

## **GLOBAL EDUCATION AND SCIENCE NETWORK (GESN)**

### **Establishing a Global Education and Science Network that Engages Secondary Schools**

*(Submitted by WMO)*

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#### **Summary and purpose of document**

To inform CGMS of new developments between WMO and NASA related to the GLOBE Programme and proposal to establish a Focus Group to report to CGMS-XXXIV on potential modalities and impacts to establish a functional GESN

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- Appendices:**
- I. Establishing a Global Education and Science Network that Engages Secondary Schools
  - II Joint Statement of Intent between the United States National Aeronautics and Space Administration (NASA) and the World Meteorological Organization (WMO) to Collaborate on the Global Learning and Observations to Benefit the Environment (GLOBE) Program

## **PROGRESS/ACTIVITY REPORT**

### **Background**

#### **ESTABLISHING A GLOBAL EDUCATION AND SCIENCE NETWORK THAT ENGAGES SECONDARY SCHOOLS**

1. At CGMS-XXXI, hosted by WMO and held in Ascona, Switzerland in 2003, WMO proposed to establish an exciting, worldwide, hands-on education and science programme, through involved scientist-school partnerships globally. The Global Education and Science Network (GESN) would have engaged senior personnel that include highly committed scientists and educators with substantial experience in the effective leadership of large national and international programs. CGMS asked to consider supporting this initiative. A more detailed description of the proposal made at CGMS-XXXI is contained in Appendix I. CGMS-XXXI agreed to further examine GESN.
2. NASA subsequently established a major and funded programme called GLOBE. NASA asked for proposals that would outsource the GLOBE programme. A consortium between WMO and the University of Wisconsin made a proposal to NASA. The strength of the WMO/University of Wisconsin proposal was the involvement of CGMS through satellite operators, the Virtual Laboratory and WMO Members. The proposal, if accepted, would have supported the required resources described in paragraph 4 "Summary" of the Annex. However, another consortium was awarded the contract.
3. Recently, NASA has expressed a desire to reinvigorate the GLOBE Project and is seeking other avenues to accomplish this. In particular, at the 10<sup>th</sup> Annual GLOBE Conference, the WMO Director for Education and Training discussed with NASA and the Director of GLOBE the modalities for a WMO-NASA collaboration on the GLOBE Programme and the signing of a Letter of Intent. A copy of the draft Letter of Intent is attached as Appendix II.
4. Thus, CGMS is asked to reconfirm its interest in supporting the GESN and establish a Focus Group to report to CGMS-XXXV on potential modalities and impacts to establish a functional GESN. It is further requested that outlines for a Strategy and Implementation Plan be developed for GESN. If sufficient progress is achieved, a draft Strategy and Implementation Plan is desired. The original GESN proposal presented at CGMS-XXXI should be amended as appropriate taking into consideration the new draft Strategy and Implementation Plan.

## **ESTABLISHING A GLOBAL EDUCATION AND SCIENCE NETWORK THAT ENGAGES SECONDARY SCHOOLS**

### **1. INTRODUCTION**

The World Meteorological Organization proposes to establish an exciting, worldwide, hands-on education and science programme, through involved scientist-school partnerships globally. The Global Education and Science Network (GESN) will engage senior personnel that include highly committed scientists and educators with substantial experience in the effective leadership of large national and international programs. CGMS is asked to consider supporting this initiative.

There are two principal elements of the proposed effort:

- A commitment to providing equal opportunities in science, math and technology education for all of the world's children. The multi-talented and culturally diverse GESN team is committed to the "No Child Left Behind" concept and fully intends to establish the programmatic standard in the achievement of this goal. Through exemplary teamwork and a management approach that will focus on maximizing the strengths of each of the contributing organizations and individuals, we hope to achieve world participation in effect earth science education.
- A focus on establishing a worldwide science and education infrastructure. WMO will help support and coordinate six globally dispersed Regional Coordinator offices that will participate in the training of international partners, as well as professional development opportunities that address the unique needs and requirements for teachers and schools within those regions.

Education objectives are met through:

- State of the art distance learning technologies and continuing education opportunities that will be designed and implemented by the WMO at the international level;
- Partnerships with existing nationally recognized education networks and organizations that avoid duplication of effort and fully exploit existing infrastructure to provide grade appropriate, inquiry-based, standards-aligned materials, training and support for teachers and students;
- Emphasis on increasing the number of young women as well as other underserved communities in the future mathematics, science and technology workforce through liaisons with informal education organizations;
- Inclusion of selected earth science datasets from CGMS partners and have the support of the other space faring nations involved in earth observing space missions, allowing schools to "Adopt a Pixel" around the world;
- The enhancement of the existing model of the Train-the-Trainers workshops by adapting and incorporating exemplary approaches for adult professional training;
- A commitment to develop and implement a model for the creation of a Master's Degree program for in-service teachers.

This paper details activities that will:

- (1) Assemble a team of international partners;
- (2) Connect WMO training centres with secondary schools;

- (3) Conduct long distance training demonstrations at selected schools using the Virtual Laboratory for Education and Training in Satellite Meteorology techniques and materials;
- (4) Foster school level field work for adopting a pixel with measurement protocols;
- (5) Construct a global school data web site that sustains help desk functions;
- (6) Assemble an international classroom of 50 model students at WMO facilities in Geneva for one week each year;
- (7) Engaging the CGMS and other key partners;
- (8) Have a presence at WMO Headquarters in Geneva.

## **2. PROPOSED ACTIVITY**

Given the increasing emphasis on science education placed by WMO and its member nations, the Global Education and Science Network is an attempt to reach into the secondary schools and train the future generation of weather and climate specialists. A GESN Coordinator at WMO will be selected to function as the lead Science and Education entity for coordination of the international activities. WMO will work in cooperation and agreement with the jointly sponsored Virtual Laboratory for Education and Training in Satellite Meteorology comprised of six "centres of excellence" and their sponsoring host Permanent Representative at specialized Regional Meteorological Training Centres to connect with the secondary schools within the region to plan a growth strategy. Since WMO Members are responsible for activities in their own country, an approach to training and support can be developed in each country without too much external action as this would be mutually beneficial to WMO commitments endorsed by the country's government.

In many countries the growth and effectiveness of education and training efforts are hindered due to the lack of sufficient resources. UNESCO and the World Bank already have in place a mechanism for grants and programs for science education in many countries (e.g., Benin). GESN will work with these organizations in providing some resources for schools to help further the education and training effectiveness.

Involvement of scientists and other community members through clubs and other organizations is another factor in the growth and successful implementation of the GESN. Through professional societies such as the AGU, EGS, ICASE, IGARSS, scientists in other countries will be recruited to become involved in the GESN and support their community schools in GESN training, support, mentorship and also in regional conferences that focus on the use of remote sensing data.

WMO's involvement will be to cooperate and coordinate GESN implementation in each Member country. This will require: (i) training teachers in the WMO Virtual Laboratory assistance, (ii) providing administrative support for organizing regional training workshops and other events, (iii) translating, printing, and distributing teacher guides and other training materials, (iv) helping with equipment needs by identifying local sources that can provide tested/calibrated instruments, (v) maintaining global school data web site (this has already been established but should become part of the WMO web site), (vi) helping to establish an annual event for teachers in each of the six regions where experiences in the GESN are shared and student research through inquiry-based projects are encouraged, and (vii) organizing an international classroom in Geneva for one week where 50 students from selected schools will give papers and share experiences and receive awards from WMO.

The GESN will establish regional nodes at six 'Centres of Excellence' in WMO Regional Meteorological Training Centres (Nairobi – Kenya, Niamey – Niger, Nanjing – People's Republic of China, Barbados, and San Jose – Costa Rica) and the Australian Bureau of Meteorology Training Centre (BMTTC) in Melbourne. The host countries of RMTCs are responsible for the establishment and maintenance of the Centres. The main purpose of these Centres is to conduct training

programmes that are needed, and not otherwise available, in their respective regions. GESN will facilitate cooperation between these nodes and the region's secondary schools. These RMTC Liaisons will host Train-The-Trainer workshops in their facilities on a rotating basis (3 worldwide per year) and be in constant communication with the rest of GESN Training/Support team to ensure high quality support for international partners.

Part of the success of the GESN depends on the engagement of schools reporting quality in situ data consistently to the data archive. The consistency will indicate that the educational role of schools is benefiting from being active in the GESN, and the quantity and the quality is crucial for scientific use of the data. A current snapshot of the data reported by schools around the world as illustrated in Table 1.

Hosting an International Student Classroom in Geneva for one week where 50 students from selected schools will present their competitively selected journal articles, share experiences and receive awards from WMO at the Annual Meeting in Geneva will be an excellent incentive to increase the number of student reports submitted. The GESN coordinator will organize an international classroom in Geneva for one week where 50 students from selected schools will give papers and share experiences and receive awards from WMO.

The GESN will accomplish this, in cooperation and agreement by the hosting Permanent Representative, by: (a) facilitating the placement of a GESN-supported person at each specialized RMTC - centre of excellence- who will develop the teacher contacts and familiarize them with the GESN training materials and, (b) accepting as experts in WMO facilities at least two GESN-supported people who will assist with the logistics of generating training manuals, observing long distance training demonstrations, reporting on progress, and coordinating the international workshops.

### **3. DISTANCE LEARNING**

Additional up-to-date information can be found via the *WMO Satellite Activities URL* : [www.wmo.ch/hinsman/satsun.html](http://www.wmo.ch/hinsman/satsun.html). *Information on Meteorological and Other Environmental Satellites* (WMO-No. 411) contains further relevant information. Satellite related training activities are separated into six regions wherein a "centre of excellence" – a specialized RMTC - has the primary responsibility to train the trainers for using meteorological satellite data; each RMTC has an operational satellite data provider supporting it with resources to accomplish the training. To date several demonstration projects for Satellite Meteorology Applications focused at the Regional Meteorological Training Centres have been undertaken in response to the 45th WMO Executive Council Report that strongly "supported the proposal that each satellite operator or group of satellite operators participating in the space-based sub-system of the World Weather Watch's Global Observing System (GOS) co-sponsor at least one of the specialized satellite applications training centres ("centres of excellence") strategically located around the globe with regard to the satellite training programme." These satellite-focused RMTCS have been linked through the concept of a virtual laboratory that utilizes inexpensive personal computer technology and Internet for data distribution. Connecting the RMTC with secondary schools in the region will enable training of future users of satellite data and expand the network of trainers in the university and secondary school classrooms.

Through programmes already developed to impart meteorological training to a wide number of people, the team already has substantial experience in the development and utilization of innovative teaching tools (e.g., COMET, interactive on-line tools). Essential, compelling teaching experiences include real-world opportunities for teachers to learn and discover how science works. Distance learning, has been developed by the COMET and now includes a set of professional development series (PDS) (Lamos 1998). Each PDS defines training requirements for the operational weather forecaster. Within each PDS, separate instructional components are developed to meet the training requirements. The PDS, which includes satellite meteorology, is the Integrated Sensor Training (IST) PDS. Information on the IST PDS can be accessed via the

Web at [meted.ucar.edu/ist](http://meted.ucar.edu/ist). The IST PDS represents a concerted effort to bring together diverse training activities, which have traditionally focused on individual sensors such as satellite, radar, and other observing systems. The IST PDS is supported by the Virtual Institute for Satellite Integration Training (VISIT), comprised of staff from the CIMSS, CIRA, and the NWS training facilities.

VISIT and the IST PDS programme are working together to make satellite meteorology distance training a reality. Through the development of various training materials, the operational forecaster and the on-station training officer can access a *virtual classroom and laboratory*. This virtual classroom is composed of a diverse and rapidly growing set of materials: tutorials, on-line classroom presentations, GOES gallery, Satellite Interpretation Discussions, technical attachments and Web-based modules. The Virtual Laboratory for Satellite Meteorology has been endorsed by the Executive Council of the WMO and its Commission for Basic Systems (CBS). The Web-based and teletraining approaches described here can be included into the development of the Virtual Laboratory.

The training materials are available to all WMO Member countries as part of the Virtual Laboratory. The training materials are available at several locations on the Web. To help training officers organize the materials, the various sites are easily accessed (VISIT at [www.cira.colostate.edu/ramm/visit/visithome.asp](http://www.cira.colostate.edu/ramm/visit/visithome.asp) and the COMET satellite meteorology class at [www.comet.ucar.edu/class/satmet/home.html](http://www.comet.ucar.edu/class/satmet/home.html).)

The use of strictly remote training sessions and tutorials runs into two major limitations at most weather offices: limited network bandwidth and limited instructor interaction. The bandwidth limitation is especially serious when loading large animation files. To address these limitations, an interactive training tool called VISITview was developed by the Virtual Institute for Satellite Integration Training (VISIT) at CIMSS and CIRA. VISITview is a platform-independent distance learning and collaboration software program that allows multiple users to view the same series of images containing graphics and text with a large number of user features.

VISITview ([www.ssec.wisc.edu/visitview/](http://www.ssec.wisc.edu/visitview/)) teletraining software is being developed by VISIT with support from the IST PDS program. The VISITview programme is not proprietary and is freely available. VISITview is designed to provide the instructors and students with a set of easy to use tools for creating and conducting teletraining sessions. VISITview is Web-based, but may be used in two modes: with the graphics files on a central server or with these files residing on a local disk. In the latter case, only the commands are sent over the Web. These two modes can be used together, if desired. An exciting application of this capability will arise if VISITview can be coupled with the satellite streaming media provider WorldSpace Corporation. Since the files reside on a local server (and can be shipped out via CD-ROM ahead of a training session), only the commands would need to be delivered to activate training and this can be accomplished even in areas without Internet connectivity by using World Space's inexpensive satellite radio receiver for the PC (see letter of support). Many of the VISITview tools have been found to be extremely effective in distance learning exercises; they will be expanded under these activities. In summary, through the development of various training materials, the operational forecaster and the on-station training officer can access a virtual classroom and laboratory.

#### **4. SUMMARY**

In summary CGMS support is being solicited for the GESN plan to:

- (1) Support a full time GESN coordinator at WMO;
- (2) Support part time GESN support people at each RMTTC;
- (3) Connect RMTTCs with secondary schools in participating countries;
- (4) Translate training manuals, publish, and distribute as necessary;

- (5) Participate as observer in long distance training demonstrations at selected schools using the Virtual Laboratory;
- (6) Organize annual workshop with RMTTC leaders and secondary school representatives engaged on GESN team;
- (7) Maintain global school data web site (this has already been established but should become part of WMO web site);
- (8) Organize an international classroom in Geneva for one week (50 students from selected schools will give papers and share experiences and receive awards from WMO).

To further this activity it is suggested that a focus group be established that can study this proposal and report back to CGMS. Since the GESN relies on the Virtual Lab, it would be beneficial for a member of the GESN focus group to attend the Virtual Laboratory Focus Group meeting in Barbados in December 2003 to solicit support from the Centres of Excellence. The WMO Secretariat remains committed to the GESN concept and would work through WMO structures such as its Executive Council, Commission for Basic Systems, EC Panel on Education and Training and WMO Consultative Meetings on High-level Policy on Satellite Matters.

**Table 1**

**Schools Participating in International Data Sharing  
(initiated by the GLOBE project wherein schools adopt a pixel by taking local measurements of temperature, moisture, cloud conditions, winds, etc and log them into an internationally accessible web site)**

COUNTRY	# Schools participating in International data sharing (active)	COUNTRY	# Schools participating in International data sharing (active)
Romania	4	Switzerland	59
Portugal	7	Suriname	3
Monaco	2	Spain	96
Latvia	3	Namibia	9
Hungary	25	Lebanon	6
El Salvador	6	Australia	318
Dominican Republic	1	Cameroon	22
Austria	5	Cyprus	17
The Former Yugoslav Republic of Macedonia	9	Ecuador	41
Greece	26	Madagascar	26
Estonia	36	New Zealand	65
Iceland	11	Poland	51
Belgium	9	Netherlands	100
Ghana	40	Tunisia	4
Bolivia	6	Bulgaria	4
Norway	71	Germany	349
Finland	129	Mexico	54
Trinidad and Tobago	5	Costa Rica	21
Kuwait	5	Peoples Republic of China	56
Korea, South	15	Guinea	7
Jordan	23	Argentina	58
Czech Republic	101	Egypt	13
Sweden	44	United States of America	8974
Croatia	115	Panama	26
Japan	125	Pakistan	12
Italy	28	Bangladesh	3
Israel	64	Denmark	13
Benin	107	Bahrain	7
Ireland	16	Kenya	29

<b>COUNTRY</b>	<b># Schools participating in International data sharing (active)</b>
Russian Federation	85
Thailand	63
Marshall Islands*	4
Kazakhstan	36
Fiji	8
India	121
Peru	44
Moldova	27
Canada	136
Chile	38
Turkey	75
South Africa	79
Senegal	22
Nepal	57
United Kingdom of Great Britain and Northern Ireland	334
Ukraine	40
Philippines	40
United Republic of Tanzania	28
Uruguay	10
Kyrgyzstan	47
Colombia	25
The Gambia	22
Sri Lanka	1
Qatar	20
Palau*	2
Morocco	2
Mongolia	1
Mali	1
Federated States of Micronesia	4



**Joint Statement of Intent  
Between the  
United States National Aeronautics and Space Administration (NASA)  
and the  
World Meteorological Organization (WMO)  
to Collaborate on the  
Global Learning and Observations to Benefit the Environment (GLOBE) Program**

NASA is the lead U.S. implementing agency for the GLOBE Program, an international environmental science and education program that brings students, teachers, and scientists together to study the global environment. GLOBE has created an international network of students at primary, middle and secondary school levels studying environmental issues, making environmental measurements, and sharing useful environmental data with one another and the international science community.

The World Meteorological Organization (WMO) is an international organization comprising 187 Member States and Territories. It is the authoritative voice within the United Nations system on the state and behavior of the Earth's atmosphere; its interactions with the oceans, the climate it produces and the resulting distribution of water resources. One of the main purposes of the WMO is to encourage research and training in meteorology and, as appropriate, in related fields and to assist in coordinating the international aspects of such research and training.

The organizations each noted the historical accomplishments of the other in goals to increase environmental awareness throughout the world, to improve scientific understanding of the global environment, and to support improved achievement in science and mathematics education, and intend to work together in the GLOBE program to enhance the general public's understanding of weather and climate change here on Earth.

Recognizing the WMO's valuable contributions to be made to the GLOBE Program, the organizations would like to consult with each other to identify areas of benefit to the GLOBE Program as they work together in areas of potential collaboration that could include:

- Enhancement of environmental awareness and scientific understanding of the Earth through:
  - Involvement of established Meteorological Centers in GLOBE partner countries in the implementation of regional GLOBE Program activities, including schools that do not have access to computer technology and electronic communications capabilities;
  - Promotion within the GLOBE network of a better understanding of the Earth as a system, based on sound science.
- Reinforcement of international scientific collaboration through:
  - Invitation of established meteorological networks and regional centers to become involved in the implementation of GLOBE;
  - Involvement of scientists collaborating with WMO in the scientific evolution of GLOBE.
- Development of GLOBE facilitated innovative environmental, scientific, technological, and educational activities by WMO, and perhaps selected governments and private sector partners(s). It is envisioned that these activities would capitalize on the opportunities afforded by GLOBE to introduce scientific, computer, and communication technologies in the classroom around the world and to also teachers to use such classroom technologies.

NASA and the WMO will appoint and notify each other of their respective representatives to serve as points of contact responsible for administering the joint activities of the GLOBE Program within the applicable countries as necessary

Should NASA and the WMO decide to pursue specific implementation activities pursuant to this joint statement, such activities will be subject of a specific, separate agreement which will address detailed aspects of the cooperation including liability, funding, and specific programmatic responsibilities of each organization.

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For the National Aeronautics and  
Space Administration of the  
United States of America

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For the World Meteorological Organization  
(WMO) of Switzerland

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Date