVESTIGATION	PURPOSES OF DATA
Hydrosphere	Improve the monitoring of surface waters both inland and along the coasts of oceans and seas.
Transparency	Determine how far light can penetrate the water and support the growth of algae and submerged aquatic vegetation.
Alkalinity	Help determine the vulnerability of fresh waters to changes in pH from inputs of acidity.
Conductivity	• Determine the overall loading of salts and other compounds dissolved in freshwater; • Help determine the usability of fresh water for different purposes.
Dissolved Oxygen	• Determine what animals can live in the water; • Help scientists determine the mixing of air and water at the water's surface.
Freshwater Macroinvertebrates	• Help determine the biodiversity of a freshwater ecosystem; • Help scientists determine the overall state of a water body.
Marine Invertebrates	• Help determine the biodiversity of coastal beach ecosystems; • Help determine the overall state of coastal beach ecosystems; • Test the hypothesis that the distributions of marine animals will change with climate change.
Nitrates	• Help scientists determine the potential uses of water; • Help determine the effects of inputs of nutrients from surrounding areas on a water body.

INVESTIGATION	PURPOSES OF DATA
pH	• Help scientists determine what can live in the water, both animals and plants; • Track the mixing of waters in estuaries and along coasts; • Help scientists relate water quality to surrounding soil and geology and to the pH of rain and snow melt.
Salinity	• Track the mixing and source of waters in estuaries and along coasts; • Help track the state of saline inland waters.
Temperature	• Determine the overturning of lakes; • Track the mixing of waters in estuaries and along coasts; • Help determine evaporation rates; • Help scientists determine what can live in the water.

INVESTIGATION	PURPOSES OF DATA
Phenology	Help scientists detect the nature and extent of climate change and its effects on plants and animals.
Arctic Bird Migration	Determine changes in Arctic bird migration as both an indicator and response to global and regional climate changes.
Green-up, Green-down Budburst, **Lilacs, Phenological Gardens	• Delineate the length, start and end of the growing season; • Help scientists interpret satellite observations of greenness.
**Hummingbirds	Determine changes in hummingbird migration as both an indicator and response to climate changes and land cover.
Seaweed Reproduction Phenology	Determine changes in seaweed reproduction as both an indicatorand response to climate changes.

INVESTIGATION	PURPOSES OF DATA
Pedosphere (Soil)	Help scientists understand soils and how they function, change, and affect other parts of the ecosystem, such as climate, vegetation and hydrology.
Bulk Density	• Help in the interpretation of soil temperature and moisture measurements; • Help determine soil porosity (volume of empty space for air and water) in combination with Particle Density; • Provide some indication of mineral versus organic content of soils; • Help understand the ability of roots or organisms to penetrate the soil horizon.

INVESTIGATION	PURPOSES OF DATA
Field Characterization (structure, color, consistence, texture, and the presence of rocks, roots, & carbonates)	• Help scientists create soil maps; • Help track the global carbon cycle; • Provide information for interpretation of soil temperature and moisture measurements; • Help to interpret the history of the soil; • Provide information to determine the appropriate uses of a soil.
Fertility	• Indicate the suitability of the soil for supporting growth of crops and other plant life; • Provide indication of nitrate and phosphate inputs to water bodies.
Moisture	• Help track the water cycle in the Earth system; • Help determine the times of plant sprouting and growth; • Help scientists improve weather and climate prediction; • Help understand the potential for decomposition and weathering of soil; • Compare with existing models and data sets for validation and for local detail.
Particle Density	• Help determine soil porosity (volume of empty space for air and water) in combination with Bulk Density; • Provide some indication of mineral versus organic content of soils; • Help in the interpretation of soil temperature and moisture measurements.
Particle Size Distribution	• Determine the mixture of sand, silt, and clay particles in soil; • Provide information to help determine the appropriate uses of a soil; • Provide information for interpretation of soil temperature and moisture measurements. • Provide critical information for mathematical modeling of water, energy, and carbon dynamics in soils.
pH	• Help determine what can grow in the soil; • Help determine the effect on the pH of water flowing through soil; • Give insight into other chemical properties in the soil.
Temperature	• Provide new data for tracking climate and annual cycles; • Help scientists determine times of insect emergence and plant sprouting; • Help determine heat transport in near-surface soil; • Help understand the potential for decomposition and weathering of soil; • Help scientists monitor the energy balance of the Earth system.

4. GLOBE's Approach to Ensuring Data Quality

Training

GLOBE requires training to ensure quality and consistency in data collection.

Teacher training

GLOBE teachers are trained to understand and implement the protocols through workshops or other training forums. The training is held in a person-to-person format and involves hands-on conduct of the protocol by the trainee. Training is delivered by GLOBE Trainers. Teachers can also complete required online protocol eTraining modules and assessment tests

on the GLOBE Website as approved by their Country Coordinators (CCs). CCs increasingly have been employing a hybrid approach to teacher training, with teachers completing some eTraining modules prior to a training workshop and then completing additional eTraining modules after the completion of the workshop.

Trainer training

It is important to have GLOBE Trainers leading GLOBE workshops who are knowledgeable in The GLOBE Program with a firm understanding of protocols, procedures, quality of data being collected and recorded, and who can guide teachers in how to implement GLOBE in their educational setting. These GLOBE Trainers must be able to educate as well as support teachers to ensure GLOBE protocols are conducted properly. Currently there are two certified types: GLOBE Trainers and GLOBE Mentor Trainers. The GLOBE Program has developed a GLOBE Trainer Process that provides opportunities for individuals worldwide to become GLOBE Trainers.

Best Practices Guides

In addition to training, written step-by-step instructions are given in the Teacher's Guide for each science protocol, providing rigorous guidance on best practices for making observations. The science protocols are intended to be implemented as instructed, using instruments that meet certain specifications in order to ensure data accuracy worldwide. A list of instruments as well as instrument suppliers are available below in number 5 and 6.

Completeness

A measurement must contain all required elements before it can be submitted and stored in the GLOBE database.

Range and Logic Checks

Observations submitted to GLOBE must pass range and logic checks before the data are allowed in the database. Future time cannot be entered and minimum values cannot be greater than maximum values. Instant feedback is provided at the time of data entry to indicate if the value(s) pass checks and likewise will be stored in the GLOBE database. For example, the enforced maximum value for dark voltage in the aerosol protocol is 0.02. If a GLOBE participant tries to enter a value of 0.03, which exceeds the maximum allowed value, they will get an error message and not be allowed to submit the data. The data entry form does not default to a value (e.g., 0.02) when an error message is triggered; a valid data value must be entered by the participant in order to submit correctly to the database.

Location Data

Location data has become more accurate over time. From 1995-2014, GLOBE members had two options to enter the latitude and longitude coordinates associated with their measurement site: (1) GPS or (2) other. The "other" category includes techniques such as

estimating latitude and longitude coordinates from a map. Not all techniques categorized as "other" are known. GLOBE requested five decimal places for all reported latitude and longitude coordinates to achieve high and consistent spatial accuracy. Four significant digits after the decimal place implies 100-meter accuracy; five digits implies 5-meter accuracy. After 2014, GPS is the standard for obtaining latitude and longitude coordinates. When the GLOBE data entry app was used, the measurement is associated with the user's GLOBE site's latitude and longitude.

When using The GLOBE Program's app, GLOBE Observer (described in Section 5: Technology), a person's location is automatically located on a map. The Land Cover and Trees tools in the app have a button users can press to refresh their automatic GPS location (via their cellular device) to potentially improve the location accuracy. If users judge that their device places their location incorrectly as indicated by a red pin on the map, users have the option to manually adjust their location on the map.

Photograph Approval

Photographs submitted through The GLOBE Program's app, GLOBE Observer are screened automatically before being added to the public GLOBE database. Photographs containing inappropriate content, faces, or personally identifiable information (e.g., automobile license plate numbers) are removed or blurred.

5. Measurements and Instruments

GLOBE environmental measurements are categorized into four study areas: Atmosphere, Biosphere, Hydrosphere and Pedosphere (Soil).

The following pages summarize the current specifications for the required instruments for the protocols listed. The GLOBE measurements and instruments are differentiated by skill level. The Instrument Landing page, www.globe.gov/en/do-globe/research-resources/globe-equipment, allows the user to explore all the instruments associated with each sphere.

This information can also be found on the GLOBE Website at www.globe.gov/sda/tg/toolkit.pdf. The Science Working Group is currently updating the instrumentation information in this document.

MEASUREMENT	INSTRUMENT	SKILL LEVEL
ATMOSPHERE		
Aerosols	Sun photometer, digital voltmeter	Middle, Secondary
Air Temperature Maximum/ Minimum & Current	Maximum/Minimum thermometer, Calibration thermometer, Instrument shelter	All
Automated Weather Station Protocols	Weather station with a data logger attached to a suitable computer, calibration thermometer, rain gauge	Middle, Secondary

MEASUREMENT	INSTRUMENT	SKILL LEVEL
Digital Multi-day Maximum/ Minimum Air & Soil Temperatures Protocol	Digital multi-day maximum/minimum thermometer, calibration thermometer, soil thermometer, instrument shelter	All
Barometric Pressure	Aneroid barometer or altimeter or digital barometer	All
Cloud Cover and Contrails/Type	Cloud chart	All
Precipitation, Liquid	Rain gauge	All
Precipitation, Solid	Snow board, Rain gauge, Snow depth pole	All
Precipitation pH	pH indicator paper	Primary
	pH meter, three pH buffers (7, 4, and 10)	Secondary
Relative Humidity	Digital hygrometer, Thermometer (calibration or maximum/minimum)	All
	Sling psychrometer, instrument shelter, calibration thermometer	All
Surface Temperature	Infrared thermometer (IRT)	Middle,
**Surface Ozone	Ozone test strip scanner, ozone chemical test strips, ozone measurement station, sealable bags, wind direction device	All
Water Vapor	GLOBE/GIFTS Water Vapor Instrument	Middle, Secondary

MEASUREMENT	INSTRUMENT	SKILL LEVEL
BIOSPHERE		
Biometry Canopy Cover Ground Cover Tree Circumference Tree Height	Clinometer and densiometer (both may be student- made), 50m tape measure	All
Biometry Grass Biomass	Drying oven (plants)	All
Land Cover Mapping	Remote sensing image, MultiSpec software	All
Species Identification	Dichotomous keys	All
Budburst	Local plant identification guide	All
Green-Up	Local plant identification guide, compass, camera, mm ruler	All

MEASUREMENT	INSTRUMENT	SKILL LEVEL
Green-Down	Local plant identification guide, compass, camera, GLOBE Plant Color Guide	All
Latitude and Longitude of study sites	Smartphone	All

MEASUREMENT	INSTRUMENT	SKILL LEVEL
HYDROSPHERE		
Alkalinity	Water Alkalinity kit	Middle, Secondary
Dissolved Oxygen	Dissolved oxygen kit	Middle, Secondary
Electrical Conductivity—Fresh Water Sites Only	Total dissolved solids (conductivity) tester, calibration solution	All
Freshwater Macroinvertebrates	Latex gloves, clear plastic jars, small plastic vials, plastic squirt or spray bottles, 20 mL bulb, basting syringes, eyedroppers, plastic or metal forceps, magnifying glasses or loupes, 5 L white buckets, white trays, sub-sampling tray, 0.5 mm sieve (or smaller), sieve between 2-5 mm, locally applicable macroinvertebrate identification keys, specimen bottles with preservation solution (70% ethanol) and tight lids (optional), 1 x 1 m quadrat (optional)	Middle, Secondary
Nitrate	Water Nitrate kit	Middle, Secondary
Salinity—Brackish and Salt Water Sites	Hydrometer, 500 mL clear plastic graduated cylinder, organic liquid-filled thermometer	All
Salinity Titration Method—Brackish and Saltwater Sites	Salinity kit	Middle, Secondary
Transparency—Deep Water Sites Only	Secchi Disk, 5 m rope	All
Transparency—Surface Water	Turbidity tube	All
Water pH	pH indicator paper	Primary
	pH meter, three pH buffers (7, 4, and 10)	Middle, Secondary
Water Temperature	Organic liquid-filled thermometer	All

MEASUREMENT	INSTRUMENT	SKILL LEVEL
PEDOSPHERE (SOIL)		
Automated Soil Moisture and Temperature Station Protocols	Soil Moisture/ Temperature Station attached to a weather station with a data logger attached to a computer, Calibration thermometer	Middle, Secondary
Automated Soil and Air Monitoring Protocol	4-Channel data logger and software, 1 Air temperature sensor, 3 soil temperature sensors, data logger-to-computer interface cable, watertight box, Desiccant, Instrument shelter	Middle, Secondary
Bulk Density	Metal sampling cans or other containers, drying oven, graduated cylinder, sieve	All
Digital Multi-Day Soil Temperatures Protocol	Digital Multi-day Maximum/Minimum thermometer, Calibration thermometer, Soil thermometer	All
Infiltration	Dual ring infiltrometer	All
Particle Size Distribution	500 mL graduated cylinders, soil dispersing reagent (Sodium Hexametaphosphate), 250 mL or larger containers, thermometer, 100 mL graduated cylinder, meter stick	
pH	pH paper or meter and pH buffers, 100 mL beaker, balance	
Soil Characterization—Field Slope, Horizon Depth, Structure, Color, Consistence, Texture, Carbonates	Clinometer, camera, meter stick, color chart, sample cans, other containers, shovel or auger	All
Soil Fertility	Soil NPK kit	
Soil Moisture	Balance, Meter stick, Drying oven (soils), Sample Cans Other soil containers, Auger (depth sampling), 50 m tape measure (transect)	All
Soil Moisture Meter	Soil moisture meter, soil moisture sensors, Gypsum block, PVC piping	Secondary
Soil Particle Density	100 mL volumetric or Erlenmeyer flask with stoppers, heat source, thermometer, balance	All
Soil Temperature	Soil thermometer	All

6. Instrument Specifications and Suppliers

Specifications

All GLOBE instrument specifications represent the minimum specifications necessary to collect scientifically valid data. GLOBE schools may use instruments that meet or exceed these specifications. For example, the GLOBE specifications for pH paper call for a range of 2 to 9 pH units. A pH paper with a range of 1 to 14 exceeds specifications and may be used

by GLOBE schools. GLOBE instrument specifications can also be found in the GLOBE Teacher's Guide (Pages 12 through 24) at: www.globe.gov/sda/tg/toolkit.pdf.

CCs are responsible for finding instruments that meet the minimum specifications necessary for data collection.

The GLOBE Implementation Office (GIO) has sent the GLOBE Instrument Specifications to potential instrument suppliers. A number of suppliers have provided information sheets with catalog/ordering numbers and prices of items which they offer, and which the suppliers state meet GLOBE specifications. This information is available on the GLOBE Website in the "Resource Room" under the "Scientific Instrument and Equipment Suppliers" link or at: www.globe.gov/fsl/html/templ.cgi?inst_suppliers&lang=en&nav=1

The GLOBE Program does not endorse any of these suppliers but hopes that this information will assist GLOBE schools in the purchase of instruments needed to participate in the program. Prices and other information from the suppliers may change, so it is important to contact any supplier for the latest information prior to ordering instruments.

Regional Equipment Suppliers links are also available.

- Africa
- Asia and Pacific
- Europe and Eurasia
- Latin America and Caribbean
- Near East and North Africa
- North America

CCs should notify GIO of any local or regional equipment suppliers that they or their teachers have used or recommend in the purchasing of GLOBE equipment. It is assumed that the equipment offered by these regional equipment suppliers meets GLOBE instrument specifications.

7. GLOBE International STEM Network (GISN)

The GLOBE International STEM Network (GISN) is the bridge connecting the researchers of today with those of tomorrow. An international coalition of science, technology, engineering, and mathematics (STEM) professionals, members of the GISN work to promote Earth science and education in schools and classrooms. These professionals can act as student mentors for research projects, volunteer as judges for school and virtual science fairs, or serve in other educational relationships with students, teachers, and STEM professionals.

Scientists in the GISN mentor students and teachers, present scientific ideas, and/or collaborate on scientific research. Each relationship between a scientist and a GLOBE school is unique and is determined by the scientist and the school. This relationship can be established in different ways. Here are a few reasons why scientists participate in GLOBE:

Mentor and Inspire: Scientists working with GLOBE have a strong desire to mentor and inspire young minds by interacting with the next generation.

Education and Community Outreach: The GLOBE Program offers an ideal means to partner science and education. The hands-on nature of GLOBE allows students to become involved in authentic scientific research. Since GLOBE relies on a network of partners to implement the program, it is possible to find partners eager to work with scientists' projects or to become partner themselves. These partnerships involve a variety of groups such as satellite missions, university departments, zoos, science centers and museums.

Research Quality Data: All data are collected following scientifically valid protocols, and research scientists work to ensure the accuracy of all measurements. All data reporters have undergone first-hand training.

Spatial and Temporal Coverage: GLOBE has a scientific database extending over 25 years with data in most Earth system science research areas that can be used to supplement standard research data. As of 2022, over 220 million environmental measurements have been collected by students around the world.

Field Campaigns: GLOBE students can collect data related to scientists' research expanding their observation network. For example, GLOBE students have partnered with several NASA Earth science satellite missions to provide measurement data to the missions.

Contribute to Science Education: GLOBE students want to be a part of real world, cutting edge science that matters to them, their community and scientists. GLOBE scientists contribute to science education in a unique way that can have a lasting impression on student interest in science as well as scientific literacy.

International Reach: The international nature of GLOBE provides a unique opportunity for scientists to add an international, or even global, component to their research.

Name Recognition: Established in 1994, GLOBE is an internationally recognized and respected program in the realm of science education.

Ways Scientists Can Participate in GISN

Each relationship with a GLOBE student is unique and is set by the scientist and school. GISN members are mentors and role models for students**,** and scientists participate at a level that is appropriate to their skills, resources, availability, and interest.

Inspire:

This "Inspire" level of involvement in GLOBE is typically incidental to a scientist's regular work and may fulfill outreach requirements of the scientist's employment. Options under this level include:

- Visit a GLOBE school to do an activity
- Write blogs about science topics and experience related to GLOBE and their field of expertise on the GLOBE Blog
- Judge GLOBE International Virtual Science Symposium projects
- Judge local, in-person GLOBE science fairs

Engage:

The "Engage" level of involvement in GLOBE involves a sustained effort in the network. The scientist is expected to secure institutional support for this level of involvement or to be self-supported. Options under this level include:

- Partner with a GLOBE teacher or school
- Use GLOBE data in their research

Educate:

The "Educate" level of involvement in GLOBE involves the scientist taking an initiative toward a dedicated effort that will promote learning among the GLOBE community. Support for this level of involvement is expected from an institution or organization that is sponsoring a student science fair or from a GLOBE Partner. Options under this level include:

- Sponsor a GLOBE student science fair
- Affiliate with a GLOBE Partner
- Become a GLOBE Trainer

Lead:

The "Lead" level of involvement in GLOBE will require significant interactions with GLOBE management at the country and international levels consistent with sponsorship arrangements. Support for this level is expected to come through grants made in response to proposals; the sponsors of GLOBE may occasionally or periodically solicit such proposals. Support for this level also may be a significant component of the engagement and public outreach activity of a science mission or institution and supported as part of a partnership agreement with GLOBE. This will include reporting requirements. Options under this level include:

- Assume responsibility for a GLOBE protocol (Guidelines for Proposing New Protocols)
- Involve GLOBE teachers and students in scientific research
- Assume responsibilities for GLOBE student research campaigns or Intensive Observation Periods (Guidelines for Proposing a New Campaign or IOP)
- Become a GLOBE Partner

8. Science Opportunities

Research Process

GLOBE provides students the opportunity to participate in the scientific research process and provides details on the nine steps in the scientific process and the GLOBE Science Process.

GLOBE Student Research Campaigns and Intensive Observation Periods

GLOBE has active field measurement Student Research Campaigns and Intensive Observation Periods (IOPs) where students, teachers, and scientists around the world can collaborate. Available at country, regional and global scales, GLOBE hosts a variety of different initiatives to foster cooperation between the GLOBE community and professional

scientists. All GLOBE Campaigns and IOPs take an inquiry-based approach to research that emphasizes hands-on learning and authentic science experiences.

Find more information about our current GLOBE Measurement Campaigns and IOPs Website.

Details on proposing a new Campaign or IOP are located here. GLOBE accommodates two to three Global Measurement Student Research Campaigns or IOPs per year, while it is up to the country and/or region in accommodating Campaigns and IOPs on the country or regional level.

NASA Earth Science Satellite Mission Connections

GLOBE also provides opportunities for students to participate in GLOBE Campaigns and IOPs related to NASA Earth science satellite missions. Following are some examples of how GLOBE has collaborated with satellite missions. Please look here for current satellite mission collaborations.

Geostationary Operational Environmental Satellites—R Series (GOES-R)

The Geostationary Operational Environmental Satellites—R Series (GOES-R) is the next generation of geostationary Earth-observing systems. The advanced spacecraft and instrument technology employed by the GOES-R series provide significant improvements in the detection and observations of environmental phenomena that directly affect public safety and protection of property. The GOES-R program is a collaborative development and acquisition effort between the National Oceanic and Atmospheric Administration (NOAA) and the National Aeronautics and Space Administration (NASA).

Soil Moisture Active Passive Mission (SMAP)

The NASA Soil Moisture Active Passive (SMAP) Mission provides measurements of soil moisture and freeze/thaw state. The SMAP Mission produces daily maps of soil moisture with global coverage every three days.

The SMAP team is looking for GLOBE Program students to take measurements at their schools. Students can compare remotely sensed SMAP data to the actual soil moisture data they collect at their school locations.

CloudSat

Clouds influence Earth's weather and climate. They bring water from the air to the ground and from one region of the globe to another. Clouds also have a large impact on Earth's radiation budget; even small changes in cloud abundance or distribution could affect climate.

GLOBE students and teachers can collect and enter data that will be compared to CloudSat measurements. CloudSat, in turn, contributes Earth science learning opportunities to lifelong learners and shares the results of CloudSats scientific research mission to improve our understanding of clouds and global climate change.

Global Precipitation Measurement (GPM)

Water participates in many important natural chemical reactions and is a good solvent. Changing any part of the Earth system, such as the amount or type of vegetation in a region or from natural land cover to an impervious one, can affect the rest of the system. Rain and snow capture aerosols from the air. Acidic water slowly dissolves rocks, placing dissolved solids in water. Dissolved or suspended impurities determine water's chemical composition. Current measurement programs in many areas of the world cover only a few water bodies a few times during the year. GLOBE students provide valuable data to help fill these gaps and improve our understanding of Earth's natural waters.

CALIPSO

Aerosols, both natural and human-caused, can affect weather and climate. Launched on 28 April 2006 along with CloudSat, the Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observation (CALIPSO) satellite's mission is to study the role that clouds and aerosols play in regulating Earth's weather, climate and air quality. Both satellites fly in formation as a part of the international "A–Train" (Afternoon) constellation. CALIPSO is a collaborative NASA/CNES (Centre National D' Études Spatiales) satellite mission that uses lidar to profile the vertical distribution of clouds and aerosols to determine their role in the heating and/or cooling of Earth. CALIPSO and other A-Train satellites are substantially increasing our understanding of the climate system.

ICESat-2

The Ice, Cloud, and Land Elevation Satellite–2, or ICESat–2, will measure the height of a changing Earth, using technology that takes 10,000 laser pulse measurements per second. ICESat-2 will carry a photon-counting laser altimeter that will allow scientists to measure the elevation of trees, ice sheets, glaciers, and more.

The Trees Around the GLOBE campaign, launched in conjunction with ICESat-2, compares tree height data with ICESat-2 measurements. The tree height data can then be complemented with additional GLOBE protocol data for use in student research.

Section 4: Community

Section 4: Community

This Country Coordinator Implementation Guide has been developed as a resource guide to assist GLOBE Country Coordinators in the operations and implementation of The GLOBE Program in their countries. Section 4: Community contains:

1. GLOBE Regional Meetings
2. GLOBE Training and Support
3. GLOBE Teachers
4. GLOBE Trainers and Mentor Trainers
5. GLOBE Training Resources
6. Protocol eTraining
7. Training Workshop Site Requirements
8. Training Workshop Items Provided by Country Coordinators
9. GLOBE Teams
10. Sharing News, Events, Accomplishments and STEM Successes

1. GLOBE Regional Meetings

GLOBE Regional Meetings are held annually to provide an opportunity for Country Coordinators in the region to meet (with the region's Governance Board if present) to receive updates on the program, share best practices and develop annual strategic plans for the region, utilizing the GLOBE Strategic Plan as a reference point.

The Regional Coordination Office (RCO) works with the Host Country Coordinator (CC) on many aspects of the Regional Meeting (RM) ranging from the meeting theme and agenda to site requirements and in-country support of attendees. Following are the responsibilities of each party as well as the GLOBE Implementation Office (GIO).

Responsibilities of the Regional Coordination Office and Host Country Coordinator:

1. The RCO schedules dates and location for the RM by communicating with the Country Coordinators (CCs) in the region. Typically, the dates and location for the upcoming RM are finalized at the previous one.
2. The RCO with the Host CC identifies a local hotel for participants and visits the hotel site to ensure that the facility can accommodate the meeting:
    a. Obtain Room Block for estimated overnight guests
        i. Meeting Space
        ii. Wireless connection
        iii. Screen and projector
        iv. Microphones (if needed)

b. Catering (Food)

   i. Breakfast

   ii. Breaks

   iii. Lunch

   iv. Dinner

3. Invitations to attend the meeting are provided only to those CCs who have provided a Country Report, completed their annual GLOBE Partner Survey and met data reporting requirements.
4. The RCO with the Host CC organizes airport transfer for participants upon arrival and departure (airport pick up and return after event). It is recommended to hold the event at a hotel that provides transportation. If this is not available, the Host CC secures a plan for transportation to all attending the event.
5. The RCO sends an official letter of invitation, upon request, to all perspective participants as needed for travel permissions or visa purposes. These include a draft agenda, what to expect upon arrival at the airport, ground transportation information to/from the airport, local weather information, and information about any offsite events that may require special clothing. For supported participants, this letter will also include information about the level and amount of financial support the participant will receive.
6. The RCO with the Host CC invites appropriate national and/or regional dignitaries to attend opening/closing ceremonies as appropriate. The RCO also invites the ambassadors of the countries in the region located in the capital city of the host country of the event in order to raise awareness of the international impact of GLOBE.
7. The RCO with the Host CC obtains funding from local venues to cover expenses related to breaks, meals and transportation to and from meeting sites, if possible.
8. The RCO organizes all meeting logistics including round trip air travel (or rail travel) from the participant's home airport (or rail station), ground transportation, meeting room set ups and any covered meals/ breaks (all covered meals must take place during the meeting dates and must be considered an integral part of the meeting, i.e. working lunch. Working meals must include an agenda and participant list).
9. The RCO collaborates with the Host CC (and the Regional Governance Board if present) and the GIO to prepare the draft agenda, in consultation with the region's CCs, so that it can be finalized and distributed to participants no later than four weeks prior to the workshop.
10. The RCO ensures that all participants receive information at least one week before the event regarding hotels, contact information for country host and others to ensure transport upon arrival, as well as weather conditions, clothing and other logistical information such as currency rate, etc.

11. The RCO provides an opportunity for all participants to evaluate the event and share this information with the Host CC (and the Regional Governance Board if present) and the GIO.
12. The RCO designates a note-taker for the meeting. Notes from the meeting are sent to all meeting participants.
13. The RM includes discussions about efforts to build capacity in the region and does not spend time on lengthy report outs. The RCO distributes the Country Reports prior to the meeting to inform the CCs about GLOBE activities in the region.

Regional Meeting Site Location Requirements

1. A large room with seating at tables for all participants needs to be available exclusively for participants of the RM for the duration of the meeting.
2. Availability of breakfast/lunch/dinner options at or near the meeting hotel.
3. Availability of Internet access and/or computer station (such as a business center located in the hotel).
4. Projection capabilities including:
    a. A large screen or white wall for projection
    b. Over-head projector
    c. Flip chart on easel, and/or
    d. Blackboards (or whiteboards) for the indoor portions of the meeting
5. Other materials required for the meeting.
    a. Agenda
    b. Pens
    c. Pencils
    d. Paper
    e. Hand out information
    f. Presentation Information (Handouts)
    g. Name Badges

Virtual Annual Regional Meeting

When it is not possible to hold an in person meeting (as a result of a health crisis, conflict, etc.), a virtual annual GLOBE RM will be held in its place. While this means there is not travel to a country location for the meeting, all CC requirements should be completed and sent to the RCO by a specified date prior to the meeting. Meeting structure may be different with shorter days and different modes of content delivery.

Responsibilities of the GLOBE Implementation Office:

1. Facilitate U.S. Embassy involvement in the event as needed.
2. Assist with development of event agendas as needed.
3. Attend the meeting in person or virtually to update CCs on program developments.

2. GLOBE Training and Support

In supporting countries, GLOBE sees training as part of a continuum that begins before and continues after a CC completes Train-the-Trainer Training. Clearly, developing a qualified team of trainers is a major enabling step in the progress of virtually every country, but it is just one part. GLOBE training and support activities are broken down into three categories—initial support, training, and continuing support—to emphasize that the support starts immediately after a country joins GLOBE and continues indefinitely. Furthermore, it highlights that the training process is often an on-going process that may take place over a number of training events, and the relationship between CCs and their GLOBE trainers and teachers is also an ongoing relationship.

Welcome to GLOBE

Around the world, when new countries join GLOBE, they will be welcomed immediately and personally by the senior management of GLOBE, initiating the onboarding process:

- The NASA GLOBE Program Manager sends a letter to the Government Point of Contact (GPOC) welcoming him/her to The GLOBE Program. The welcome letter introduces the GIO Director and the GLOBE International Coordinator.
- The GLOBE International Coordinator arranges an onboarding call with the GPOC and CC to welcome them to The GLOBE Program; introduce the overall GLOBE organization, community, policies and regularly held events; and guide them in their first steps of launching the program in their country, including but not limited to available materials and resources, obtaining training and establishing their web presence on www.GLOBE.gov included below. GIO will introduce the Regional Coordinator in their region who will participate in the telecon.

1. Agenda for onboarding call
    a. Introductions
    b. Overview of GLOBE
        i. Organization—GIO, RCOs, GLOBE Working Groups (WGs)
        ii. Community—Roles and responsibilities of GPOCs and CCs; GLOBE International STEM Network (GISN)
        iii. Website and Data Information System—Website content and resources, country pages, accounts, partner implementation tools, and GIO/RCO training on these
        iv. Resources—protocols, educational materials, The GLOBE Program's app, GLOBE Observer
        v. Policies—translation, reproduction, use of GLOBE trademarks, etc.

vi. Meetings, events and measurement campaigns—Annual Meeting, Regional Meetings (RMs), GLOBE Learning Expedition (GLE), International Virtual Science Symposium (IVSS), current global and regional campaigns

vii. Trainer/Mentor Trainer process and training opportunities

viii. Country goals and objectives for GLOBE and implementation plans (GIO requests CC to develop a draft implementation plan for discussion at a second call)

c. GIO schedules a second call for CC to present the draft implementation plan and GIO to provide feedback

- GIO Communications announces new partnering countries to the GLOBE Community via the GLOBE newsletter, Website and/or other communications vehicles.

GLOBE Website and Data/Information System (DIS)

- DIS adds the new partnering countries to the appropriate web pages at www.GLOBE.gov with an approved flag (or other approved image), and the GIO Community Support Team (CST) adds the names of the designated points-of-contact (POCs).
- GIO CST communicates with the CCs of new countries and helps them to set up accounts on the Website. GIO CST also offers training opportunities so that the CCs and other program participants are fully familiar with the functionality and content available on the Website and can use it as a day-to-day tool for the implementation of GLOBE.

Community

- Following the GIO-arranged telecon, RCOs follow up with new CCs to provide information about the functions of the RCO and GLOBE activities in the region.
- RCOs introduce new CCs to the GLOBE Community in the region and put them in touch with other Partners in the region for mutual support.
- GIO Director and GLOBE International Coordinator help new CCs make contacts as appropriate with other GLOBE Partners who may have shared interests in various projects or activities.

Materials and Resources (covered in onboarding call and follow-on activities)

- GIO shows new CCs how and where to locate the GLOBE Teacher's Guide and its various components (e.g., protocols) online.
- GIO also informs them about the Elementary GLOBE books and the GLOBE Earth As a System poster and associated materials and where they can be found on the GLOBE Website.
- GIO informs them about The GLOBE Program's app, GLOBE Observer and where to locate it online.
- GIO informs new CCs about GLOBE instrument specifications, and RCOs identify possible instrument suppliers in their region.
- GIO explains the policies on translation, reproduction, other matters and the use of GLOBE trademarks.

GLOBE Meetings and Training (covered in onboarding call and follow-on activities)

- GIO informs new CCs of upcoming Annual and Regional Meetings, including the contact information of the organizers, and encourages them to begin early planning to secure funding and travel visas for one or more representatives to participate in these meetings which deliver training and best practice exchange for all who attend. CCs are responsible for all costs associated with their and/or their representatives' attendance at GLOBE Annual Meetings. GLOBE only provides some support for CCs' attendance at RMs.
- GIO introduces the GLOBE Train-the-Trainer model and the certification process.
- Following the onboarding call, RCOs work with new CCs to determine what initial training, including protocol training, is most beneficial for them to establish sufficient number of qualified trainers in the country to initiate or reinitiate GLOBE implementation. RCOs also work with them to arrange and implement in-person or virtual training sessions (at the country's expense) and invite them to other planned regional events or trainings, as appropriate.
- Once new CCs are ready to begin training teachers, RCOs will offer assistance to them for this initial training. RCOs can offer advice on workshop facilities, equipment, protocols to be trained, and possible approaches to implementing the Program in the school systems. Funding for these trainings is the country's responsibility. In the latter case, the RCOs will also suggest connections with other countries in the region.

GLOBE's goals for CCs are that they will recruit, train, and mentor – or provide continuing support—to schools in their target areas and that every GLOBE school they support will take and submit measurement data to the GLOBE database and submit GLOBE student research projects. CCs ensure that a new teacher is trained in a GLOBE school if its GLOBE teacher(s) leave so that GLOBE students can continue their activities under the guidance of a GLOBE-trained teacher. GLOBE also recognizes and supports country's goals for meeting their objectives for GLOBE: education, science, environment, technology, etc. Following training, GIO and RCOs continue to work with CCs to achieve these goals.

Furthermore, GIO, RCOs and the GLOBE team work with CCs to utilize, create, or modify existing tools and resources to enable them to manage their implementation aspects more efficiently. GIO will provide letters and acknowledgements as requested to assist them in building learning communities and strengthening local support for their GLOBE activities. GLOBE's communications tools such as the GIO Director's letters and videos, GIO News Briefs, RCO communications (calls, webinars and virtual meetings) and other information on the GLOBE Website, publications, and the structure of the Annual and Regional Meetings reflect the focus on providing continuous support to GLOBE countries.

Lastly, GIO worked closely with CCs and other members of the GLOBE Community to develop the GLOBE Strategic Plan 2018–2023. GIO assesses progress towards achieving strategic plan goals on an annual basis and more often if necessary to coordinate the GLOBE Community's mutual efforts for a successful program—locally and globall—and to celebrate the achievements of GLOBE participants as we all work in partnership to:

- Increase environmental awareness;

- Contribute to the scientific understanding of Earth; and
- Contribute to improved student achievement in science and mathematics.

3. GLOBE Teachers

All teachers will be recognized as part of the GLOBE family as soon as they begin their training with CCs. Accordingly, teachers will be recognized as GLOBE Teachers when CCs have trained them in any protocol or set of protocols. CCs may give them GLOBE Teacher certificates recognizing them as full members of GLOBE, or they may choose to present them with certificates customized to suit their needs. GLOBE Certificate Templates and instructions are available on the GLOBE Website for CCs to utilize.

4. GLOBE Trainers and Mentor Trainers

The GLOBE Program has a long history of building the capacity of its community by certifying GLOBE Trainers and Mentor Trainers. The result is a vibrant, growing community with members who are equipped to accomplish the mission and strategic goals of GLOBE [*Education Goals #2. GLOBE's capacity to deliver high quality professional learning experiences (trainings) has increased* (from GLOBE Strategic Plan 2018–2023)].

To accomplish this, it is important to have GLOBE Trainers leading GLOBE workshops who are knowledgeable in the GLOBE program with a firm understanding of protocols, procedures, quality of data being collected and recorded, and who can guide teachers how to implement GLOBE in their educational setting. These GLOBE Trainers must be able to educate as well as support teachers to ensure GLOBE protocols are properly being conducted. There are three types of GLOBE trainers:

- **Candidate Trainers** are individuals seeking accreditation to be a formal GLOBE Trainer. They must provide documentation of their competency in four critical areas: (1) Science, (2) Education, (3) Adult Learning, and (4) Knowledge of GLOBE. Candidate Trainers will work with a Mentor Trainer to lead a GLOBE Workshop under the guidance and supervision of this Mentor Trainer.
- **Candidate Mentor Trainers** are individuals seeking accreditation to be a formal Mentor Trainer to GLOBE Trainers. They must provide documentation of their competency in four critical areas: (1) Science, (2) Education, (3) Adult Learning, and (4) Knowledge of GLOBE. If possible, Candidate Mentor Trainers will work with a Mentor Trainer to assist Candidate Trainers in leading a GLOBE Workshop under the guidance and supervision of this Mentor Trainer.
- **Trainers (and Master Trainers)** are certified to train educators in various GLOBE scientific protocols, educational activities, and GLOBE science research process. GLOBE Trainers are the front line ambassadors from GLOBE to faculty and teachers from elementary through university and the general public. Please note: the terms Trainer and Master Trainer have been combined into one term, Trainer. The term Master Trainer will no longer be used.
- **Mentor Trainers** aid in advancing the community of Trainers by mentoring Candidate Trainers.

For more information on the certification process, please check the links below:

1. GLOBE Trainer and Mentor Trainer Qualifications and Certification Process
2. Candidate Trainer Application
3. Candidate Trainer Workshop Observation Form
4. Current Trainer Active Status Form
5. Candidate Mentor Trainer Application
6. Candidate Mentor Trainer Workshop Observation Form
7. Current Mentor Trainer Active Status Form
8. View List of Trainers on our World Map

5. GLOBE Training Resources

GLOBE provides video tutorials on managing training workshops (how to create workshops, sign up teachers, and recognize when training is complete). GLOBE Trainers have worked with GIO to develop training materials (Introduction to GLOBE, presentations on each of GLOBE's five spheres, student inquiry, implementation, sample agendas and workshop evaluation, and Website training materials). CCs can search for trainers here.

6. GLOBE Protocol eTraining

GLOBE has developed Protocol eTraining modules and assessment tests to supplement in-person GLOBE training and/or provide alternatives to attending a GLOBE training workshop.

7. GLOBE Training Workshop Requirements

This section outlines information on the requirements for organizing, coordinating and running a GLOBE training workshop on a number of levels from teachers to trainers, including responsibilities of the RCO, Mentor Trainers and Host CC.

Purpose of training

- To facilitate the pedagogical preparation necessary to ensure a successful GLOBE training event, resulting in successful teacher training events
- To provide a training opportunity for CCs to send Trainer Candidates, Mentor Trainer Candidates and/or teachers, provided they are able to obtain their own funding to support these individuals
- To provide an opportunity for the host country to train a large number of teachers (approximately 30) with the assistance of a Mentor Trainer and/or Trainer Team

Preparations for the Workshop

The RCO manages the following tasks in relation to a training event if it is held in conjunction with the Annual Regional Meeting.

Facilities

- Identify and provide the training facilities (see Site Requirements).
- Identify the computer laboratory where the technology-training component of the workshop will be held. In some cases, a room equipped with laptops or iPads will work. See description of computer needs in the Site Requirements below.

Trainers

- Work with the RCO and/or GIO to identify and recruit Mentor Trainers and Trainers to be included on the training team (taking into consideration the protocols and activities to be covered during the workshop, as well as the funding available to support expenses).
- Organize and communicate with the Regional Trainers and local assistants joining the training team to ensure a well-organized training event.

Equipment

- RCO requests Trainers to provide a list of all equipment and materials necessary for the protocols and activities they will be facilitating/training.
  - Trainers also provide a list of all equipment and materials which they can bring with them.
  - Host CC locates any equipment and material needs identified by Mentor Trainers (including those which Mentor Trainers have agreed to bring – as a back-up)
  - Host CC communicates any equipment and material needs (which they are unable to attain in-country) to the RCO; RCO will survey regional partners
  - If RCO and host CC are unable to locate certain equipment and materials, RCO communicates this information to GIO as soon as possible. As a last resort, if GIO representative(s) are attending regional meeting, it may be possible for them to transport or ship a small amount of equipment and/or materials.
- In the event that funding has been obtained to purchase equipment for the workshop, it is necessary to arrange for someone on the Training Team in the Host country to count/inventory all boxes when they arrive at the training site to ensure that the entire shipment is received. Each box should contain a packing list inside which should also be checked to confirm all contents have been included. Mentor Trainers, RCO, and GIO should be notified as soon as possible to confirm the status of the shipment's arrival.
- If funding has been obtained to provide workshop participants with instruments and/or training materials, the host partner is responsible for facilitating the purchase and shipment of these instruments and materials as well as distribution to the workshop participants. **NOTE: The GIO can assist the Host CC in the communication with U.S.-based vendors.** However, it is preferable to obtain equipment within the region to support regional vendors.
- Work with Mentor Trainers to identify appropriate data sheets, field guides, and other handouts; Host CC is responsible for making copies for participants at the training workshop based on Mentor Trainer needs.

Training Site Requirements

- **Full-time Meeting Room:** A large meeting room with seating at tables for all participants needs to be available exclusively for participants of the GLOBE Trainer Workshop for the duration of the training event.
- **Breakout Room:** A second, smaller room with tables is needed that can be used as a lab (e.g., soil and/or hydrology). Floors and tables may need to be covered with plastic.
- **Trainer Preparation Room:** A room with sufficient space and security to hold workshop materials (scientific instruments, educational materials, and copies, including data sheets and field guides from the GLOBE Teacher's Guide) and to allow Mentor Trainers access for training preparation. A large table should be available in this room for trainers to use for organizing and making an inventory of the instruments.
- The rooms should be available at least 1 day (preferably 2 days) prior to the start of the workshop; equipment and materials should be readily available by the Mentor Trainers upon their arrival.
- Lunches and breaks should be organized at or near the meeting room to prevent loss of time due to transportation.
- Projection capabilities including:
  - a large screen or white wall for projection,
  - over-head projector,
  - flip chart on easel, and/or
  - blackboards (or whiteboards) for the indoor portions of the meeting.
- Transportation arranged to visit off site locations where protocol training will occur.
- There should be a minimum of 1 computer for every 2 participants connected to the Internet with direct broadband access or through WiFi. The appropriate software should be installed and configured to access the Internet with a browser such as Chrome, Edge, Firefox, or Safari. An LCD pallet/screen (or comparable computer projector) for projections from a computer screen should also be available. Alternatively, laptops or electronic notebooks can be used in the meeting room once Internet access is available. Appropriate Internet browsers are listed on the following Website: http://browsehappy.com. One of these browsers should be on these computers and should always be up to date.

Suggested Length of Workshop

- When developing a GLOBE workshop agenda, it is important to identify which protocols and activities will be trained. Each protocol requires a minimum amount of time; therefore, the Host CC includes Mentor Trainers in the discussion of time and site requirements. A training workshop could last anywhere from one day to an entire week, depending on the content. Several sample agendas are available on the GLOBE Website. Please feel free to contact the GIO Community Support Team for further details or assistance.
- It is essential that the Host CC assign one or two host country support staff to assist with local issues surrounding the implementation of a GLOBE regional workshop. In past

events, access to a photocopier, computer and printer for the GLOBE Training Team has proved invaluable.

- **The specifications for the four GLOBE study sites are listed below:**

Atmosphere: The GLOBE Atmosphere site should be located on a flat, grass covered area, at least 5 meters away from trees or buildings. If the workshop will cover air temperature and/or precipitation, a 10 cm by 10 cm square by 2 meter long post should be provided for the mounting of the Atmosphere Instrument Shelter (a 50 cm by 25 cm thermometer enclosure). A rain gauge mounted can either be mounted on this post or on a separate post (please see http://www.globe.gov/documents/348614/348678/atinst.pdf for more information). This study site should be in close proximity to the indoor workshop site.

Biosphere: The GLOBE Biosphere protocols are best done at a natural forest, woodland, shrub land, or grassland site. For training, natural means not watered, irrigated, mowed, or planted with decorative, non-native plants. Ideally, this site should be a square measuring 90 m by 90 m that is homogeneous in vegetation cover (clearings and paths within the site are fine). The site must be within 15 minutes transportation time of the indoor workshop location. If an ideal site is not available, the protocols can be trained on a 30 m by 30 m site, in a stand of trees and/or shrubs in a park, or in a grassy field. Please note, if the grassland site is to be trained, permission is needed to clip at least a 1 m by 1 m square to the bare ground (this should not kill the grass).

Hydrosphere: The GLOBE Hydrosphere site requires safe access to surface water of any stream, river, lake, bay, seashore, or pond **within 15 minutes transportation time** of the indoor workshop site. Ten liters of distilled water should be available for the hydrology trainer.

Pedosphere (Soil): The GLOBE Pedosphere site is an area where one can dig to a depth of 1 meter. Natural areas or parks where the soil has not been disturbed are ideal, but any location where there are at least 2 distinct layers in the top meter of soil is acceptable. Permission to dig a 1 m deep soil pit is desirable, but the protocol can be taught using an auger to remove soil samples. It's best to have a facilities manager determine the best location to avoid disturbing electrical or plumbing lines. Some additional surface soil will also be disturbed. The site should be as close as possible (within 15 minutes transportation time) to the indoor workshop location.

Note: Transportation time refers to the time it will take to get workshop participants from the indoor site to the other field site using whatever means of transport will be available (e.g., walking, van or bus).

8. Items Provided by Country Coordinators

The following table lists support materials for GLOBE workshops. The number is based on 30 workshop participants. The materials may change based on the protocols being taught in the workshop.

	ITEM	QUANTITY	SUBSTITUTES
Miscellaneous	Cellophane tape	8	None
	Scissors	8	Knife
	Distilled water	7–10 liters	None
	Rubber bands	1	None
	Permanent markers, black	10	None
	Permanent markers, red	5	None
Pedosphere	Microwave	1	None
	Triple beam balance	2	Electrical scale
	Shovel for digging soil pit	1	None
	Hot plates	2	Bunsen Burner, camp stove
	Wood blocks (5cmx, 10cmx,25cm)	3	Flat, solid object used for striking soil can without denting it
	8 oz (250 ml) or similar soil sample cans	36	Please collect 250 ml or similar cans for preserved vegetables, fruit, etc. Smooth the edges so people don't cut their hands.
	White paper plates or similar	100	Something to hold soils in the classroom. Need something durable.
	250ml plastic cups	20	Glass beakers or other containers may satisfy this purpose, or empty plastic bottles with the tops cut off.
	2 liter clear plastic bottles	8	i.e. soda/juice bottles
	1.5 liter clear plastic bottles	8	i.e. soda/juice bottles
	0.5 liter clear plastic bottles	8	i.e. soda/juice bottles
	100 ml plastic cups	25	Glass beakers or other containers
	Baking soda	2	None
	Trowels	3	Shovel
	Golf tees or similar	40	Twigs, sticks, etc. to identify soil horizons
	Distilled white vinegar	1	None
	Rolling pin	1	Something to crush soil peds/blocks/pieces
	Plastic spoons	1	Regular spoons, or something to scoop soil

	ITEM	QUANTITY	SUBSTITUTES
Biosphere	Local dichotomous keys	5	Local vegetation books
	Dental floss	8	String, twine, etc.
	Approximately 30 cm rulers	4	None
Atmosphere	Wood Boards (5 x 10 x 61cm)	4	4 wooden boards to support atmosphere shelter
	Wood post (approx. 10cm x 10cm x 2m)	1	Atmosphere shelter fastened to post which is supported by the 4 wood boards
Hydrosphere	Plastic pails	2 to 5	Plastic buckets, children's buckets
	Rope (5m)	5	None
	Salt (NaCl)	2	None
	Rope (50m) for sample buckets / secchi disk	1	May be 2x25 but needs to add up to 50m approx.
	250ml plastic cups* *also listed under soil investigation	20	Glass beakers or other containers may satisfy this purpose, or empty plastic bottles with the tops cut off.

9. GLOBE Teams

GLOBE Teams can be created to enable collaboration on a variety of activities such as data competitions, science projects and support of educational initiatives. GLOBE teams can bring together family members, clubs, troops, classes, or any other group of interested individuals for real-world science experiences. Through working together on projects, a team can contribute valuable information to the scientific community while strengthening the groups interpersonal coordination.

Teams can be created by anyone and managed directly on the GLOBE Website. Visit here to create or join an existing GLOBE Team.

10. Sharing News, Events, Accomplishments and STEM Successes

CCs are encouraged to share information on their GLOBE activities with the GLOBE Community on a regular basis, through communication to RCOs or through the GLOBE Website. Doing so will highlight activities and recognize GLOBE members in their countries. It also will provide ideas and examples of best practices that will help inspire new GLOBE activities around the world. Details on these can be found below and in Section 6: Communications.

- GLOBE Stars and STEM Stories
  - GLOBE Stars (Instructions)
  - STEM Stories (Instructions)
- GLOBE News
- GLOBE Events

Section 5: Technology Systems

Section 5: Technology Systems

This Country Coordinator Implementation Guide has been developed as a resource guide to assist GLOBE Country Coordinators in the operations and implementation of The GLOBE Program in their countries. Section 5: Technology Systems contains:

WEBSITE ACCESS

1. Website Tutorials on Special Management Tools for Country Coordinators
2. Web Tutorials on Using the GLOBE Website
3. Country Coordinator Quick Guide to GLOBE Website

DATA ENTRY, VISUALIZATION AND RETRIEVAL

1. GLOBE Data Entry
2. Email Data Entry Instructions
3. Data Entry Mobile App
4. The GLOBE Program's app, GLOBE Observer
5. Data Visualization
6. Data Retrieval (ADAT, API)

WEBSITE ACCESS

1. Website Tutorials on Special Management Tools for Country Coordinators

Resources have been developed to support Country Coordinators' use of the GLOBE Website in their implementation of GLOBE. These Website tutorials focus on the special management tools available to Country Coordinators for training and supporting their teachers as well as tracking, understanding and reporting overall GLOBE involvement and use.

Tutorials cover the following topics:

1. Managing Schools and Users
2. Managing Partner and Country Pages
3. Managing Workshops
4. Reports and Metrics
5. Workshop Help

2. Web Tutorials on Using the GLOBE Website

The GLOBE Website is made up of several specialized areas that enable you to engage, collaborate and educate as well as enter and interact with scientific data. The following Web Tutorials were developed to help you understand and work with the various parts of the

GLOBE Website:

1. Setting up Your Data Site
2. Entering Measurement Data
3. Retrieve and Visualize Your Data
4. Setting up Your GLOBE Account
5. Creating Student Accounts

3. Country Coordinator Quick Guide to GLOBE Website

Below is a quick guide to how to do different tasks on the GLOBE Website. This guide can also be downloaded from the Website here. The first step is to Login to www.globe.gov with your email address and password.

Quick Guide to the GLOBE System

Every **trained member** of GLOBE can:

Enter Data into the Live Site	Login to GLOBE and click the "Enter Data" button on the home page.
Practice entering data into the Training Site	Login to GLOBE, move the mouse on "GLOBE Data" tab on the home page, then "Data Entry," then choose "Training Data Entry" from the menu.
Visualize Data	Click on the link "Visualize Data" on the Home Page.
Change their information (email, password, address etc.)	Click on your name on the top right and "Account Settings" to access and edit your account information
Upload a picture of themselves	Go to your "MyPage" (Click the circle with a person figure inside then select "My Page"), and select "Change" on the picture on the left. Or...Click on the circle with a figure inside on the top right then select "Account Settings" to access your account information. The first link "Information" on the left will allow you to upload a picture.
Request someone to be their Friend	Search for the person you want to be a friend. Click on their name to go to their "MyPage." Click the "Collaboration" tab and then the link under their picture which says "request to be a friend." You will be notified via email when they accept.
Post to a Forum	Go to the forum you are interested in and click "Post a new Thread" or click "Reply" to an existing thread. You can also "subscribe" to the forum to receive email anytime someone posts to the forum.
Change the content on their "MyPage"	Go to your "MyPage" (Click the circle with a person figure inside then select "My Page"). Look for and click the 3 vertical dots in the middle column of the page. You will see a form/text editor into which you can input information.
Input the number of students they directly support (for GLOBE metrics)	Go to your "MyPage" (Click the circle with a person figure inside then select "My Page"). Scroll down the page, and in the middle of the page, click the "Edit" link next to "Number of students using GLOBE this year".

Change GLOBE Info **Through "GLOBE Info," users can select what information to display on their "MyPage" and the "Collaboration" page such as the languages they speak, their activities on the GLOBE Website, and their preference to collaborate with other GLOBE Community members.** **Collaborate** I'm interested in collaborating with • Display Activities • Blogs • Calendar Event • Document Library • Friends • Image Gallery • Journal • Message Boards • Wall Post **Languages**	To access the member GLOBE Info, click on the User picture from the GLOBE Homepage, then select "Account Settings." In the "Account Settings" page, select "GLOBE Info" link from the left side panel.
Find Someone to Collaborate With	Select Community ->Find a Project Collaborator" from the top Menu. Use the form to find someone who is in a particular country and using the same protocols as you. Select "Add as Friend," and they will receive an email from you.

Every **teacher** can also:

Create Student Accounts	Go to your "MyPage" (Click the circle with a person figure inside then select "My Page"), then look for the "Student Accounts" section in the middle of your "MyPage." Select "Add Account" and fill out the form.
Monitor what their Student Accounts are doing	Go to your "MyPage" (Click the circle with a person figure inside then select "My Page"). Select the "Collaboration" tab. In the middle of the page under your "Friend" map is "Friends Activities." Anything your student does will be listed here.
Submit student reports	Use the "Do GLOBE" drop down menu and select "Student Research Report." On the Student Research report page, click the "Upload your research report" button on the right of the page. Fill out the form to submit your student research report.
Add pictures to their school's image gallery	Use the "Go to" drop down on the top left of the page and select your school under "My Organization" (if you cannot see "Go to menu" on the left side of the home page, click the menu button to view the menu). Click on the "Images" tab. Add pictures for your school.

Every teacher who has **"School Manager"** checked as a GLOBE role can also:

Edit the school information (address, phone, location)	Go to "Manage" on the top left, select "Users and Organizations." Then click on the "Organizations" tab and then select your school from the list. There are various categories you can select to add or change your school information
Edit the school's "About us" content on the school page.	Use the "Go to" drop down on the top left of the page and select your school under "My Organization" (if you cannot see "Go to menu" on the left side of the home page, click the menu button to view the menu). Click the 3 vertical dots icon to see a form, which will allow you to add text and pictures for your school.
Change another teacher's information at their school	You can help a colleague to change or update their information. On the left side Menu, select Manage->Users and Organizations. By default, it goes to Users tab where it will show all the users under your school and you can find your colleague's name. You can then edit their information or help them change their information if needed.
Add a picture for their school on their school's page	On the left side Menu, click "Manage" and select "Users and Organizations" then click "Organizations" tab. Find your organization from the list and click the school name to edit its information. The picture for your school is uploaded on the first option selection.

Every **Country Coordinator** (with the GLOBE organization manager role checked) can also:

Create, Edit or Delete User accounts for the people at schools which are connected to them.	Go to Manage->Users and Organizations. You can browse or select All Users. You can click on Action->Edit to edit it, or select "Add" to add a new user. (Note – it's always easier to add a user's organization before adding them)
Create, Edit or Delete Schools which are connected to them.	Go to Manage->Users and Organizations then click "Organizations" tab. You can browse or select "All Organizations." Check the box next to the school name to show the possible actions you can do, or click the + button to add a new school. (Note: you cannot delete schools that contain Data Site and/or Teachers.)
Changing the teacher's school or adding a new school to their account.	First you will need to check if the school you desire to add to the teacher's account is already in the GLOBE system. If you cannot find the school, follow the steps in the field above to add the school to the system then proceed to the next step. If you can find the school in the system, you can proceed to the next step. Go to Manage-> Users and Organizations. You can search for the teacher you want to change their school by typing their name or their email address in the search field. Once they show up in the search results, Click their name or click the 3 dots to the right and select edit from the menu. The teacher's account settings will open. Click the Organization link on the left side menu. In the organization link, click the select button, a window will popup where you can search for the school you would like to add to the teacher's account. After you find the school, click the Choose button to add it then click the Save button on the following page to save the changes you made. After adding the new school, you can remove the previous school if needed by clicking the x on the right side of the school. Note: when searching for users or organizations, typing the name or email address between quotation marks helps filtering the results "name".
Change a user's training records	Go to Manage->Users and Organizations. You can browse or select "All Users." Click the user name to open their account settings and then select "GLOBE Training" link. Check "Workshop Override" box to change the records listed. (Only use sparingly and only add a user to a workshop that you are sure they attended)

Give a teacher the "School Manager" Role	Go to Manage->Users and Organizations. You can browse or select "All Users." Click user name to open their account settings and then select "GLOBE User Groups." On the bottom, select "School Manager" check box, then hit save.
Create Workshops	Go to Manage-> Workshop Administration The "Workshop Management Tool" should open (if the Tool doesn't automatically open, click the "Launch Admin Workshop" link to open it manually) from the "Workshop Management Tool" main menu. Select "Create New Workshop," fill out the form and submit to post the new workshop.
Search for Trainers	Go to Manage-> Workshop Administration, Search/Manage existing workshop. Look for the workshop for which you need to find trainers, then select the "Add Trainer / View Trainer's list."
Send an email to people they have trained	Go to Manage-> Workshop Administration and use " GLOBE Members Trained via Workshops under your Organization(s)" to send an email.
See Metrics on what schools are reporting data and when they last reported	Go to Manage-> School Status Reports

Partner Dashboard

The Partner Dashboard is an important portal for Country Coordinators to help them view all the tasks that need their attention in one place.

To access the Partner Dashboard, go to "Manage" in the control panel, then click Partner Dashboard. Partner Dashboard link: https://www.globe.gov/group/guest/~/control_panel/manage?p_p_id=partnerdashboard_WAR_globegovpartnerdashboardportlet

The Partner Dashboard enables Country Coordinators to perform the following tasks.

- Member status summary
- View new accounts and approve them
- View Newly approved account and contact them info about workshops and training opportunities.
- View Newly trained users in the Country.
- View Trained users in the Country.
- View Citizen Scientists in the Country.
- View Trained Citizen Scientists in the country.
- View Trainers in the Country
- View Mentor Trainers in the Country.
- Workshop Tasks Reminders:
- View workshop action needed

Trainer Dashboard

The Trainer Dashboard is another tool to help Country Coordinators, Regional Office Coordinators and the GLOBE Education Working Group to view and process Trainer and Mentor Trainer applications.

To access the Trainer Dashboard, go to "Manage" in the control panel, then click Trainer Dashboard. Trainer/ Mentor Trainer link: https://www.globe.gov/group/guest/~/control_panel/manage?p_p_id=gov_globe_trainerdashboard_TrainerDashboardPortlet

The Trainer Dashboard enables Country Coordinators to perform the following tasks.

- View a Trainer or Mentor Trainer application status.
- View the account of the applicant.
- View the organization that the applicant belongs to.
- View the supporting documents submitted by the applicants.
- Approve or reject a Trainer or Mentor Trainer Application.
- Approved applications move to the Education Working group to review and assign a Mentor Trainer.
- Rejected applications, stop the process and inform the applications the reason of denial.

Updating Country Page

Country Coordinators can update the country page and its child pages.

Some of these updates include:

- Adding content to the Country Main page.
- Updating the About & Contact info page.
- Adding News to the News page
- Adding Events to the Events page

Updating the Contents of the Resources page.

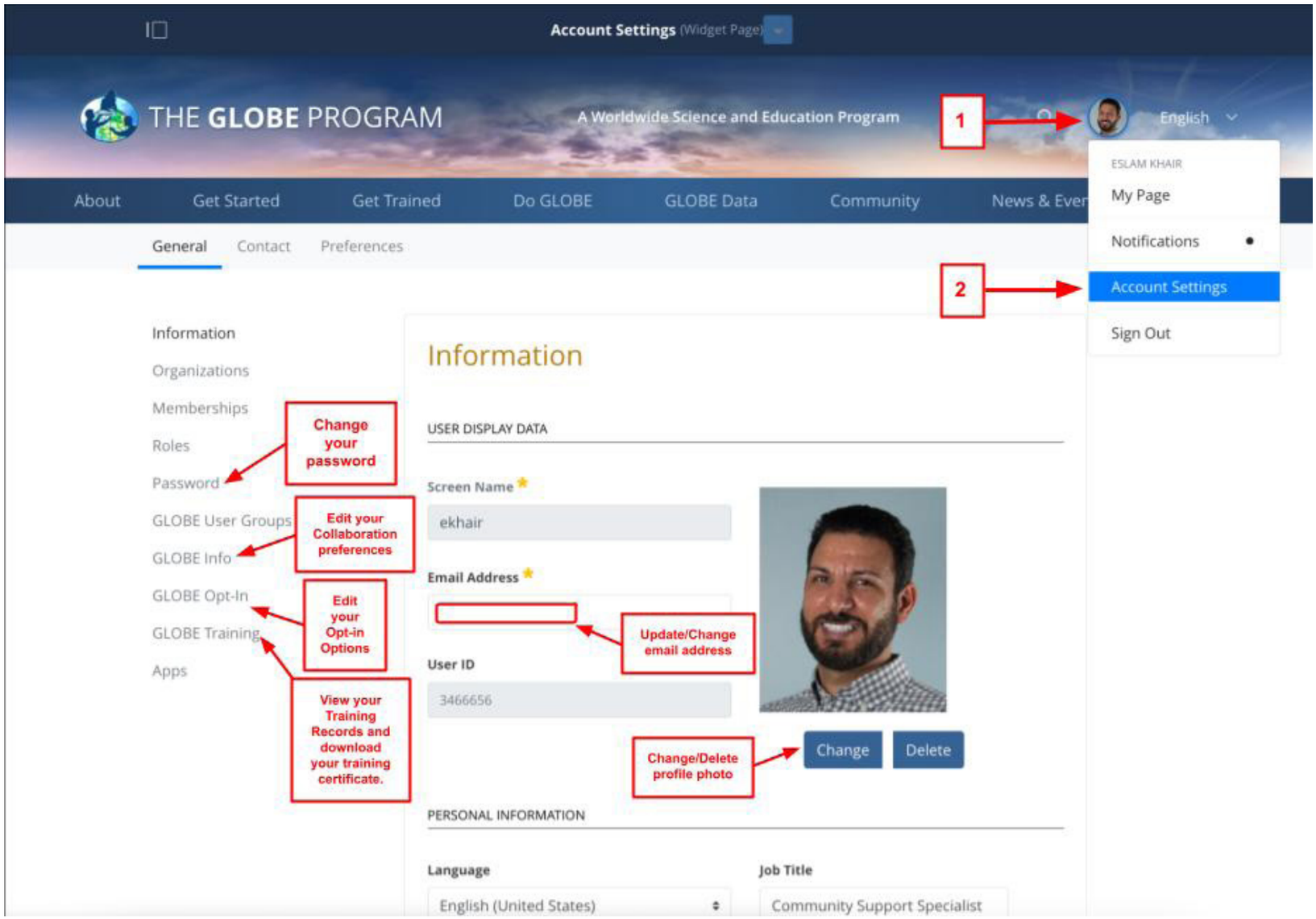
Updating the Country pages is different from one page to the other.

To update the contents of the country page or any other page (Resources), simply move the mouse until the Web Content Display bar shows up. Click on the 3 dots at the right side of the bar and select Edit Web Content. The text editor will show up where you can add text, media and links and format it.

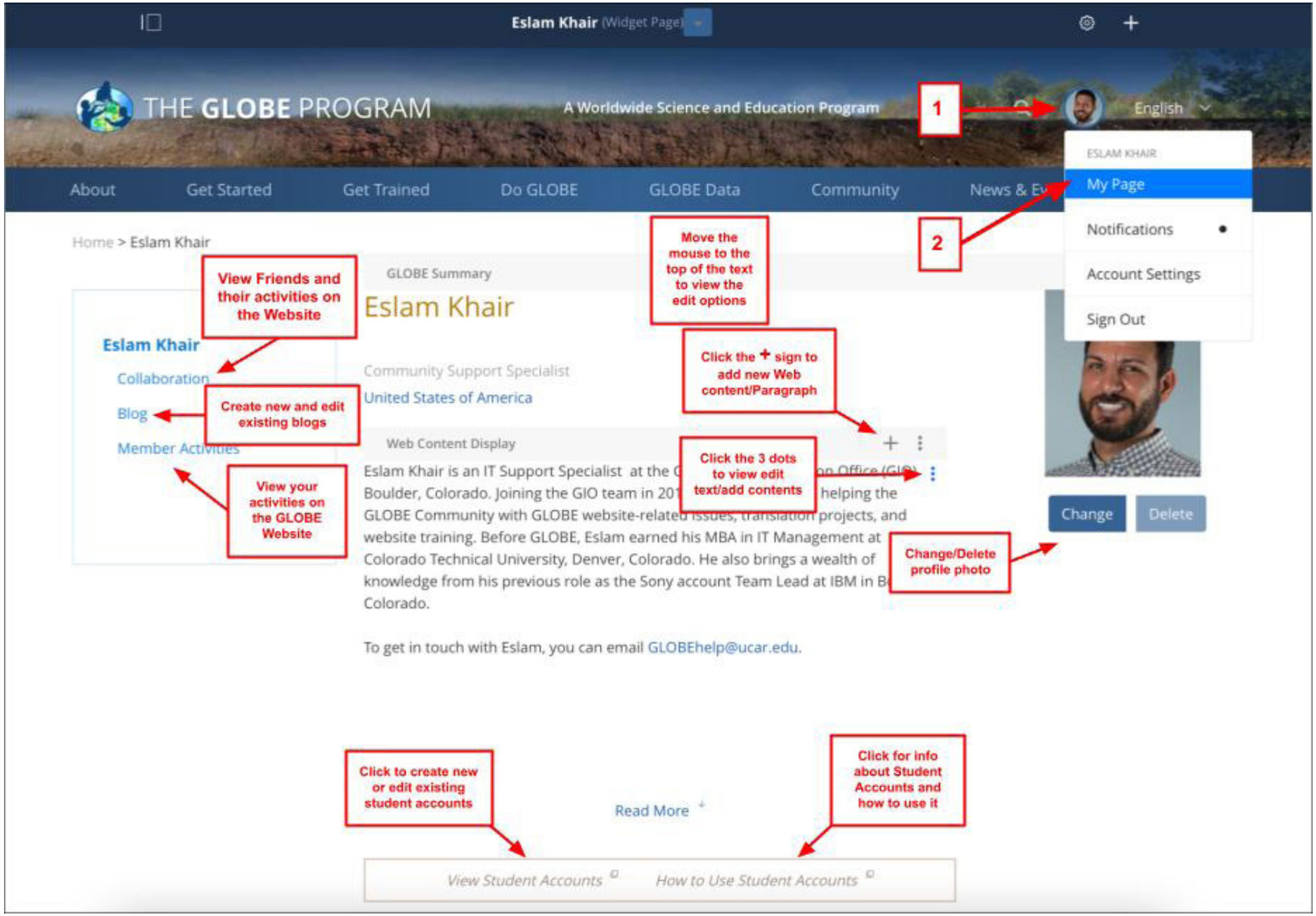
To update the About and Contact info page. Click on Add Contact, then select the (Yes (Use member's profile)) Then select the GLOBE Member you would like to add to the page and select the contact information you would like to view. Please note, only members with GLOBE accounts will show up in the list. If the member is not already in the system, you will need to create their account first before adding them to the Country Page.

To add news and events to the News or the Events page, go the country page, click on the Window shape on top of the page to view the Control panel on the left side of the page. Click the Arrow to the left of the Country name to expand, Click the Arrow to the left of the Contents and Data to expand. Click Web Content. In the Web Content Page, click the Filter and Order to select News or Events to add.

1. Account settings

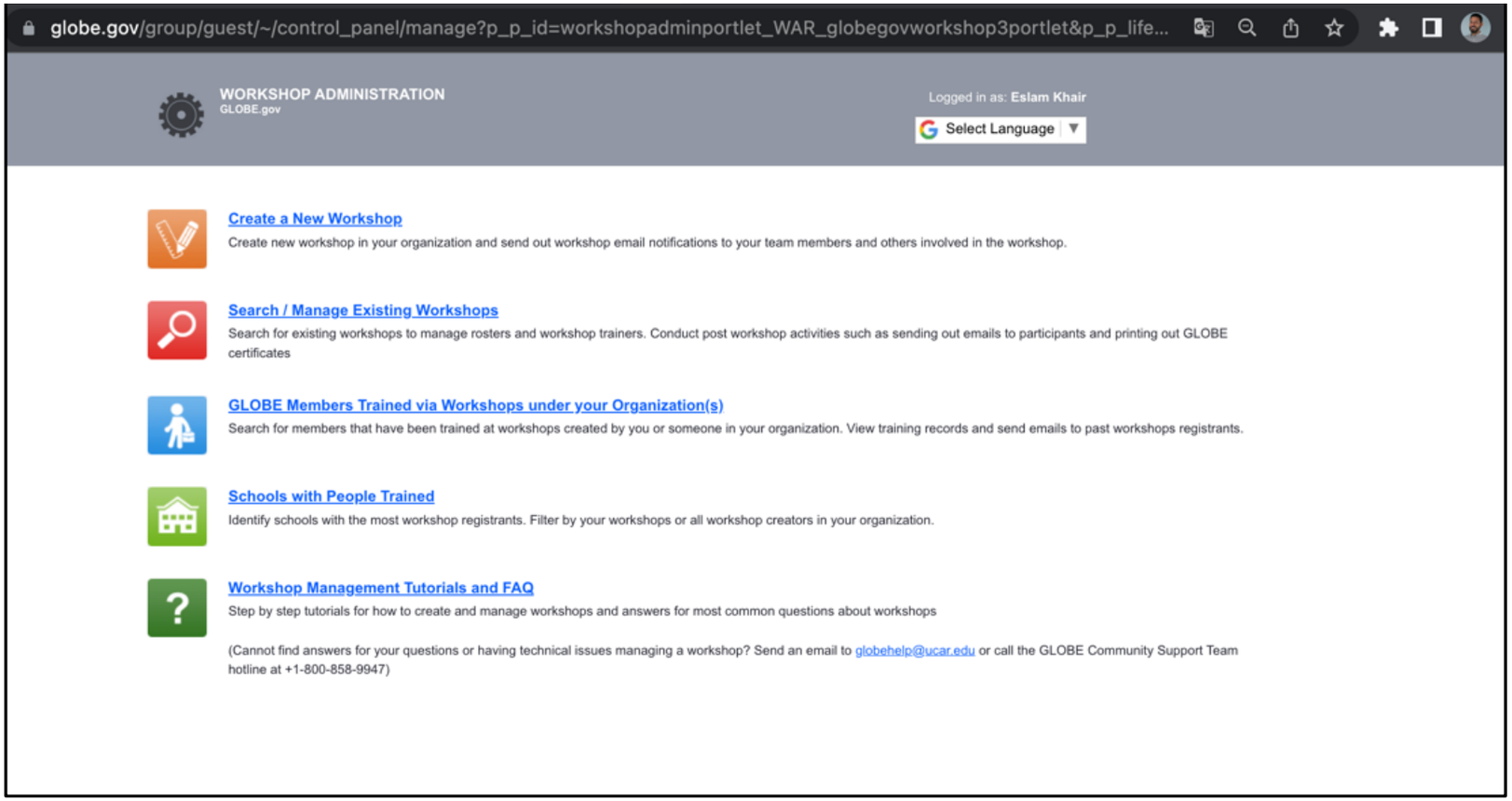


2. My Page

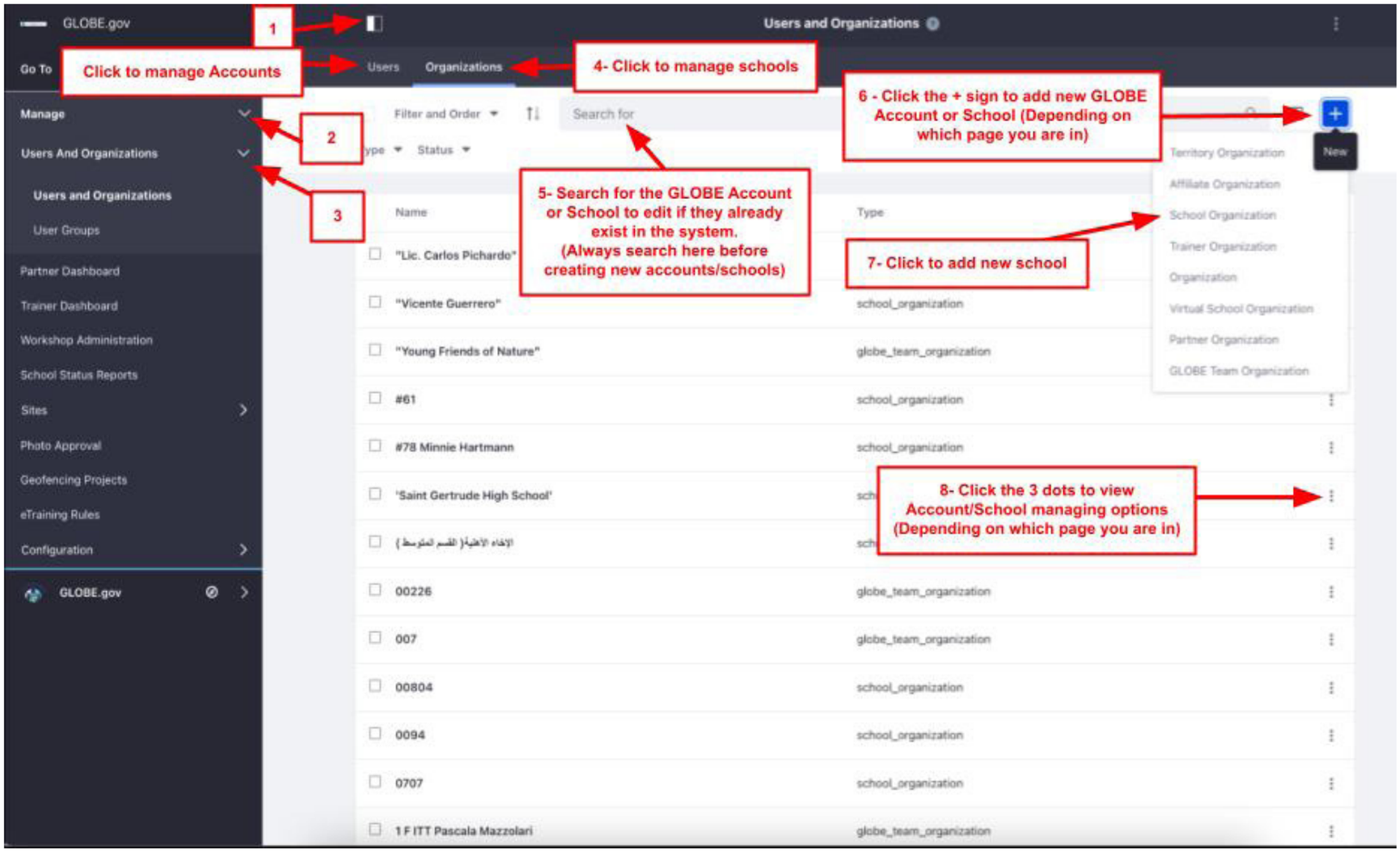

Eslam Khair (Widget Page)
THE GLOBE PROGRAM
A Worldwide Science and Education Program
1
English
ESLAM KHAIR
My Page
Notifications
Account Settings
Sign Out
2
About
Get Started
Get Trained
Do GLOBE
GLOBE Data
Community
Home > Eslam Khair
Move the mouse to the top of the text to view the edit options
View Friends and their activities on the Website
GLOBE Summary
Eslam Khair
Eslam Khair
Collaboration
Blog
Member Activities
Create new and edit existing blogs
View your activities on the GLOBE Website
Community Support Specialist
United States of America
Click the + sign to add new Web content/Paragraph
Web Content Display
Click the 3 dots to view edit text/add contents
Eslam Khair is an IT Support Specialist at the
Boulder, Colorado. Joining the GIO team in 201
helping the
GLOBE Community with GLOBE website-related issues, translation projects, and
website training. Before GLOBE, Eslam earned his MBA in IT Management at
Colorado Technical University, Denver, Colorado. He also brings a wealth of
knowledge from his previous role as the Sony account Team Lead at IBM in B
Colorado.
To get in touch with Eslam, you can email GLOBEhelp@ucar.edu.
Change
Delete
Change/Delete profile photo
Click to create new or edit existing student accounts
Read More
Click for info about Student Accounts and how to use it
View Student Accounts
How to Use Student Accounts

3. Control Panel

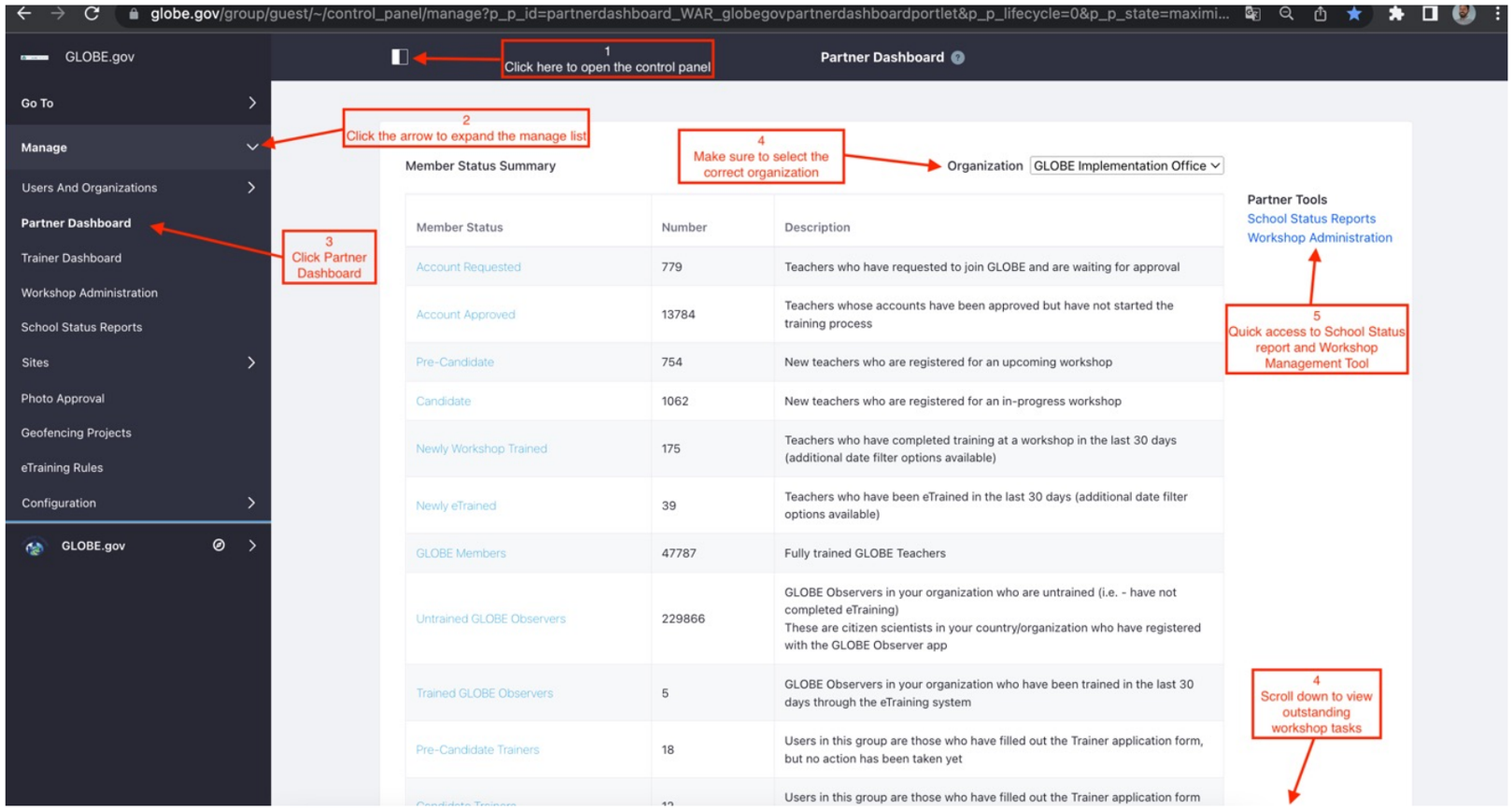
4. Workshop Administration Tool



5. Users and Organization for Managing accounts and schools

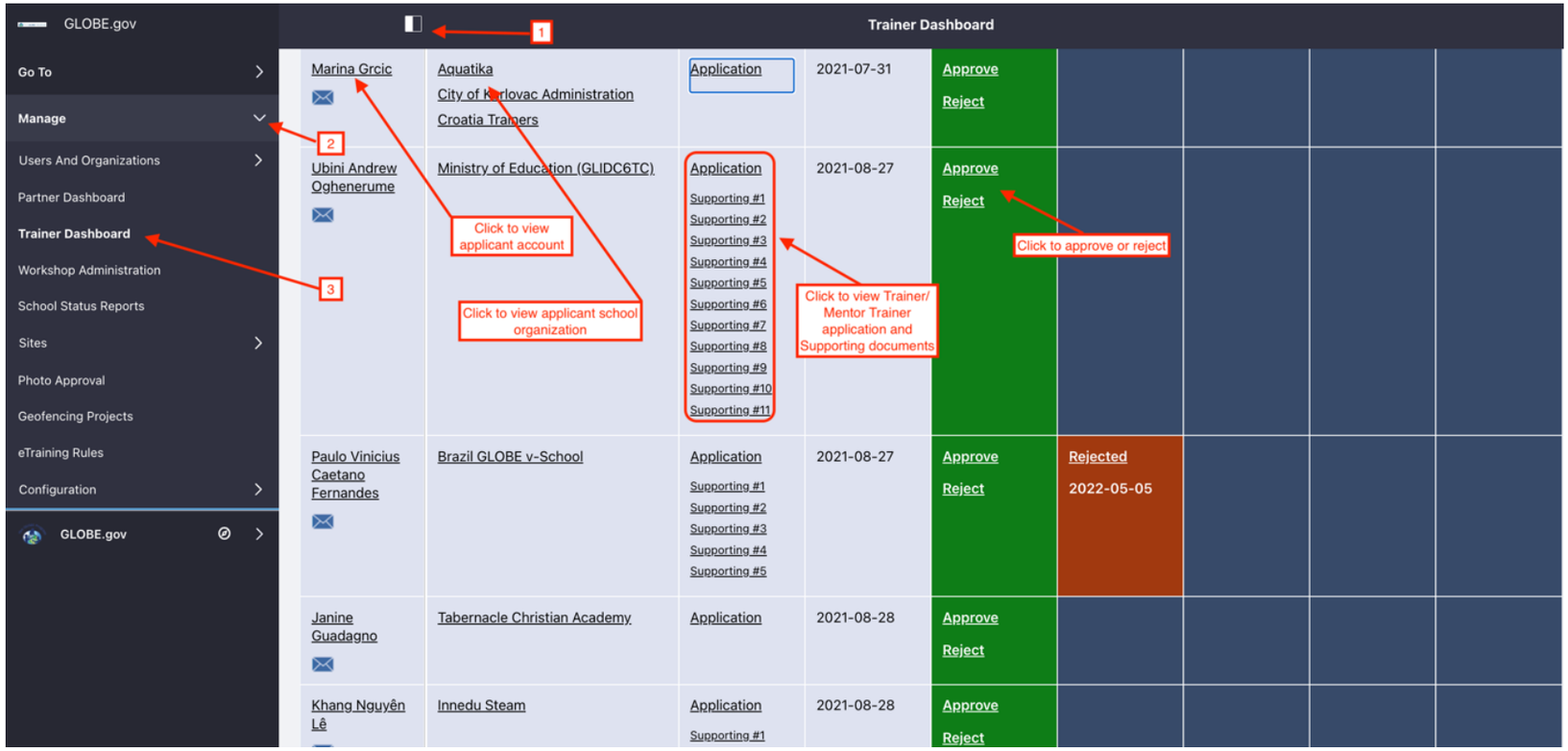


6. Partner Dashboard



Member Status	Number	Description
Account Requested	779	Teachers who have requested to join GLOBE and are waiting for approval
Account Approved	13784	Teachers whose accounts have been approved but have not started the training process
Pre-Candidate	754	New teachers who are registered for an upcoming workshop
Candidate	1062	New teachers who are registered for an in-progress workshop
Newly Workshop Trained	175	Teachers who have completed training at a workshop in the last 30 days (additional date filter options available)
Newly eTrained	39	Teachers who have been eTrained in the last 30 days (additional date filter options available)
GLOBE Members	47787	Fully trained GLOBE Teachers
Untrained GLOBE Observers	229866	GLOBE Observers in your organization who are untrained (i.e. - have not completed eTraining) These are citizen scientists in your country/organization who have registered with the GLOBE Observer app
Trained GLOBE Observers	5	GLOBE Observers in your organization who have been trained in the last 30 days through the eTraining system
Pre-Candidate Trainers	18	Users in this group are those who have filled out the Trainer application form, but no action has been taken yet
Candidate Trainers	12	Users in this group are those who have filled out the Trainer application form

7. Trainer Dashboard



Useful Links:

- https://www.globe.gov/group/partners/overview/partner-and-cc-website-tutorials
- https://www.globe.gov/get-trained/tutorial-center
- For questions please email globehelp@ucar.edu

DATA ENTRY, VISUALIZATION AND RETRIEVAL

1. GLOBE Data Entry

Several options are offered for GLOBE data entry and are located here. Live data entry, training data entry and email data entry are described in the Navigating the new Data Entry Tools web tutorial.

2. Email Data Entry Instructions

GLOBE Email Data Entry requires that one must:

- Use their Organization ID
- Use a Site ID associated with their organization
- Use the email address associated with their GLOBE account

Learn more about where to find both ID's by visiting the following pages:

- Organization ID
- Site ID

To emphasize, in order to accept data, ***you must use the email address associated with your GLOBE user account****. This ensures that your data is accepted into the database and that you will be able to receive notifications related to your data submission.*

Detailed instructions for submitting GLOBE data via email are located here.

3. Data Entry Mobile Application

GLOBE'S Data Entry Mobile Application (app) for mobile devices is available on both iOS and Android platforms.

GLOBE's Data Entry App allows you to enter GLOBE protocol data directly from your iOS or Android device for any of GLOBE's protocols. After an initial download of forms, you can record your measurements in the field, and then choose to send your data to GLOBE when you have an internet connection. The app streamlines some aspects of data entry, and allows you to use your phone's camera to document your sites and measurements. This app is intended only for users who have an existing GLOBE Trained account.

Please note that even though the GLOBE Data Entry app is available for GLOBE Trained Users, it is currently being merged with The GLOBE Program's app, GLOBE Observer and will retire eventually once all the protocols are included in The GLOBE Program's app, GLOBE Observer (described below).

Download the app for android now from Google Play

Download the app for iOS now from the App Store

4. The GLOBE Program's app, GLOBE Observer

What is The GLOBE Program's app, GLOBE Observer?

- A citizen science app allowing volunteers in GLOBE countries to take observations and contribute to the Global Learning and Observations to Benefit the Environment (GLOBE) community
- A way to collect data to track changes in the environment in support of Earth system science research, and interpret NASA and other satellite data
- An open data set available to scientists, and supporting students of all ages in doing real scientific research through the GLOBE Program
- This app is intended for GLOBE Citizen Scientist untrained users but could also be used by GLOBE Trained users. The new version allows Trained users to enter additional data sets.

Download the app and follow the instructions to get started. Always follow guidelines from your local officials and only participate in GLOBE activities or use The GLOBE Program's app, GLOBE Observer if it is safe to do so.

5. Data Visualization

With the GLOBE Visualization System, you are able to view, graph, and export GLOBE data from around the world. You can use various filters to find both contemporary measurements as well as historical data ranging all the way back to 1995. Currently, the system supports a subset of GLOBE protocols, but GLOBE is continually adding new features, so be sure to check the GLOBE Website for the latest updates.

6. Data Retrieval

Instructions for using GLOBE tools for analyzing data can be found here.

ADAT

Find and use the data you are interested in with GLOBE's Advanced Data Access Tool (ADAT). You can refine your search using various parameters and then choose specific sites that contain the measurements you are looking for. Specific search parameters include:

- Protocol
- Date Range
- Date Count Range
- Site Name
- Country/State/Territory
- Proximity to Lakes or Rivers
- School/Teacher/Partner
- Elevation Range
- Latitude/Longitude Range
- Proximity to Latitude/Longitude

Once you have chosen the site you want to investigate, more filters can be applied to narrow the data search or download the data into a CSV file for a detailed analysis with your software of choice. The ADAT also includes the option to download a summary file that compiles the amount of available data for each site of interest. This feature can be used to determine which sites may be more data-rich and worth further investigation.

API

Quickly access GLOBE data and filter it by various parameters with GLOBE 'API calls.' Each 'API call' is associated with a unique URL and variable combination that allows measurements to be found with speed and ease. The GLOBE API is focused on supporting developers who want to use a programmatic interface to retrieve GLOBE data.

Section 6: Communication Systems

Section 6: Communications Systems

This Country Coordinator Implementation Guide has been developed as a resource guide to assist GLOBE Country Coordinators in the operations and implementation of The GLOBE Program in their countries. Section 6: Communications Systems contains:

1. GLOBE Communications
2. GLOBE trademarks, service marks and logo usage requirements
3. Photo/Video Release Forms
4. Information requirements for GLOBE Stars, News and Events, STEM Stories
5. GLOBE Media Materials
6. Writing a GLOBE Press Release

1. GLOBE Communications

The GLOBE Implementation Office (GIO) uses a variety of tools to inform, educate, inspire and engage the GLOBE Community. News stories and information on GLOBE Events are posted on the GLOBE Website. GIO also creates and produces video presentations, including addresses by the GIO Director to the broad community and at regional and national events. A selection of GLOBE videos can be found on the Website, and the entire selection is on GLOBE's YouTube playlists.

GIO also sends out monthly News Briefs and letters and other communications to GLOBE community members. In the role of Country Coordinator (CC) and Deputy or Assistant CC and to stay in touch with GLOBE and receive the most up-to-date news, you must opt-in to our communication network. When you join our mailing list, you'll receive content like:

- The GLOBE News Brief
- Letters to the community
- Updates on upcoming GLOBE events
- Other messages from the GLOBE Communications Team

Rest assured, GLOBE will never disclose or sell your personal information to outside parties. If you leave the position of CC, Deputy CC or Assistant CC, you can choose to opt-out of GLOBE communications.

The GLOBE Program has several social media channels and provides daily postings to Facebook and Twitter; weekly postings to YouTube and occasionally to Instagram. Follow us or subscribe to keep up on the latest news posted to GLOBE social media.

Facebook https://www.facebook.com/TheGLOBEProgram
Twitter https://twitter.com/GLOBEProgram
YouTube https://www.youtube.com/user/globeprogram
Instagram https://www.instagram.com/globeprogram

2. GLOBE Trademarks, Service Marks and Logo Usage Requirement

The GLOBE Program is pleased to grant permission to its partner organizations and participating schools to use GLOBE trademarks, service marks and the GLOBE logo in materials prepared and distributed in hard copy or electronic form as part of activities directly related to participation in The GLOBE Program. These are uniquely designed for easy recognition and to provide consistent branding of GLOBE materials. Use of the trademarks must be consistent with the terms outlined below.

The trademarks that may be used are:

- The GLOBE® Program
- GLOBE®
- GLOBE® STARS
- GLOBEMail®
- The GLOBE logo:

Whenever the GLOBE trademarks, service marks and logo are used, they should be marked with the ® symbol, as shown above, except when redundant or repetitive uses of the symbol might appear awkward or cumbersome. In such repetitive use, the symbol should be applied the first time the trademark is used.

The license for use of these trademarks and service marks includes use in raising funds or other resources to support participation in The GLOBE Program, such as producing and selling items like T-shirts, mugs, and mouse pads. The trademarks and service marks may not be used to raise funds or other resources for purposes other than The GLOBE Program.

The trademarks and service marks should be used under circumstances that represent good taste and must not be used in any way that could be construed as endorsing any product, service, organization, or point of view not directly associated with participation in The GLOBE Program. The use of these trademarks and service marks may not be sublicensed to any other organization or individual, and the trademarks may be used only while the partner or school is a participant in The GLOBE Program.

The GLOBE trademarks and service marks should not be incorporated in your trademarks, service marks, organization or company names, Internet addresses, domain names, or similar designations for use in education and program areas represented by the GLOBE marks. This license is granted by the University Corporation for Atmospheric Research (UCAR). UCAR reserves the right to monitor use of the GLOBE trademarks service marks and logo, including inspecting goods or services on which the trademarks and service marks are used, and to withdraw its consent for use of these trademarks and service marks or change the guidance for their use at any time. If there are any questions about the use of

these trademarks and service marks, please contact the GLOBE Community Support Team at 1-800-858-9947or globehelp@ucar.edu. A link to the usage requirements is here.

We encourage all GLOBE CCs, U.S. Partners and schools to use these trademarks and service marks to show their pride in being part of this exciting international environmental science and education program. GLOBE logos can be downloaded in a variety of sizes and formats for use by the GLOBE Community.

3. Photo/Video Release Forms

It is necessary for you to obtain permissions from individuals who appear in photos and video footage in order for these materials to be used on the globe.gov Website. Download media release forms, for adults and for minors, from the GLOBE Website. You will find forms in English, Spanish and Arabic.

4. Information Requirements for GLOBE Stars, News and Events, STEM Stories

GIO highlights on the globe.gov Website special GLOBE activities and events that CCs, GLOBE teachers and GLOBE students would like to share with the GLOBE community. In addition to recognizing and documenting significant GLOBE activities occurring in GLOBE countries, these stories often provide ideas and inspiration to other schools, teachers and CCs around the world. GIO also highlights how GLOBE has inspired students and teachers to pursue Science, Technology, Engineering and Math (STEM) education and careers. Following are ways CCs can acknowledge and promote activities, events and student and teacher accomplishments on the GLOBE Website.

GLOBE Stars

GLOBE Stars are stories of projects, events and activities being conducted around the world in connection to GLOBE including student research, students helping research scientists through collecting and interpreting data, students making an impact on local communities, teachers and schools expanding GLOBE within their country or region, and collaborative activities. GLOBE Stars spark imagination and inspire the GLOBE Community with news of GLOBE at work in the world.

GLOBE wants to hear about the Stars in your GLOBE community and has developed simple, easy-to-use guidelines for submitting a GLOBE Star story. GIO will work with you to produce your story and ensure that it reaches a broad audience worldwide.

If you have any questions, contact communications@globe.gov.

GLOBE News and Events

News about events (meetings, trainings, learning expeditions, etc.) also is of interest to the GLOBE community. They demonstrate program progress and generate ideas for innovative implementation activities around the world. CCs have the capability to write and post news items on their country page and to request that these news items also be posted on their

regional page and on the GLOBE Website News and Events section. Submit the request for your news that you have posted on your country web page to your Regional Coordination Office (RCO) for inclusion on your regional web page. If deemed appropriate for worldwide attention, the RCO will "push" the information to the GIO Communications Team who in turn will advance the item to the GLOBE News page of the GLOBE Website.

CCs and RCOs use the following instructions to post information to country pages, regional pages or the GLOBE.gov News and Events page:

https://drive.google.com/file/d/0BxFm9ck-Z2eYYV82ZEdGRlFwMmM/view

STEM Stories

GLOBE is gathering stories of students, teachers and alumni who have been influenced by their GLOBE experiences to pursue further education in Science, Technology, Engineering and Math (STEM). We want to hear from:

- Current GLOBE students who intend to pursue further education in STEM;
- Former GLOBE students who are currently engaged in higher education in STEM areas or who have gone into STEM careers; and
- Teachers who have sought further training in STEM subjects, either through GLOBE training or through other professional development training, in order to enhance their capabilities as teachers or for new careers in STEM.

CCs are encouraged to invite current and former GLOBE students and GLOBE teachers in their countries to share their story on how GLOBE has inspired their STEM activities with the GLOBE Community and provide them the following instructions:

https://www.globe.gov/news-events/globe-stars/about-stem-stories-instructions

5. GLOBE Media Materials

GIO has created short concise documents that support efforts by GLOBE Community members to promote and expand GLOBE in their countries or regions.

The GLOBE Overview Pages is a top-level description of The GLOBE Program and the benefits it provides to students, teachers and other community members. It includes a list of published papers and presentations on the program.

There also are a variety of GLOBE Information Sheets that focus on specific aspects of the program and highlight GLOBE's collaborations with other organizations such as Peace Corps and the United Nations Environment Program. They can be used individually or compiled as a set for specific audiences and stakeholders.

GIO has developed a PowerPoint template that is available to CCs to use for their presentations.

6. Writing a GLOBE Press Release

Five points are important to a good press release: Who, What, When, Where and Why. If possible, a sixth, How, should be included, as well as who said what to get quotes. It is important to get all these points in the first sentence or two. Use short words and write short sentences and short paragraphs. Two sentences make a good paragraph in a press release. Almost every press release can be written on one or two typewritten pages.

Follow local press release format; below are items to remember:

- Always give exact date, time, and location of your event, including the location for media parking and specific entrance information
- Provide at least a two- or three-sentence description of the overall GLOBE Program, including information on the number of schools and countries involved (check the GLOBE Home Page at www.globe.gov for up-to-date information).
- Check every point of your release for accuracy. Never guess on dates, times, places, or spelling of names
- CC, local GLOBE teacher, etc. (contact person) and phone number at the appropriate position of the release, and print the release on school letterhead

Please see the example on the following page.

Sample Press Release for New Country Joining GLOBE (Contact Name/#/School,etc)

LOCAL STUDENTS ASSIST GLOBAL SCIENTISTS COLLECT ENVIRONMETAL DATA

Students at **(NAME OF SCHOOL)** are joining The GLOBE Program, an international network of young people taking and analyzing scientific measurements of the Earth system and sharing their observations and research with other students and scientists around the world.

The Global Learning and Observations to Benefit the Environment (GLOBE) Program is an international environmental science and education partnership. GLOBE students are contributing to a better understanding of the planet by making regular environmental observations at thousands of locations around the world and sharing their information and research via the Internet.

Students will select a study site near the school where they will take regular measurements of various atmospheric, hydrological, biological, and geological features. The students will then enter their data and their student research projects via the Internet to the GLOBE Web site at www.globe.gov. Their data will be combined with data from other GLOBE schools around the world and with other science sources, such as satellite imagery, to create dynamic, online images of the Earth.

(TEACHER'S NAME) attended a workshop with GLOBE scientists and educators for instruction on the measurement procedures and the GLOBE Website.

(Insert GLOBE Teacher and/or Country Coordinator Quote)

The GLOBE Program is sponsored by the U.S. National Aeronautics and Space Administration (NASA) with support from the National Science Foundation (NSF), the National Oceanic and Atmospheric Administration (NOAA), and the U.S. Department of State. It is implemented through a cooperative agreement between NASA and the University Corporation for Atmospheric Research (UCAR) in Boulder, Colorado.

(Insert: Local support for GLOBE activities is being provided by ...)

For more information on GLOBE in **(Country)**, contact:
(GLOBE Country Coordinator and contact information)