

Strategic Guidance for Current and Potential Contributors to GEOSS

Contributing to and Benefiting from GEOSS

Purpose of this Document: This document answers strategic questions for current or potential contributors of GEOSS systems, from the perspective of high-level systems architecture and data management. A companion 'Tactical Guidance' document provides more technical information for managers and implementors of systems, data centres, etc. For additional information about GEO and GEOSS, see <http://earthobservations.org>

What is the Global Earth Observations System of Systems (GEOSS)?

As a “system of systems”, GEOSS is composed of contributed Earth Observation systems, ranging from primary data collection systems to systems concerned with the creation and distribution of information products. Although all GEOSS systems continue to operate within their own mandates, GEOSS systems can leverage each other so that the overall GEOSS becomes much more than the sum of its component systems. This synergy develops as each contributor supports common arrangements designed to make shared observations and products more accessible, comparable, and understandable.

How is GEOSS managed by the Group on Earth Observations (GEO)?

GEOSS is overseen by the Group on Earth Observations (GEO), an intergovernmental organization at the ministerial level. The GEO vision is to realize a future wherein decisions and actions for the benefit of humankind are informed via coordinated, comprehensive and sustained Earth observations and information. This vision follows from international recognition that the data and information associated with Earth Observations are crucial to enhancing human health, safety and welfare, including poverty reduction, environmental protection, disaster loss reduction, and sustainable development achievements. Associated international Summits include:

- the United Nations Millennium Summit in September 2000 set goals to address the world's main development challenges;
- the World Summit on Sustainable Development in September 2002 agreed on increased use of Earth observation to support sustainable development and to address major issues such as climate change, water resource management, disaster management and environmental protection; and,
- the G8 Summit in June 2003 called for strengthened international co-operation on global observation, including development of strategies and an implementation plan.

GEO was created through a series of Earth Observation Summits, starting in July 2003. By February 2005, GEO had established the GEOSS 10-Year Implementation Plan and Reference Document, describing how GEO will: achieve comprehensive, coordinated, and sustained Earth observations; assist developing countries to contribute to and

benefit from Earth observations; and promote full and open exchange of Earth observations. The GEOSS 10-Year Implementation Plan is updated periodically. The Earth Observation Summit in November 2007 will focus on implementation progress.

As of October 2007, GEO includes 71 Member countries, the European Commission, and 46 Participating Organizations (the current list is online at <http://earthobservations.org>). Any member State of the United Nations may become a GEO Member. Subject to approval by GEO Members, any intergovernmental, international, or regional organization with a mandate in Earth observation or related activities may become a GEO Participating Organization. All GEO Members and Participating Organizations must formally endorse the GEOSS 10-Year Implementation Plan. (The GEOSS 10-Year Implementation Plan and its associated Reference Document are available online at <http://earthobservations.org>)

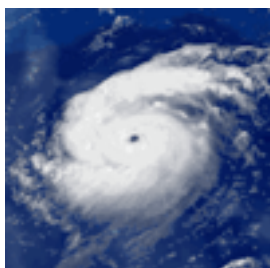
What is the scope of GEOSS?

By virtue of its contributed components systems, GEOSS aspires to encompass all areas of the world, and to include all manner of observations, whether space-based, airborne, or in situ. In its promotion of capacity-building in Earth observation, GEOSS will build on existing local, national, regional, and international initiatives.

GEOSS will be primarily focused on issues of regional and global scale and on cross-sector applications, while also facilitating the operation and enhancement of Earth observing systems that are focused on national, local, and sector-specific needs. In this context, investments in Earth observations worldwide certainly exceed tens of billions of dollars per year. Those investments already yield substantial societal benefits, but those benefits will be increased through the collective actions enabled by GEOSS.

At present, GEOSS Implementation is concentrating on nine areas of societal benefits:

- Reduction and Prevention of Disasters
- Human Health and Epidemiology
- Energy Management
- Climate Change
- Water Management
- Weather Forecasting
- Ecosystems
- Agriculture
- Biodiversity



How will GEOSS help to Realize Societal Benefits?

The GEOSS 10 year Implementation Plan and Reference Document is the guiding document concerning how GEOSS will achieve the envisioned societal benefits. Working with the communities who are already active in each of the nine societal benefit areas, GEOSS implementors will cooperate in identifying user needs, defining observation requirements, and implementing coordinated systems. In some areas, the initial focus may be on cooperative efforts at defining requirements. In other areas where common requirements are already well characterized, the initial focus may be on data sharing and the joint exploration of future technologies. Such tailored approaches can be seen in the 2-year, 6-year and 10-year targets given in the GEOSS 10 year Implementation Plan.

One example is the GEOSS societal benefit area labeled “Reduction and Prevention of Disasters”. Here, the delivery of timely and accurate information on hazards and conditions in threatened areas is of prime importance throughout the disaster cycle: from prevention and preparedness through response, recovery, and mitigation. GEOSS can help ensure that crucial observational data from very different sources is available, can be brought together effectively, and can be integrated with predictive models. GEOSS has targeted efforts to promote needed observational systems, enhance data

sharing, and promote common data assimilation techniques, among other activities.

The societal benefit area labeled “Water” provides a different example of how GEOSS will help to realize benefits. The World Summit on Sustainable Development articulated a plan to establish integrated water resources management to cover issues including flood and drought, agriculture, ecosystem, health, and energy. Targeted activities in GEOSS implementation will help to bridge between global observational information and local information, and to facilitate moving successful research into operational use. GEOSS activities will also promote recognition of common issues at regional scales and the understanding of natural and anthropogenic effects. These and other targeted GEOSS activities will enhance watershed information availability that is so important for the understanding and management of basins and subsequent realization of societal benefits.

It can be seen that GEOSS acts in multiple roles to help realize the envisioned benefits. GEOSS has a role in: enhancing observation systems worldwide, expanding spatial and temporal coverage of observations; coordinating the integration and modeling of observational data, leading to more accurate and useful information and predictions; and, coordinating among the nine societal benefit areas, promoting more effective sharing of data and information across very different communities.

The realization of societal benefits is an important focus for GEO, and will be addressed through demonstration projects using the GEOSS common architecture in concert with global observations and local applications in solving real-life issues across the various societal benefit areas. The success of such demonstration projects, even those of fairly modest scale, are as crucial to the success of GEOSS as are the overarching GEO vision and the GEOSS interoperability arrangements.

What kinds of systems are already encompassed within GEOSS?

The overall GEOSS is a federated system that grows ever more useful over time as its constituent GEO Members and Participating Organizations link their contributed GEOSS components together. (GEO itself operates none of the components of GEOSS, other than a Web site and certain administrative facilities.) The components already contributed by GEO Members and Participating Organizations can be grouped in the following broad categories:

- Components to acquire observations: based on existing local, national, regional and global systems to be augmented as required by new observing systems;
- Components to process data into useful information: recognizing the value of modeling, integration and assimilation techniques as input to the decision support systems required in response to societal needs; and
- Components required to exchange and disseminate observational data and information: including data management, access to data, and archiving of data and other resources.

What are the benefits of contributing a system to GEOSS?

Many benefits can be expected by an organization that contributes a system to GEOSS. Among these are the following:

- the data and information used or produced by a contributed system can more easily shared with data and information supported by other systems, resulting in improved products and services or wholly new cross-system synergies or discoveries;
- the association of related systems through GEOSS enables collective optimization of observational strategies and cooperative gap filling, leading to coverage and continuity improvements for data that otherwise may be addressed inadequately;
- contributing a system to GEOSS enables the potential sharing of costs for data collection, processing, distribution, archiving, and other common expenses;
- a GEOSS contributed system gains worldwide exposure to potential users of the products and services offered;
- a GEOSS contributed system gains worldwide exposure to potential collaborations that could enhance system products, services, performance, or other aspects;
- association with GEOSS enables the contributor to draw upon the world-class expertise in Earth Observations and

- automated systems represented by the extensive network of GEO Members and Participating Organizations;
- systems contributed to GEOSS typically gain enhanced interoperability based on open, international standards; and,
 - countries and Participating Organizations that actively participate in GEOSS cooperate in capacity-building to contribute and exploit Earth observation data and information, thereby enhancing the applications that yield benefits to their societies, especially in developing countries.

What are the requirements for contributing a system to GEOSS?

Systems intended to become GEOSS Components can only be contributed by GEO Members or Participating Organizations, and each of them must have endorsed the GEOSS 10-Year Implementation Plan. A key part of that Implementation Plan are the GEOSS Data Sharing Principles: “There will be full and open exchange of data, metadata, and products shared within GEOSS, while recognizing relevant international instruments and national policies and legislation. All shared data, metadata, and products will be made available with minimum time delay and at minimum cost. All shared data, metadata, and products for use in education and research will be encouraged to be made available free of charge or at no more than the cost of reproduction.”

Technical requirements on contributed systems from a systems architecture and data management perspective are known as “interoperability arrangements”. At minimum, any new GEOSS Component is understood to be bound by the GEOSS interoperability arrangements as documented at the time it was contributed. As stated in the GEOSS 10-Year Implementation Plan and Reference Document:

The success of GEOSS will depend on data and information providers accepting and implementing a set of interoperability arrangements, including technical specifications for collecting, processing, storing, and disseminating shared data, metadata, and products. GEOSS interoperability will be based on non-proprietary standards, with preference to formal international standards. Interoperability will be focused on interfaces, defining only how system components interface with each other and thereby minimizing any impact on affected systems other than where such affected systems have interfaces to the shared architecture.

GEOSS interoperability arrangements are to be based on the view of complex systems as assemblies of components that interoperate primarily by passing structured messages over network communication services. By expressing interface interoperability specifications as standard service definitions, GEOSS system interfaces assure verifiable and scaleable interoperability, whether among components within a complex system or among discrete systems.

In the system of systems adopted by GEO, virtually all the operational infrastructure is provided through contributions by GEO Members and Participating Organizations. This includes certain components that are common across the whole of GEOSS. For instance, the GEOSS Clearinghouse provides registry services with: a description of each of the formally contributed components of GEOSS; metadata about the various data and information holdings in each of the contributed components; technical specifications for using the services exposed by the contributed components; and, descriptions of key interoperability standards in use across the contributed components of GEOSS.

The process of contributing a system to become a part of GEOSS begins by registering it as a ‘GEOSS Component’ through the online registration form. If the system has public service interfaces, these also should be registered. The contributed system and service interfaces are then catalogued by the GEOSS Clearinghouse for discovery and access.