



# **IEOS/GEOS IMPLEMENTATION ISSUES**

**A study developed by the  
ATMOSPHERIC POLICY PROGRAM  
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EXECUTIVE SUMMARY**

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## EXECUTIVE SUMMARY

Observations of the phenomena that occur in the Earth system — its atmosphere, oceans, land masses, biosphere and natural and human resources and hazards— could expand understanding of those phenomena and enable a safer, more efficient society. An extraordinary international effort is now underway to promote and plan “the development of a comprehensive, coordinated, and sustained Earth observation system of systems among governments and the international community to understand and address global environmental and economic challenges.” In recognition of the crucial role data from those systems could play in protecting human health and safety, alleviating human suffering and poverty, and achieving sustainable development, 51 nations have agreed to cooperatively implement a Global Earth Observation System of Systems (GEOSS) to collect those data for the purpose of providing information for decision makers. GEOSS has the potential to provide substantial benefits to all nations. An *ad hoc* interagency Group on Earth Observations (GEO) is developing a 10-year implementation plan for GEOSS.

In parallel with this coordinated international planning, the U.S. has established the Interagency Working Group on Earth Observations (IWGEO) to prepare a strategic plan for the development and implementation of the U.S. Integrated Earth Observation System (IEOS). The strategy will reinforce U.S. leadership in GEOSS. Currently, the international GEO and the U.S. IWGEO are developing cases for an integrated system of Earth observations; characterizing some of the societal benefits and requirements; and addressing a range of issues, such as the need for convergence of observations, the opportunities for synergy, requirements for interoperability and architecture, data access and use, capacity building, outreach, governance and resourcing, performance indicators, and schedule.

The level and nature of investments made in this area in the coming few years will either sustain or limit – perhaps for decades – our ability to meet growing national and international needs for effective earth observations, science and services. The ultimate international response to the proposed effort to implement and, in the future, strengthen GEOSS will depend on how effectively global thinking, dialogue, and planning address a range of challenges.

While much of the planning effort is directed at the scientific and technical aspects of the task, there are a host of policy issues that must be resolved if the implementation of an integrated Earth observing system is to be successful. The IEOS and GEOSS planners must come to grips with these issues that are largely if not wholly external in character. They reflect far broader national and international political and economic realities, and must be addressed by a range of individuals, institutions, and nations. Of course, the effort to fully realize IEOS/GEOSS will extend over a decade, at least, and will require a commensurate evolutionary approach to resolving the associated policy issues.

The success of IEOS/GEOSS is clearly dependent on community efforts that complement and enhance governmental planning. The American Meteorological Society (AMS), with the support of the IEOS planners, organized this study of three key policy issues that must be resolved in order to successfully implement IEOS/GEOSS. In undertaking this study, the AMS Atmospheric Policy Program solicited the participation of experts from a broad range of disciplines. The study participants examined a series of options to resolve each of the issues. After considering the options, the participants agreed on a set of recommendations to respond to the issues.

For the purpose of discussing the policy issues, it is useful to define several important terms (see box).

### IMPORTANT DEFINITIONS

(In the context of this study)

- **Stakeholders** – those who have an interest, involvement, and investment in IEOS/GEOSS data and information. The stakeholders encompass these groups:
  - **Information users** — those who use IEOS/GEOSS-based information to make decisions or conduct research in societal benefit areas ranging from reduction of life and property risks to natural resource management
  - **Information providers** — those who analyze and produce user needed information based on IEOS/GEOSS data (includes public and private sector providers of services, as well as researchers who advance understanding that leads to new products and services)
  - **Data Users** — those who make use of IEOS/GEOSS data to conduct research, characterize the state of the Earth system or produce Earth system information for use by information providers
  - **Data providers** — those who are directly involved in the collection, quality control, transmission, and archiving of IEOS/GEOSS data essential for users
- **Value** — measure of usefulness and importance to the users of IEOS/GEOSS data and information. Value contains quantitative elements (e.g., disease pathways tracked; lives not lost; injuries avoided; profits increased; enhanced crop yields; improved natural resource management) and qualitative elements, in terms of non-quantified, social benefit (e.g., improved human health and well being; addressing issues of hunger and poverty; enhanced capacity to anticipate and respond to environmental changes)

This study, although focusing largely on the implementation issues of IEOS, has also considered the international aspects involved with GEOSS. **In the final analysis, GEOSS can only be effectively implemented if the U.S. successfully implements IEOS.**

## **INVOLVING IEOS/GEOSS STAKEHOLDERS**

Involving the full range of stakeholders in the planning, implementation, and continuing development is critical for the success of IEOS/GEOSS. A structured framework and an associated, ongoing process for stakeholder involvement is necessary for demonstrating the practical applications of Earth observations and their relevance to government policy, societal well-being, and the interests of citizens. This will in turn encourage support for the continuing operation and enhancement of IEOS and GEOSS. Moreover, IEOS and GEOSS enhancements must be aimed at satisfying unmet needs of the users that can only be documented through such a process. **The process to involve stakeholders in IEOS/GEOSS planning to satisfy unmet information needs should be implemented as early as possible in the initial planning.**

This study concentrated on the process to be considered for stakeholder involvement in IEOS. Clearly, the requirement to involve stakeholders in assessing the value of GEOSS data and information and identifying unmet needs for future enhancements extends to all nations. Therefore, whatever process is adopted for U.S. stakeholder involvement could be applied internationally.

Finally, it is clear that the process to involve stakeholders should be iterative. An initial requirement is to identify the range of stakeholders, to clarify their roles in IEOS development and operation, and to determine in consultation with them the most effective mechanisms for assuring effective communication. The first step is to identify sufficient representatives of the information provider and user communities to capture an initial sense of the larger communities. Subsequent steps would provide for successively greater breadth of stakeholder and decision maker participation.

**RECOMMENDATION 1: There should be ongoing, comprehensive stakeholder evaluations of IEOS value to U.S. interests and future needs that are initiated as part of the earliest planning efforts. The comprehensive evaluations should consist of a forum series combined with periodic stakeholder conferences, and coordinated multi-year studies of IEOS data and information value.**

Economists, social scientists, political scientists, and policy analysts working with representative stakeholders would carry out value analyses. These analyses would provide basic information for periodic conferences among the IEOS data and information stakeholders spanning the full breadth of IEOS applications across the societal benefit areas. Initially, these conferences should be held annually, but after several years, as IEOS improvements are implemented to meet stakeholder needs, the conference cycle should be lengthened. The conference reports would summarize the results of the dialogues on the current values of IEOS information, as well as, on the unmet stakeholder needs that could be addressed by further development of IEOS. The conference reports and value studies

would then provide the foundation for discussions at a series of forums, each focused on a societal benefit area, that would add the vital participation of academics and decision makers. The forum reports would document detailed value estimates of the current IEOS data and products and discuss recommendations to address infrastructure enhancements; research and technology developments and applications; and educational innovations to improve IEOS information for public and private decision support systems in each societal benefit area.

**RECOMMENDATION 2: A clearinghouse of IEOS user applications and services should be established.**

The communities of stakeholders should be greatly expanded within the U.S. by establishment of a IEOS clearinghouse effort to gather and disseminate information about successful IEOS applications (unless an appropriate institutional capability already exists). By regular dissemination of information about IEOS capabilities through publications, Internet pages, and/or periodic conferences, potential users would be made aware of the value of IEOS data and related services. An additional, important benefit of such a system would be to provide high-level decision makers with evidence of effective application of IEOS data and information thereby encouraging their support and enhancement of IEOS. As the inventory of effective applications of IEOS information grows, support for the system would be expected to grow significantly over time. The IEOS clearinghouse would be a very effective outreach effort that could encourage implementation of the clearinghouse concept on an international scale. Of course, the clearinghouse would have to adopt procedures to encourage application developers to contribute information and documentation about their application. By utilizing modern technologies for archiving and communication, a distributed international clearinghouse could be developed that would permit each nation to monitor access and subsequent utilization of their GEOSS contributions.

**RECOMMENDATION 3: An IEOS stakeholder advisory group should be established.**

As a *supplement* to the ongoing comprehensive stakeholder evaluations developed under Recommendation 1, an IEOS stakeholder advisory group should be formed. The group members should be appointed to serve specified terms. The group should periodically meet with decision makers to discuss GEOSS benefits and identify unmet needs. The group could use electronic communication approaches to involve much wider stakeholder participation. The group's activities could serve to reduce the number of forums and conferences that might be needed for the comprehensive evaluations. In addition, such a group would provide a sustained focus on relevant issues, as opposed to participants at periodic forums. The latter could then be used to build on the advice that comes from the more long-running advisory group.

If the IEOS planners implement these three recommendations, stakeholders will be deeply and effectively involved in the evaluation of benefits from the systems' output and the

planning of enhancements to the systems. Moreover, through U.S. leadership, there should be a steady expansion of the benefits to all GEOSS member nations.

## **ENSURING LONG-TERM IEOS AND GEOSS SUPPORT**

If IEOS and GEOSS are to have continuing support, administrative oversight and financial stability are essential. For administrative stability, formal oversight arrangements for IEOS and GEOSS, policies, rules, and procedures will have to be negotiated and established. A fully staffed and supported IEOS Secretariat that is responsive to the participating executive agencies and Congress would serve that function effectively. *Sound oversight will provide the administrative stability necessary to ensure continuing financial support for IEOS.*

For financial stability, IEOS and GEOSS will always depend on the value that is demonstrated for the data and information that are produced by the systems. **As a result, whatever support mechanism is instituted, an ongoing process for evaluating the value of the IEOS and GEOSS products must be established. Moreover, there will have to be a continuing, robust research program to add value to IEOS and GEOSS products.**

The study participants make the following recommendations for IEOS and GEOSS administrative and financial mechanisms:

**RECOMMENDATION 4.1: In the U.S. an IEOS secretariat should be established as soon as possible to oversee the administration and management of ongoing IEOS activities and operations.**

Within the U.S., there is a pressing need for a mechanism to oversee the operation and management of IEOS. A secretariat that is responsive to the participating executive agencies and Congress would serve that function effectively. Sound oversight will provide the administrative stability necessary to ensure continuing financial support for IEOS. This oversight, through a full-time, fully staffed secretariat, must be instituted as soon as possible to assure successful initiation and subsequent effective implementation of IEOS.

**RECOMMENDATION 4.2: A GEOSS secretariat and funding mechanism should be established in association with an intergovernmental organization that presently exists or is developed through suitable international arrangements and, ideally, a negotiated collaborative relationship with a scientific, non-governmental organization, such as ICSU.**

In the final analysis, the selection of a GEOSS support mechanism will depend on the ability of the planners to convince the member nations that the mechanism is sound and responsive to GEOSS funding and operating requirements. Obviously, a secretariat must also be established to oversee the administration and management of ongoing GEOSS activities and operations.

An international agency/organization, which is deeply committed to environmental issues or a consortium of such agencies, could systematically gather voluntary funding, as well as provide oversight for the management of GEOSS. For example, the UN system and other international organizations with global Earth observation mandates could formally establish, via identical resolutions, a joint intergovernmental subsidiary body and joint secretariat which will be accepted by all the key organizations and by all countries as the single high level coordination mechanism for GEOSS implementation. Another possible approach is an intergovernmental successor to GEO, with its own operating procedures and Secretariat established either as a fully independent organization or as a part of the United Nations system.

Finally, the established intergovernmental organization should seek a collaborative arrangement with a non-governmental organization such as the International Council for Science (ICSU), formerly the International Council of Scientific Unions. ICSU provides scientific advice and oversight for activities they coordinate. ICSU is very sensitive to the needs of the developing nations.

The resulting collaborative organization would gather funding from the GEOSS member nations in accordance with their ability to contribute. Many developing nations that will be member nations of GEOSS are not in a position to make financial contributions. As a result, the financing of GEOSS observational capabilities, especially equipment and personnel, in developing nations will depend, at least in part, on voluntary or assessed contributions of developed nations. It is imperative that the developed nations accept that responsibility. The mechanism recommended by this study will provide a vehicle for ensuring that those responsibilities will be met. The mechanism will also provide internationally credible oversight of GEOSS management.

## **FACILITATING GEOSS DATA EXCHANGE**

A major GEOSS challenge is to establish a system of data and information exchange that is as close as possible to “full and open” in order to realize the global benefits that can flow from an integrated global Earth observation system of systems. The U.S. is committed to full and open exchange of IEOS data. The appropriate U.S. agencies will have to review the data sets to decide which data cannot be exchanged due to national security or proprietary concerns. Access to all other IEOS data will be without restrictions.

GEOSS participating nations must be convinced that a successful sharing of Earth system information will enhance the physical and economic well being of their citizens. U.S. leadership in providing IEOS data on a full and open basis, except for security or proprietary limitations, should encourage international adoption of that principle. As a result, it is anticipated that the GEOSS participants will be strongly motivated to ensure that a maximum amount of information is made available to all. There are counterbalancing forces at work, however, that will give rise to inhibitions to full and open data exchange. Among these forces are national security concerns, intellectual property rights laws, proprietary pressures from the private sectors, and political pressures to recapture some of the costs of GEOSS participation through marketing of national data and products, etc. In the final analysis, the selection of a GEOSS data sharing mechanism will depend

on the ability of the planners to convince the participating nations that the mechanism is sound and responsive to GEOSS goals. The study participants make the following recommendation for the GEOSS data sharing mechanism:

**RECOMMENDATION 5: A process of negotiation should be developed to explore actions to be taken to move data sets from any restricted categories to full and open sharing status.**

GEOSS planners, following U.S. leadership, should be urged to take the view that part of the GEOSS charge is to expand, over time, the range of data types that are freely shared internationally.

The study participants believe that a negotiation process is the best way to maximize the amount and types of data that GEOSS member nations will share on a full and open basis. In implementing this process, data types would be categorized according to whether they are: (1) currently being fully shared; (2) not shared because they are highly sensitive or for reasons of compelling national security; or (3) not shared currently, but where sharing is not outside the realm of possibility, i.e., an intermediate sharing category. Attention would then focus on negotiations – an exploration of what actions might be taken to convince member nations to move data sets in this intermediate category into the “fully shared” category.

There is a strong likelihood that increasing amounts of observations and information will be available to meet all users’ needs, thereby confirming GEOSS data as a “global good” contributing to significantly to economic and social well being of the world’s citizens.



GEOSS is an undertaking of significant international importance. GEOSS can only succeed if the U.S. effectively implements IEOS. Long-term, global scale observations of the components of the Earth system have long been the goal of the Earth science communities. As a result, IEOS and GEOSS have captured the attention and support of those communities.

The issues that are the focus of this study must be resolved if the long-term vision of systematic observation of the Earth system is to be fully realized. In addition to enabling implementation of IEOS and GEOSS, resolution of these issues could lead to a new era of global cooperation that will steadily expand the community of effective users of Earth system information resulting in ever-greater benefits for humanity.

The American Meteorological Society (AMS), as the leading atmospheric and related sciences professional society, is very pleased to have been the organizer of this study. The Atmospheric Policy Program of the AMS would be pleased to assist in the implementation of the study recommendations.

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