



GROUP ON
EARTH OBSERVATIONS

GEO-VI

17-18 November 2009

Implementation Guidelines for the GEOSS Data Sharing
Principles

Document 7(Rev2)

As accepted at GEO-VI

Implementation Guidelines for the GEOSS Data Sharing Principles

According to the Global Earth Observation System of Systems (GEOSS) *10-Year Implementation Plan*, the purpose of GEOSS 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.” GEOSS is seen by its participants as an important contribution to meeting the United Nations Millennium Development Goals and to furthering the implementation of international treaty obligations. The system will encompass all areas of the Earth and will benefit a broad range of user communities, including managers and policy makers, scientific researchers, civil society, governmental and non-governmental organizations, international bodies, and developing country users. GEOSS will incorporate *in situ*, seaborne, airborne, and space-based observations and address the interoperable integration of observations and models to support nine societal benefit areas.

The GEOSS *10-Year Implementation Plan* explicitly acknowledges the importance of data sharing in achieving the GEOSS vision and anticipated societal benefits. The Plan, endorsed by nearly 60 governments and the European Commission at the 2005 Third Earth Observation Summit in Brussels, highlights the following GEOSS Data Sharing Principles:

- **There will be full and open exchange of data, metadata and products shared within GEOSS, 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 being free of charge or no more than cost of reproduction will be encouraged for research and education.**

All members of GEO—whether existing ones or new—are required to endorse the Plan and therefore these Principles.

At the same time, it is important to underscore the fact that GEOSS is composed of voluntarily contributed systems and data, which are governed by pre-existing laws, policies and practices that may not be fully compatible with the Principles. The association of GEO Members and Participating Organizations and thus their adherence to the Data Sharing Principles are not legally binding. The Principles will gain acceptance and importance through good-faith voluntary adherence, which may also be accompanied by legal and policy changes at the national or international levels. GEO welcomes all data contributions into the GEOSS. When registering data in GEOSS, the contributor should present any restrictions arising from relevant international instruments and national policies and legislation, and the duration of each restriction, that is applicable to the exchange of the data, metadata and products submitted.

In 2006, the GEO Secretariat requested the Committee on Data for Science and Technology (CODATA), an interdisciplinary committee of the International Council for Science (ICSU), to recommend implementation guidelines for the GEOSS data sharing principles and to draft an accompanying background white paper that helps to explain and substantiate these *Implementation Guidelines*. The GEO-V Plenary agreed to expand the effort and to establish a Data Sharing Task Force, led by Member governments, to support GEO to reach a consensus on the practical steps to implement the GEOSS data sharing principles. Based on the analysis of the relevant GEOSS documents, applicable international agreements and practice, on extensive consultation with experts on data policy from around the world, and on its own deliberations, the GEO Data Sharing Task Force proposes these *Implementation Guidelines* for further consideration by GEO Members and Participating Organizations in implementing the GEOSS Data Sharing Principles.

It is important to emphasize that the successful implementation of the Data Sharing Principles will depend upon successfully promoting the benefits of full and open access to GEOSS data through a process that engages directly both data providers and data users, including their respective contributions and perspectives. Moreover, it should be recognized that GEOSS is a dynamic system in a continual state of development and evolution. Therefore, as new observing systems and data types are deployed and the world in which they are operating changes, it may become necessary to revise these *Implementation Guidelines* on a periodic basis and not view them as immutable.

Promoting the implementation of the principle of full and open exchange of data, metadata and products in accordance with the GEOSS Data Sharing Principles.

1 FOR GEOSS TO REALIZE ITS VISION AND POTENTIAL, IT IS ESSENTIAL TO PROMOTE THE FULL AND OPEN EXCHANGE OF DATA, METADATA AND PRODUCTS IN ACCORDANCE WITH THE DATA SHARING PRINCIPLES.

GEOSS is envisioned as a system of systems that can deliver integrated data and information according to the timescale required to meet important user needs, particularly as reflected in the GEO Work Plan. Therefore, it is important that the component systems of GEOSS interoperate seamlessly with each other and with the fewest possible constraints on the sharing and integration of needed data and information (i.e., metadata and data products). To achieve this, it is vital for data and information providers who share the goals of GEOSS to participate actively in the system and to implement, at the very least, the minimum set of technical and policy requirements that have been identified by GEO for data and system interoperability.

The GEOSS Data Sharing Principles use the term “full and open exchange” of data, metadata and products as the guiding policy, which has been used in various public international and national environmental projects and research over the past two decades. In this context, full and open exchange means that data, metadata and products made available through the GEOSS are made accessible with minimal time delay and with as few restrictions as possible, on a nondiscriminatory basis, at minimum cost for no more than the cost of reproduction and distribution. By adhering to the GEOSS Data Sharing Principles, system operators and other providers allow those data, metadata and products that they contribute to GEOSS to be shared under clear, predefined terms, consistent with these Principles and Implementation Guidelines.

To engage the GEO Community in implementing the Data Sharing Principles, the emphasis should be on promoting the benefits of full and open access to GEOSS data through a process that engages directly both data providers and data users.

Enabling GEOSS users to reuse and re-disseminate shared data, metadata and products.

2 THE FULL AND OPEN EXCHANGE OF DATA CALLED FOR IN THE DATA SHARING PRINCIPLES SHOULD APPLY TO GEOSS DATA, METADATA AND PRODUCTS EVEN AFTER SUCH SHARED INFORMATION IS DISSEMINATED TO USERS. USERS NEED TO BE ABLE TO INTEGRATE, REUSE, AND RE-DISSEMINATE THE SHARED INFORMATION WITH MINIMAL RESTRICTIONS IN ORDER TO ACHIEVE MAXIMUM RESULTS IN THE GEOSS SOCIETAL BENEFIT AREAS.

A literal reading of the GEOSS Data Sharing Principles could lead to the interpretation that the “full and open exchange of data” applies only to data when they exist “within GEOSS” itself, i.e., prior to delivery to all other potential users. This interpretation might allow GEOSS providers to impose constraints on the integration, reuse, and re-dissemination of data and information discovered and

accessed via GEOSS. Such constraints, however, would drastically reduce the utility of GEOSS to users and therefore significantly diminish the societal benefits intended to be realized by GEOSS. Because the value of data lies in their use, the users of GEOSS data would therefore need the flexibility to reuse and re-disseminate the resulting shared information in order to maximize their own uses, as well as the relevant secondary applications of such data and information for the broad societal benefits.

For example, data, metadata and products needed for immediate humanitarian assistance after a natural disaster may also be vital to recovery and reconstruction efforts that are undertaken by a wide variety of both governmental and nongovernmental organizations. Constraints on integration, reuse, and re-dissemination by GEOSS providers for non-commercial, public use for societal benefit would drastically reduce the utility of GEOSS to users and therefore significantly diminish the societal benefits intended that can be realized by GEOSS.

2.1 GEO should encourage governmental, public-sector organizations to register and provide robust and well-understood data, metadata and products in the GEOSS, without any reuse or re-dissemination restrictions on this data and information.

Many countries already have made commitments through their national laws and policies and in international agreements to provide open and unrestricted availability for data, metadata and products from various government-operated systems. By encouraging all publicly funded contributors of GEOSS elements to provide full and open access to their data, metadata and products without reuse or re-dissemination restrictions, GEO will ensure the critical mass of digital resources needed to make GEOSS an invaluable resource to the world. GEOSS' full potential can only be fully exploited if all needed data are readily available via electronic networks. Where reuse and re-dissemination restrictions are regarded as advantageous to protect against misuse or alteration, GEO Member States and Participating Organizations are encouraged to respond to upcoming recommended solutions made by the GEO Data Sharing Task Force (see 3.a.)

2.2 To meet the full range of user needs identified as priorities by GEO, private-sector or hybrid public-private systems, or public-sector organizations that are partly publicly funded, should be encouraged to contribute at least a useful subset of their data and products on a full and open basis, with minimum restrictions as to reuse and/or re-dissemination.

It is in the interest of all GEOSS components and participants to ensure that the range and use of GEOSS data continues to expand, including in developing countries. Providing usable subsets of shared information without reuse or re-dissemination restrictions from private or public-private data systems will not only help demonstrate the value of those digital resources to existing and potential users, but could also provide incentives for governments or other organizations to contribute new elements to GEOSS.

2.3 Attribution requirements should include recognition of all significant data sources or authors, as well as the GEOSS component that enabled access to and delivery of the data.

Recognition is needed not only for the GEOSS participants that delivered data, metadata and products to a user, but also to the original data sources or authors, in order to provide greater incentives for such contributions. Recognition of contributions through attribution will help provide incentives to participate in GEOSS, in accordance with the Data Sharing Principles.

Ensuring consistency in the implementation of the GEOSS Data Sharing Principles with relevant international instruments and national policies and legislation.

3 MANY GEO MEMBERS AND PARTICIPATING ORGANIZATIONS HAVE VARIOUS SPECIFIC RESTRICTIONS ON THE DISSEMINATION AND USE OF CERTAIN DATA, METADATA AND PRODUCTS BASED ON INTERNATIONAL INSTRUMENTS AND NATIONAL POLICIES AND LEGISLATION. SUCH RESTRICTIONS PERTAIN MAINLY TO CONCERNS REGARDING THE PROTECTION OF: NATIONAL SECURITY, FINANCIAL VIABILITY, PROPRIETARY INTERESTS, PRIVACY, CONFIDENTIALITY, INDIGENOUS RIGHTS, AND CONSERVATION OF SENSITIVE ECOLOGICAL, NATURAL, ARCHAEOLOGICAL, OR CULTURAL RESOURCES.

Many GEO Member States and Participating Organizations have reuse and re-dissemination restrictions based on legitimate concerns of data misuse or alteration. All participants in GEOSS are required to respect their national laws and policies and relevant international agreements in providing access to all of their data, metadata and products.

3.1 GEO Members States and Participating Organizations with reuse and/or re-dissemination restrictions based on legitimate concerns of data misuse or alteration should be encouraged to implement a more enabling data sharing culture, reviewing and wherever possible revising restrictive policies, as practical solutions to these barriers are found.

With regard to concerns of data misuse or alteration, user risk related to the use, or misuse, of the data due to limitations, inaccuracies, systematic errors, omissions, or lack of adequate data for usage still exists. As actions are developed to ensure that the identified risks associated with the reuse and/or re-distribution of data are minimized and eliminated, GEO Members should be encouraged to revise data policies that impose such restrictions. The GEO Data Sharing Task Force is undertaking actions to ensure that these data can continue to be accessed, understood, and used in an appropriate way by non-specialists while allowing more ready availability via the electronic networks. Practical guidance will be recommended as such methods are proved.

Implementing pricing policies consistent with the GEOSS Data Sharing Principles.

4 THE PRICING OF GEOSS DATA, METADATA AND PRODUCTS SHOULD BE BASED ON THE PREMISE THAT THE DATA AND INFORMATION WITHIN GEOSS IS A PUBLIC GOOD FOR PUBLIC-INTEREST USE IN THE NINE SOCIETAL BENEFIT AREAS.

GEO, TOGETHER WITH ITS GEOSS DATA PROVIDERS, SHOULD WORK TO SET STANDARDS FOR THE FULL AND OPEN EXCHANGE OF DATA BASED ON THIS PREMISE, WITH THE ONLY ALLOWABLE COST FOR DATA BEING EITHER THAT OF REPRODUCTION AND DISTRIBUTION, OR THE MARGINAL COST OF FULFILLING THE USER REQUEST.

For GEOSS to achieve its desired vision, barriers to the full and open exchange of data must be effectively eliminated. The costs of access to the information shared through the system therefore needs to be free, or as low as possible for the widest possible range of users.

4.1 The costs of data collection and system development and integration into GEOSS should be considered a previously incurred cost and, when possible, should not be included as part of cost recovery.

The default price for data under the principle of full and open exchange is the cost of reproduction and distribution to the user, or the marginal cost of fulfilling the user request. GEO Members and

Participating Organizations should be willing to develop, implement, and integrate their GEOSS components using their own resources. All organizations contributing to GEOSS should recognize that they receive direct and indirect benefits from participating in the system, such as the ability to seamlessly integrate their own data with data provided by a range of other sources.

4.2 Metadata should generally be made available openly at no cost, to enable users to discover sources of data and information without restriction.

Metadata (descriptive documentation of the primary data set) are essential to making GEOSS function effectively as a system of systems and to ensuring that all GEOSS data and information are fully accessible on a non-discriminatory basis to all users. Charging for access to metadata would constrain many potential users from discovering useful data and information that might be of significant value to them. Implementing a system that identifies users for charging purposes also increases the complexity of development and will likely increase the costs to GEOSS.

4.3 Where required, GEO should encourage development of flexible, online cost recovery mechanisms that allow different types of users to understand their access costs.

As the diversity and volume of resources and services offered by GEOSS increase, users will have more choices of types and sources of shared information to address their needs. For example, they may need to choose between access to cost-free data, which they may need to process themselves, or to value-added information or services, for which charges may apply, but which can save them time or effort. They may face tradeoffs between the higher costs of high resolution data vs. cost-free or low-cost low resolution data, between more processed quality-controlled data vs. raw data, or between real-time vs. near real-time or historic data. Some users may need to obtain data without re-dissemination or reuse restrictions, whereas others may be willing to live with restrictions in return for lower costs.

To facilitate these decisions, it is important for GEO to explore implementation of online cost recovery mechanisms similar to those now common on the Internet in industry. Such systems should greatly reduce the transaction costs for cost recovery and provide users with much more detailed and accurate information on the costs of accessing alternative data, metadata and products available through GEOSS.

4.4 For developing country users and for applications for non-commercial, public use for societal benefit, which are not covered by the research and education Data Sharing Principle, cost recovery should preferably be waived, or at least be no more than the cost of reproduction and distribution.

The existing infrastructure for data delivery over the Internet favors users in developed countries who typically have ready access to relatively low-cost and high-bandwidth connections, over those in developing countries, who have limited or expensive connectivity and who are therefore faced with higher costs of access to or delivery of data. GEO needs to work at a technical level to help equalize the accessibility of shared information to users in developing and developed countries, as well as structuring cost recovery models that facilitate and promote uses of GEOSS data that specifically address developing country problems, or users based in developing countries. For example, since the cost of fulfilling a user order is more likely to be driven by the complexity of the order rather than the volume of data delivered, cost-recovery charges should be based on the characteristics of an order rather than the volume of data (number of bytes) delivered. Moreover, where possible, GEO members should explore ways to waive or minimize costs for developing country uses and users, e.g., through direct subsidies or recognition of in-kind contributions to GEOSS. The transfer of appropriate technology also should be strongly encouraged to facilitate access of developing countries to data, metadata and products, and for them to benefit fully from GEOSS.

4.5 Approaches to cost recovery and licensing of data, metadata and products contributed to GEOSS that do not require payment for re-use of data, metadata and products already acquired by users should be encouraged.

One approach to cost recovery outside GEOSS is to reduce the payment for delivery and initial use of data, and then restrict further use unless additional payments are made. Although this approach may make initial use of data outside the GEOSS framework more economical for some users, it restricts broader reuse of data by the initial user and secondary users. It also discourages collaborative arrangements by users to purchase and share data flexibly, contrary to the purpose and intent of the GEOSS Data Sharing Principles. Remembering that the purpose of GEOSS 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”, such restrictions should be actively discouraged.

Data that may have a high (commercial) value immediately after it is acquired can often rapidly lose its value as time passes. However, such data may still have, for example, a high "scientific value". So any implementation of pricing policies should be flexible to ensure that the current value of the data is properly reflected.

Reducing the time delays for making data available through GEOSS.

5 GEO SHOULD PROMOTE “MINIMAL TIME DELAY” TO DATA WITHIN GEOSS, DEPENDING ON THE TYPE OF DATA AND APPLICATION AND THE NEED FOR APPROPRIATE QUALITY CONTROL, AND DATA SHOULD BE TRANSMITTED ON A REAL-TIME BASIS WHENEVER NECESSARY OR PRACTICABLE.

Some types of GEOSS data applications, such as disaster warnings, will depend on rapid access to data, metadata and products. Maximizing the potential societal benefits of GEOSS in many cases will require minimizing the time delays in providing data and information through GEOSS to users.

5.1 For operational systems, quality control procedures should not introduce unnecessary time delays.

In general, operational systems deliver relatively well-defined and understood data on key environmental or other parameters. In most cases, automated quality control procedures can minimize time delays in data delivery.

5.2 For research data, time delays may need to include a limited period of quality control and exclusive use by the data provider. These time delays should nevertheless be minimized.

Research data systems often deal with prototype instruments or experimental parameters, that may be less well understood than those supported by operational systems and that may be subject to more frequent or serious quality control problems. Some delay may therefore be necessary for the preparation of metadata and quality control procedures. In the case of the introduction of new research data (e.g., from a new instrument) into an existing GEOSS component, a period of restricted access on the part of the research or instrument team may be needed. Such periods should be kept to the shortest reasonable level, reflecting the normal practices of scientists and data managers responsible for similar systems or data production activities.

Promoting research and education uses of GEOSS data, metadata and products.

6 GEO SHOULD CLARIFY THE DEFINITIONS OF “RESEARCH” AND “EDUCATION.”

Ideally, such definitions would be focused on the planned use of the information shared through GEOSS, rather than the status of the user. Many different types of organizations are increasingly involved in research and education in both developed and developing countries, including various commercial, for-profit organizations, nongovernmental organizations, and governmental and intergovernmental agencies. Not-for-profit academic institutions may conduct research on behalf of for-profit firms that do not release the results for public use, whereas many for-profit organizations perform research and educational activities on behalf of governments for the public good. Thus, the institutional affiliation of the user is not necessarily a good indicator of the use of GEOSS data, metadata and products (and related services) by the user.

Instead, GEO should define the types of research and education that are to be given preferential treatment in GEOSS, e.g., publicly funded research or research that leads to openly available results. Education should at least encompass all classroom and online educational activities, but whether or not the GEO principle on research and education should apply to educational and scientific publishing is an important policy issue that the GEO community should explicitly consider.

6.1 Recognizing that shared data, metadata and products for research and educational activities (and for support of developing country users and applications for non-commercial, public use for societal benefit, consistent with section 4.d) should ideally be free of charge, or at most no more than the cost of reproduction, then any cost reductions granted by data providers to fulfill these conditions should, wherever possible be documented.

GEO should as much as possible inform users about the costs of the data and information they obtain, including any cost reductions provided for research and educational activities or for developing country applications. This will educate users about the costs they should expect when they move from educational and research applications to other operational applications. Tracking aggregate cost reductions for research, education, and developing country applications is also one important element in demonstrating to governments and other sponsors the continuing value of GEOSS in terms of its impact on capacity building.

6.2 Users receiving data at reduced or no cost should be strongly encouraged to provide impact metrics and information regarding their use of the GEOSS data, metadata and products.

A second element in demonstrating the continuing value of GEOSS is to document the impacts of GEOSS data, metadata and products in diverse arenas, including science, education, and development. Users who benefit from utilising GEOSS at reduced or no cost should be expected to provide in-kind assistance in the form of help in documenting the use and impact of data, metadata and products received.

Annex 1

GEOSS Data Sharing Task Force Terms of Reference

(for information)

1 PURPOSE

The GEOSS Data Sharing Task Force (hereafter referenced as “DSTF”) will support the Group on Earth Observation (GEO) in its objective to reach a consensus at its 2010 Ministerial Summit on the practical steps to implement the GEOSS Data Sharing Principles. This reconfirms the Cape Town Declaration that “the success of GEOSS will depend on a commitment by all GEO partners to work together to ensure timely, global and open access to data and products.”¹

2 OBJECTIVES

The DSTF is convened to:

- Submit an updated draft of *Implementation Guidelines for the GEOSS Data Sharing Principles* to Plenary 2009;
- Interact with GEO Committees and Task Teams on their data sharing opportunities and needs and work to promote harmonization of data sharing procedures consistent with the Data Sharing Principles;
- Prepare an action plan to implement the Data Sharing Principles and to enable the development of working procedures for data sharing within GEOSS;
- Produce documentation (including assessments on the actions to be taken; some representative costs and benefits; and, responsibilities for the proposed data sharing processes) to support adoption of the *Implementation Guidelines* and the action plan by the 2010 GEO Ministerial Summit.
- Consider possible recommendations to improve the principles for data sharing within GEOSS.

3 MEMBERSHIP AND WORKING ARRANGEMENTS

- The DSTF shall be composed of individuals named by GEO Members and Participating Organizations, with administrative support provided by the GEO Secretariat.
- Chairmanship or co-chairmanship of the DSTF shall be decided by the DSTF.
- Specific research work or investigations may be assigned by the DSTF to sub-teams of individual experts to address identified issues at the appropriate level of detail and professional expertise.
- Work milestones will be identified and tracked through delivery of reports and recommendations to the appropriate GEO bodies.
- The DSTF will run from 27 May 2009 through the 2010 Ministerial Summit.

¹ *Cape Town Declaration*, adopted at the GEO Cape Town Ministerial Summit, 30 November 2007.