

GEO 2009-2011 WORK PLAN

Version 1

Submitted for Technical Review

(please send comments by 8 August 2008 to secretariat@geosec.org)

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Introductory Note

This first version of a new three-year GEO Work Plan for the period 2009-2011 was prepared with the support and guidance of the GEO Executive Committee and the four GEO Committees. As described below, a number of changes have been made to the structure and approach to reflect the evolution of GEOSS since the start of the 2007-2009 Plan.

How the Work Plan format has changed

This first version of the 2009-2011 Work Plan incorporates the comments and proposals received from the GEO community during the period April to June 2008. These inputs were based on a set of written guidelines reflecting the GEO-IV and Cape Town Ministerial Summit conclusions about how the Work Plan should evolve (see Annex I).

The proposed 2009-2011 Work Plan differs from its 2007-2009 predecessor in three main ways: (i) it groups the Tasks into two thematic parts; (ii) it consolidates GEO activities under a smaller number of overarching Tasks; and (iii) it enhances the role of Communities of Practice and former IGOS themes. In addition it features “spider diagrams” to illustrate and emphasize how Tasks cut across the Societal Benefit Areas (SBAs).

1 – A two-part structure. The 2009-2011 Work Plan has been structured into two major parts to offer a clearer overview of GEO activities. Part I, “A Transverse GEOSS”, highlights how the fundamental, cross-cutting components of GEOSS, such as the GEOSS Common Infrastructure, are being built. Part II, “The nine GEOSS Societal Benefit Areas”, describes the services and end-to-end systems that will support decision-making in each of the Societal Benefit Areas. These two parts are intimately linked and fully complementary; they can be seen as representing the two faces of the GEOSS coin.

2 – A smaller number of overarching Tasks. Adhering to the guidelines cited above, the 2009-2011 Work Plan seeks to emphasize the added value that GEO brings to Earth observation. It does this by merging or linking related Tasks and activities and grouping them into just 36 overarching Tasks (compared with 73 Tasks in the current Plan). To facilitate practical implementation, many of the overarching Tasks are sub-divided into sub-tasks, each with its own Lead, Point of Contact and reporting Task Sheet. Details of how the 2007-2009 Tasks have transitioned into the new 2009-2011 Work Plan may be found in Annex II.

3 – An enhanced user-driven approach. The proposed 2009-2011 Work Plan takes full account of the transition of IGOS themes into GEO: Atmospheric Chemistry (IGACO), Global Carbon Cycle (IGCO), Geohazards, Coastal Areas, Cryosphere, Land (IGOL), Ocean, and Water cycle (IGWCO). Some themes, such as Geohazards, have decided to become a GEO Community of Practice. Others, such as Water Cycle and Atmospheric Chemistry, are in the process of doing so and, for now, still retain their identity as themes. In GEO terms, a “theme” is a “community”, with the users and providers of Earth observations working together to define and implement end-to-end applications based on observations. The transition should mark the start of a reinvigorated effort to ensure that users are engaged with GEO and that they are actively involved in implementing the Work Plan (see references to Communities of Practice and former IGOS themes throughout the document).

In addition the draft 2009-2011 Work Plan demonstrates the progress being made towards GEOSS by detailing the cross-cutting dimension of the Tasks described in Part II. “Spider-web” diagrams make it possible to visualize the general relevance of each Task to all nine SBAs – Disasters, Health, Energy,

Climate, Water, Weather, Ecosystems, Agriculture and Biodiversity. The relevance to each Societal Benefit Area is graded from a minimum of 0 to a maximum of 5. The Tasks in Part I are transverse and are therefore by definition relevant to all SBAs.

Taken together, these changes to the Work Plan approach should make the vision of a cross-cutting and user-driven GEOSS clearer for all contributors and participants. By making the linkages between Tasks and components explicit, this more focused approach seeks to bring the 10-Year GEOSS Implementation Plan for 2005-2015 closer to realization.

The Role of the GEO Committees

In June 2008, Co-Chairs representing the four GEO Committees (C4) considered the need to update the responsibilities and functions of the Committees in supporting and monitoring the implementation of the Work Plan. The C4's initial views are summarized below as a starting point for further strengthening of the Committee's role.

The four Committees are different in nature. In particular, the Architecture and Data Committee (ADC) has a clear mandate to directly oversee the implementation of architectural Tasks. It also provides guidance and reviews progress on other Tasks.

In addition to reviewing progress on the Work Plan, the Capacity Building Committee (CBC), the Science and Technology Committee (STC) and the User Interface Committee (UIC) focus on ensuring that their specific concerns are reflected in all relevant Tasks. They also support GEOSS implementation through various Committee activities. While these activities are considered essential to ensure the success of GEO Work Plans, they are not reflected as specific Tasks.

Committee activities include:

- The CBC establishes a process for identifying major capacity-building needs and gaps, defines and fosters an approach for resource mobilization, and develops general capacity-building frameworks and tools. The CBC has already produced a Strategic Document and a Roadmap to guide its work on these activities (both documents are available on the GEO website).
- The STC ensures that a wide range of science and technology communities become increasingly engaged in developing GEOSS, identifies major scientific and technological gaps and sees to it that these gaps are addressed by the Work Plan. The STC has produced a strategic document describing "The Role of Science and Technology in GEOSS" (also available on the GEO website).
- The UIC focuses on engaging user groups in GEOSS and coordinates the identification and definition of user requirements. In particular the UIC is set to establish a process for identifying critical Earth observation requirements common to many GEOSS societal benefit areas, involving scientific and technical experts, taking account of socio-economic factors, and building on the results of existing systems' requirements development processes. In addition the User Interface Committee is the framework within which both the Communities of Practice and the former IGOS themes will continue to perform and it will play a key role in promoting and guiding future progress.

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1 A TRANSVERSE GEOSS

1.1 GEOSS COMMON INFRASTRUCTURE

AR-09-01: GEOSS Common Infrastructure (GCI)

Address the core architectural principles in GEOSS, and provide useful guidelines and tools to GEO Members and Participating Organizations in the establishment and operation of GEOSS.

a) Enabling Deployment of a GEOSS Architecture (former AR-07-01)

This sub-task is led by USA, IEEE and coordinated with the Architecture and Data Committee

Document the GEOSS convergence and interoperability supporting the high-level strategic and tactical guidelines of GEOSS implementation. This implies developing a process for interoperability arrangements including the Standards and Interoperability Forum (SIF) and regional teams, and consensus on linkages of GEOSS components and Spatial Data Infrastructure (SDI). Develop user-driven system-of-systems engineering activities to ensure that the GEOSS reference and functional architecture is appropriately designed. Define and deploy core GEOSS registry infrastructure for GEO Members and Participating Organizations to: (i) commit component systems; (ii) register related resources to GEOSS and (iii) provide consultation to the contributed system facilitator. Address integration and user issues emerging from the initial operating capability of the GEOSS Common Infrastructure (GCI).

b) GEOSS Architecture Implementation Pilot (former AR-07-02)

This sub-task is led by USA, OGC and coordinated with the Architecture and Data, User Interface, and Capacity Building Committees

Lead the incorporation of contributed components consistent with the GEOSS Architecture using a GEOSS Web Portal and a GEOSS Clearinghouse search facility to access services through GEOSS Interoperability Arrangements in support of the GEOSS Societal Benefit Areas. Incorporate GEOSS contributed components into a pilot implementation of the GEOSS Architecture in coordination with Task AR-09-01a. Include relevant information on existing Earth Observation Capacity Building efforts and resources. Provide phased delivery of components to operations sub-task AR-09-01a: with each phase consisting of: architecture refinement based on user interactions; component interoperability testing; and SBA- focused demonstrations.

c) GEOSS Best Practices Registry (former DA-06-09)

This sub-task is led by Japan and IEEE

Establish GEOSS Best Practices Registry by a request for proposals from GEO Members willing to maintain/update the GEOSS Best Practices Registry. The registry should include existing cost-benefit sharing mechanisms and examples (data sharing, cooperative data acquisition, joint development, joint flight, collaborative sciences, etc). It should also include components identified in the Capacity Building Strategy. One example is the Ontology and Taxonomy Registry for GEOSS that will allow GEO Members to get an overview of, and compare/analyze available ontologies and taxonomies (when developing new ontologies/taxonomies, unnecessary overlaps and conflicts will thus be avoided). As appropriate, the ontologies/taxonomies stored in the registry will be developed into standards.

CB-06-04: GEONETCast

This Task is led by China, USA, EUMETSAT and WMO

Establish GEONETCast on a demonstration basis, then evolve to a fully operational global system with cross-cutting data to serve all GEOSS Societal Benefit Areas. To exchange real-time data among regional hubs, EUMETCast and GEONETCast America will redistribute FENGYUNCast data and products to all interested users in Europe and America. Conversely FENGYUNCast will redistribute EUMETCast and GEONETCast America data and products to all interested users in Asia.

Capacity building and user engagement activities, particularly in developing countries will be enhanced. In particular the GEONETCast Training Channel will focus on (i) end-user training on the application of products towards a specific use and the dissemination of such data via GEONETCast; (ii) linking GEONETCast products and product navigator (inside portal) with specific training material; (iii) usage of GEONETCast for training by reception of training material to be used by local trainers; (iv) general dissemination of training material focussed on environmental (GEOSS focus) data will be established.

CB-09-04: Infrastructure Development and Technology Transfer for Information Access

Identify hardware, software and other technology required to access, use and develop Earth observation data, information and products for decision making. Promote technology transfer (in its very broadest sense), and advance infrastructure and information sharing.

a) Open Source Software (former CB-07-01e)

This sub-task is led by Brazil

Encourage the development of open source solutions across/along the Earth observation value chain by building on existing efforts and drawing on networks of OSS developers. As a starting point, use the TerraView and TerraLib platform to encourage the development of open source software for end users dealing with integrated Earth observation and GIS data.

Priorities for 2009 will include: 1) Providing new versions of Spring (Image processing and GIS software for use with CBERS images), TerraView and TerraLib; 2) Developing TerraView and TerraLib training material, courses, tutorials and documentation for both programmers and end-users available (in English) and develop specialized training material for e-learning; 3) Translating into French Interfaces of TerraLib, TerraView and SPRING and tutorials and manuals of TerraLib, TerraView and SPRING.

b) CBERS

This sub-task is led by Brazil

Establish and upgrade the capacity of ground stations with a footprint in Africa to receive, process, store and distribute CBERS imagery. Data will be distributed free of charge to all interested African countries within the footprint of the respective ground stations. Two ground stations have initially been selected to accomplish the sub-task goals: Maspalomas, operated by INTA (Spain), and Hartebeeshoek, operated by CSIR (South Africa). Other possibilities, still requiring further negotiation, are: Matera, in Italy, and Malindi, in Kenya, both operated by ASI (Italy), and Aswan, operated by NARSS (Egypt).

c) SERVIR Expansion

This sub-task is led by USA

Establish SERVIR regional hubs in geographic regions other than Panama (where it was originally established to serve the Meso-American region), starting with eastern Africa. Develop additional SERVIR tools that can provide early warnings of thunderstorms, flash flooding, vector-borne disease; climate prediction mapping; and air quality monitoring. SERVIR is a system that integrates satellite

and other geospatial data for improved scientific knowledge and decision-making by managers, researchers, students, and the general public. The SERVIR system is web-based and makes available previously inaccessible Earth observation data; decision-support tools for interpreting the data; online mapping, and a 3-D, interactive visualization of the Earth. It is being used to monitor the weather, forest fires, and ecological changes, as well as respond to severe events such as red tides, tropical storms, and flooding.

d) Land-Surface Imaging

This sub-task is led by CEOS

Advocate for the rapid development of a virtual constellation on Land-Surface Imaging (LSI), designed to ensure relevant synergies with High Resolution Multispectral Imager Continuity.

Key related Tasks include: AR-09-01 (GEOSS Common Infrastructure), AR-09-02 (Connecting Observation Systems for GEOSS), DA-09-03 (Global Data Sets), CB-06-04 (GEONetcast), DI-06-09 (Use of Satellites for Risk Management), DI-09-02b (Risk Management for Floods), CL-09-01 (Environmental Information for Decision-Making), HE-09-01 (Information Systems for Health), HE-09-02 (Monitoring and Prediction Systems for Health)

DA-09-01: Data Management

a) GEOSS Data Sharing Principles (former DA-06-01)

This sub-task is led by ICSU and coordinated with the Capacity Building Committee

Invite experts to identify steps required to further the practical application of the agreed GEOSS data sharing principles. Ensure data access for Capacity Building.

b) GEOSS Quality Assurance Strategy (former DA-06-02)

This sub-task is led by CEOS and IEEE

Develop a GEO data quality assurance strategy, beginning with space-based observations and evaluating expansion to in-situ observations, taking account of existing work in this arena.

c) Data, Metadata and Products Harmonisation (former DA-06-04)

This sub-task is led by USA and CEOS and coordinated with the User Interface Committee

Facilitate the development, availability and harmonization of data, metadata, and products commonly required across diverse societal benefit areas, including base maps, land-cover data sets, and common socio-economic data.

d) Radio Frequency Protection (former AR-06-11)

This sub-task is led by WMO

Recognizing the fundamental importance of radio-frequencies necessary for all GEOSS components, in particular in-situ, ground- and space-based observations, as well as the increasing economical and political pressure on corresponding parts of the spectrum, undertake appropriate coordinated advocacy activities in association with Member countries, including representations to the International Telecommunication Union (ITU) and other bodies in charge of frequency management. This also includes a support to GEO Members in influencing their national and regional frequency management bodies. In particular, the case of passive bands, essential for Earth observations, will be monitored with the highest care, endeavouring to assess the potential impact of interference on Earth observation applications and final products. In this respect, it is also important to link with Scientific Committee on Frequency Allocations for Radio Astronomy and Space Science (IUCAF).

1.2 COORDINATED OBSERVATION SYSTEMS

AR-09-02: Connecting Observation Systems for GEOSS

Address the functional and physical connections of observation system components in GEOSS including observing, modelling and information systems.

a) Virtual Constellations (former DA-07-03)

This sub-task is led by CEOS and GTOS

Advocate rapid development of the “CEOS Constellations Concept”. Observations from a virtual constellation would provide better temporal, spatial, and spectral resolution and related data management and dissemination. A series of virtual constellations are in definition by space agencies, in consultation with user communities within the CEOS framework, each addressing key GEOSS observation gaps in the process. Prototype Constellations address:

- Precipitation, which aims to strengthen international cooperation on space-based observations of precipitation, including realisation of the GPM mission and providing guidance to new;
- Land-Surface Imaging (see CB-09-04d);
- Ocean Surface Topography, designed to ensure continuity of Sea Level measurement in accordance with GCOS requirements;
- Atmospheric Chemistry, which will address many of the needs for atmospheric observations of the climate community;
- Ocean Colour Radiometry which will provide scientific data products related to marine ecosystems and ocean biogeochemistry for near-surface global ocean and coastal waters.
- Ocean Surface Vector Winds to collect observations of ocean surface vector winds over the global ice-free ocean that will be used for operational analyses and forecasts, as well as retrospective research.

Other cases, for instance constellations of SAR systems or micro-satellites for a range of Earth observation applications, will be considered along the line.

b) WIS (former AR-07-04)

This sub-task is led by WMO

Upgrade and demonstrate the WMO Information System (WIS) as one operational exemplar of the GEOSS architecture implementation process providing improvements for multiple societal benefit areas.

c) Sensor Web Enablement for In-Situ Observing Network Facilitation (former DA-07-04)

This sub-task is led by South Africa

Foster the development of ground-based sensing networks (with advances in communications technology and ground-based in-situ technologies it is now feasible to consider webs of sensors on all types of platforms with rapid access for observations. This technology has been developed under the names of Sensor Webs and Sensor Networks). Develop scenarios or use cases that demonstrate the value of Sensor Webs to the GEOSS societal benefit areas e.g. Disasters, Health, Biodiversity, Ecosystems and Water. Evaluate the applicable standards and coordinate with AR-09-01 suitable for Sensor Webs.

d) Seismographic Networks Improvement and Coordination (former DI-06-02)

This sub-task is led by China, USA and FDSN

Improve the capabilities of global seismographic networks such as GSN, FDSN, (including regional and global components), GNSS networks and new ocean bottom networks such as VENUS and NEPTUNE. Facilitate sharing of data and event products among GEO members. Expand and coordinate efforts to provide access, using GEOSS interoperability methods, to real time and archived seismological data and products. Develop a portal that will inter-link distributed seismological data centers and provide seamless access to other GEOSS components.

Broaden the scope of this activity to identify and build upon potential synergies across in-situ observing network types (seismological, GNSS, hydrological, etc.). Synergies could range from the use of the same best practices and operational approach, to the use of a common part of the infrastructure for collection and dissemination, and co-location of in situ instruments.

e) Model Web Development

This sub-task is led by IEEE

Develop a dynamic modeling infrastructure (Model Web) to serve researchers, managers, policy makers and the general public. This will be composed of loosely coupled models that interact via web services, and are independently developed, managed, and operated. Such an approach has many advantages over tightly coupled, closed, integrated systems, which require strong central control, lack flexibility, and provide limited access to products.

Key related Tasks include: AR-09-01 (GEOSS Common Infrastructure), HE-09-01 (Information Systems for Health)

AR-09-03: Advocating for Sustained Observing Systems

This Task is supported by the Ocean Theme, the Cryosphere Theme and the Coastal Zone Community of Practice.

a) Key Climate Data from Satellite Systems (former CL-06-02)

This sub-task is led by USA, CEOS, GCOS and WMO

Establish actions securing the provision of key data for climate studies and forecasting from satellite systems.

b) Key Terrestrial Observations for Climate (former CL-06-03)

This sub-task is led by GTOS

Develop intergovernmental mechanisms for coordinating terrestrial observations needed for climate studies and forecasting. Develop a framework for the preparation of guidance materials, standards, and reporting guidelines for terrestrial (including land-coast interface) observing systems for climate and associated data, metadata, and products to expand the comprehensiveness of current networks and facilitate exchange of data.

c) Legacy of the International Polar Year 2007-08 (former CL-06-05)

This sub-task is led by Portugal and WCRP

Coordinate with the International Polar Year (IPY) to enhance the utilization of Earth observations in all appropriate realms (including, but not limited to, sea and land ice, permafrost, coastal erosion, physical and chemical polar ocean changes, marine and terrestrial ecosystem change, biodiversity monitoring and impacts of increased resource exploitation and marine transport). Ensure an

appropriate legacy for IPY projects and advocate for the continuation of relevant efforts beyond the duration of the IPY.

d) Global Ocean Observation System (former CL-06-06)

This sub-task is led by GOOS, IEEE and POGO

Enhance and improve coordination of coastal and marine climate observations in support of a global ocean observation system.

Related activities will include: Improve the global coverage and data accuracy of the climate-monitoring system and coastal/open ocean observing systems, as well as management and archival of the resulting data. Contribute to the implementation of a global coastal and open ocean observing networks using the mechanism of GOOS and Regional Alliances. In particular sustain and extend the network of Argo buoys and encourage the establishment of a Program Office to ensure the ongoing implementation of this global array of profiling floats in the ocean. Finally develop a deep ocean monitoring and profiling system to better to better monitoring the ocean water column.

e) Global Observing System for Weather (former WE-06-01 and WE-06-02)

This sub-task is led by USA and WMO

Achieve a complete and stable surface-based (in-situ and airborne, land and possibly ocean) Global Observing System (GOS). High priority should be given to a stable, and as much as possible automated, fully functional World Weather Watch Upper Air Network and the further development of the Aircraft Meteorological Data Relay (AMDAR) programme. In particular advocate the installation of humidity sensors on commercial aircraft as part of the world wide AMDAR program including the development of a standard suite of AMDAR software for all NMHSs for the different aircraft types. To broaden the system value the integration of a sensor for trace gases should be investigated.

Achieve a stable and improved space-based Global Observing System (GOS) including operational geostationary and polar components. Support WMO efforts related to (i) increased spatial and temporal resolution for geostationary imagers and sounders, (ii) a broader availability of polar Doppler wind profiles for initial operational testing.

Key related Tasks include: AR-09-01 (GEOSS Common Infrastructure), CL-06-01 (Sustained Reprocessing and Reanalysis of Climate Data), CL-09-01 (Environmental information for Decision-Making).

1.3 CROSS-CUTTING DATA SETS

DA-09-02: Data Integration and Analysis

a) Data Integration and Analysis Systems (former DA-07-06)

This sub-task is led by Japan

This Task is to coordinate data management approaches that encompass a broad perspective of the observation data life-cycle – from input to processing, archiving, and dissemination, including reprocessing, analysis and visualization of large volumes and diverse type of data.

b) Meteorological Satellite Observations

This sub-task is led by China

Implement the Chinese Meteorological Satellite Program to monitor global weather and the environment; to provide the users worldwide with the low resolution multiple source observation data; to develop integrated multi-source satellite retrieval products and share to the users; to enhance the capability of the acquirement and the application of Chinese meteorological satellite data and products.

c) Ensemble-Technique Forecasting Demonstrations (former DA-06-03)

This sub-task is led by UK

Facilitate the development of demonstration projects promoting the wider use, in other disciplines, of ensemble-based techniques originally developed for weather forecasting.

d) Global Geodetic Reference Frames (former AR-07-03)

This sub-task is led by IAG

This sub-task has the purpose to ensure the availability of accurate, homogenous, long-term, stable, global geodetic reference frames as a mandatory framework and the metrological basis for Earth observation. Identification of steps towards ensuring consistent, high-accuracy, homogeneous, and long-term stable global geodetic reference frames for Earth observation and the observing systems contributing to GEOSS.

DA-09-03: Global Data Sets

a) Global Land Cover (former DA-07-02)

This sub-task is led by CEOS and GTOS

Implement production of a high-resolution global land-cover change dataset – utilizing global, regional and earlier 1-km resolution land cover data sets. Initiate regular analysis and reporting on land cover change and promulgate the use of these products, especially in developing countries. Activities will benefit directly from the establishment of the Land Surface Imaging virtual constellation (see CB-09-04d).

b) Bio-geophysical & Land Surface Data and Parameters

This sub-task is led by USA, WCRP and IGBP (*to be confirmed*)

Coordinate the collection and distribution of land surface parameter data such as Leaf Area Index (LAI), Fraction Photosynthetically Available Radiation (FPAR) and Net Primary Productivity (NPP) for modelling. Acquire, process, and deliver of biogeophysical and land surface data and parameters

(including LAI, FPAR, NPP and Vegetation Index (VI)) as a service to the global modeling communities. There is a heritage of this type of effort (ISLSCP 1 and 2).

c) Global Phenology Data

This sub-task is led by USA

Coordinate the collection of in-situ phenology observations and expand existing observing networks. Identify and generate satellite-derived phenological/temporal metrics and test models for describing the phenological characteristics of natural and modified ecosystems – so that they might be better monitored using remote-sensing and in-situ techniques. Changes in vegetation phenology impact biodiversity, net primary productivity, species distribution, albedo, biomass and ultimately the global climate.

d) Global DEM (former DA-07-01)

This sub-task is led by Japan and CEOS

Facilitate interoperability among Digital Elevation Model (DEM) data sets with the goal of producing a global, coordinated and integrated DEM. This DEM database should be embedded into a consistent, high accuracy, and long term stable geodetic reference frame for Earth observation.

e) Development of Basic Geographic Data for GEOSS SBAs (former DA-06-05)

This sub-task is led by Japan and ISCGM

Develop document of requirement on basic geographic data for GEOSS social benefit areas through collecting details of needs and gaps between data users and developers.

1.4 CAPACITY BUILDING

CB-09-01: Resource Mobilization (former CB-07-01a)

This Task is led by Spain

Implement the Seville road map on resource mobilization. The goal is to support the implementation of the GEO Capacity Building Strategy by positioning GEO as a coordinated mechanism and broker for mobilizing resources. Through this Task the GEO community will collectively identify priorities and resource needs for addressing human, institutional and infrastructural capacity in Earth observations.

Key related Tasks include: CB-09-03 (Build Institutional Capacity to Use Earth Observations), CB-09-04 (Infrastructure Development and Technology Transfer for Information Access), HE-09-02 (Monitoring and Prediction Systems for Health), WA-06-07 (Capacity Building for Water Resource Management), CL-09-01 (Environmental information for Decision-Making)

CB-09-02: Building Individual Capacity in Earth Observations

Identify education and training opportunities across GEO societal benefit areas. A further objective would be to develop synergies across education and training programmes, encourage cross-fertilization and to address common challenges.

a) Recognition of Cross Border Education and Training in EO (former CB-08-01)

This sub-task is led by Netherlands

Bring together providers of (international and cross-border) capacity building, experts in recognition (credential valuation and accreditation) and governance (quality assurance) of higher education qualifications, and professionals from the Earth-observation and geographical-information sectors, to exchange knowledge and propose potential solutions on the issues of recognition and exchange of cross-border and international education & training products for earth observation.

b) Summer Institute on Climate Information for Public Health

This sub-task is led by USA

Develop a sustainable “Summer Institute on Climate Information for Public Health”. Building on the efforts of the The International Research Institute for Climate and Society (IRI), the Center for International Earth Science Information Network (CIESIN) and the Mailman School of Public Health. The Summer Institute offers public health decision-makers and their partners the opportunity to learn practical methods for integrating climate knowledge and information into health decision-making processes through expert lectures, special seminars, focused discussions and practical exercises.

c) UN-SPIDER/GEOSS Summer Schools on Space-based Solutions for Disaster Management and Emergency Response

This sub-task is led by UNOOSA

Build on activities of GEO Task CB-07-02 (Knowledge Sharing for Improved Disaster Management and Emergency Response), specifically on the establishment and support to regional training and capacity building programmes related to Disaster Management and Emergency Response.

d) Developing the CBERS GEO Capacity Building Network

This sub-task is led by Brazil

Develop and implement a training program for potential African end-users of CBERS images. The programme will focus on the (i) use of freeware and open source geo-processing software such as SPRING and TerraView, and (ii) development of remote-sensing applications using CBERS images. The training program will have an initial focus on users in Lusophone African countries.

e) Games Contest

This sub-task is led by IEEE

Initiate an international contest to create a game that emphasizes the impact of Earth observation on societal conditions. Develop an outcome to work with students and young people through their recreational interest to participate in game playing. The winners will support introduction of the game on a global basis, both into schools and through community organizations.

Key related Tasks include: CB-09-03 (Build Institutional Capacity to Use Earth Observations)

CB-09-03: Build Institutional Capacity to Use Earth Observations

Coordinate, strengthen and sustain existing networks within Earth observation communities as well as facilitate the construction of new networks in order to enhance capacity building.

a) Building National and Regional Capacity (former CB-07-01d)

This sub-task is led by UNEP

Build national capacity in developing countries by enabling human, technical and institutional capacity for coordinating, accessing, using and sharing environmental data, information and services. Develop and implement a participatory model for environmental networking, observing/monitoring, and data and information sharing at the national level. The model will be based on existing national mechanisms. It will include key institutions (data providers and information disseminators), integrating regional and global tools and mechanisms for environmental data and observing systems.

A related focus for this sub-task will be improving in-country coordination among national statistical organisation, remote sensing agencies, environment, forests, wildlife and water related ministries for providing improved access to national environmental data.

b) Establishing Regional Capacity Building Networks

This sub-task is led by Netherlands

Organize and reinforce international capacity building and training opportunity networks in Earth observation sciences & geo-information provision. These GEO training opportunity networks (e.g. GEOTOPS) will include virtual and e-learning based mode of knowledge transfer. A typical operational Capacity Building network in a world region will include key institutions in data provision (e.g. space agencies, a GEONETCast member or data provider) and academic (research-oriented capacity development) and professional higher education institutions and regional centers. Capacity building service delivered by those institutions should be embedded in national higher education systems (accredited, e.g. ects in European Union area), and internationally recognized by professional and/or other bodies. GEO would have a coordination role (using e.g. its web portal capacity building services and GEONETCast system).

CB-09-05: Continuous Capacity Building Needs/Gap Assessment

Engage the user community in identifying their capacity building needs for accessing, using and producing Earth observations for societal benefit. It also aims to fully develop an operational capacity building presence within the GEOSS Common Infrastructure (Task AR-09-01).

a) Identifying Best Practices, Gaps and Needs (former CB-07-01b)

This sub-task is led by the Netherlands

Through the engagement of user and expert networks, build registries and databases of current and planned capacity building activities, best practices, and identified gaps and needs. Best practice examples will include, but not will not be limited to, open-content courses, e- learning material, and downloadable data and products that support capacity building. Develop and disseminate, for each societal benefit area, specific capacity building outreach material reflecting best practices. Enable access to the above through the GEO Web Portal (AR-09-01b) and GEOSS Best Practices Registry (AR-09-01c).

b) Capacity Building Performance Indicators (former CB-07-01c)

This sub-task is led by Germany, Spain and IOC

Develop reliable and widely accepted qualitative and quantitative metrics for measuring (i) the efficacy of Earth observation capacity building programs and (ii) the implementation of GEO capacity building strategy. The development of these metrics will require the engagement of the entire GEO community to ensure buy-in.

c) User Oriented workshops for GEOSS outreach and feedback

This sub-task is led by Netherlands and IEEE

Organize a series of workshops to demonstrate GEOSS Architecture to users in all societal benefit areas and to give feedback to GEO Committees. Continue series of global and regional workshops to provide avenues for user inputs into the GEOSS requirements and feedback on the operation aspects of GEOSS and its information infrastructure. Approximately 5 Workshops per year will be organized which should support outreach on GEOSS capabilities

Organize capacity building workshops in the regions, for exposing regional and local stakeholders to best practices in capacity building and the benefits of the use of the GEONETCast data dissemination system, in combination with OS (open source) web-based applications and service deliveries, for the various societal benefit areas, and GEOSS observation networks.

1.5 USER ENGAGEMENT

US-09-01: Socio-Economic Indicators

a) Socio-Economic Benefits of GEO and GEOSS

This sub-task is led by IIASA

Build on the GEOBENE project (Global Earth Observation - Benefit Estimation: Now, Next and Emerging) and assess Earth observation benefits and GEOSS added-value. For this purpose, define test-cases, develop methodologies and analytical tools in each of the 9 GEOSS societal benefit areas: Disasters, Health, Energy, Climate, Water, Weather, Ecosystems, Agriculture and Biodiversity. In addition, develop an integrated model that will also serve as an effective decision making tool to evaluate impacts and benefits of multiple scenarios across societal benefit areas. Cooperation and data sharing benefits will also be analyzed. The assessments will be carried out using quantitative and qualitative methods and data.

b) Spatially-enabled Socio-Economic Databases for Africa

This sub-task is led by UNECA

Support the development of tools and methods for building, visualizing, and analyzing socioeconomic indicators for informed decisionmaking, policy formulation, and operational strategies for development.

2 THE 9 GEOSS SOCIETAL BENEFIT AREAS

2.1 DISASTERS

Reducing loss of life and property from natural and human-induced disasters

Disaster-induced losses can be reduced through observations relating to hazards such as: wildland fires, volcanic eruptions, earthquakes, tsunamis, subsidence, landslides, avalanches, ice, floods, extreme weather, and pollution events. GEOSS implementation will bring a more timely dissemination of information through better coordinated systems for monitoring, predicting, risk assessment, early warning, mitigating, and responding to hazards at local, national, regional, and global levels.

GEOSS 10-Year Implementation Plan, Section 4.1.1

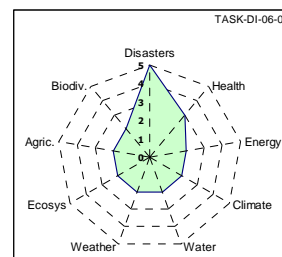
Note: Activities in the Disasters area are supported by the Geohazards, Coastal Zone and Water Cycle Communities of Practice, and IGWCO

DI-06-09: Use of Satellites for Risk Management

This Task is led by Canada, China and UNOOSA

Define and facilitate implementation of satellite constellations for risk management from a multi-hazard perspective. Develop dedicated software tools (based on AR-09-02a output) to be used, in the short term, to facilitate the analysis of coverage for critical observations and, in the medium-long term, to implement the user interface with the operators for products ordering/retrieval and data integration/ re-processing. Additional activities will include: (i) constellation requirements definition and performance assessment, with the full involvement of users, through the participation of “champions” from the relevant Community of Practice; (ii) actions towards the Board of the International Charter as well as relevant CEOS members, to identify possible strengthening of Charter mechanisms and options for widening its scope; and (iii) cross-cutting applications of use of satellites for health risk management and emergency response.

Key related Tasks include: CB-06-04 (GEONetcast), HE-09-02 (Monitoring and Prediction Systems for Health)

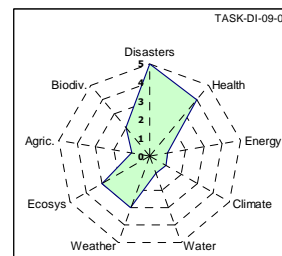


DI-09-01: Systematic Monitoring to Support Geohazards Risk Assessment (former DI-06-03 and DI-06-07)

This Task is led by the Geohazards Community of Practice

Facilitate and support access to the remote-sensing and in-situ data required to perform systematic geohazards related Vulnerability Mapping and Risk Assessment. Major interconnected activities include: (i) retrieval, integration and systematic access to the remote sensing and in-situ data of a certain number of regional areas (“Supersites”) exposed to geological threats (initial focus will be in dramatically enhancing access to SAR data); (ii) development, testing and application of Global Seismic Vulnerability Mapping to “Supersites” areas.

Key related Tasks include: AR-09-02 (Connecting Observation Systems for GEOSS)



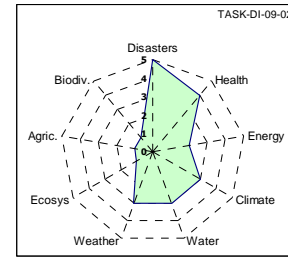
DI-09-02: Implementation of Multi-Risk Management Approach and Regional Applications

a) Implementation of a Multi-Risk Management Approach (former DI-06-08)

This sub-task is led by the Geohazards Community of Practice

Promote the definition and implementation of an integrated and comprehensive approach to systematically address all risks and all disasters phases, including risk assessment and mapping. Support ISDR in

the Implementation of the Hyogo Framework for action and promote the definition and implementation of a Disasters Community of Practice (CoP) that would provide guidance for activities and initiatives in the Disasters societal benefit area (the Disasters CoP would include and embrace existing hazard-thematic CoPs such as the Geohazards CoP.



b) Regional End-to-End Disaster Management Applications (former DI-07-01)

This sub-task is led by the Geohazards Community of Practice

Implement regional and cross-cutting end-to-end projects. Potential areas of application will include: famine and droughts early warnings for Africa (activities will be coordinated with AG-07-03); multi-risk (natural hazards and epidemics) decision-support tools for Latin-Central America and Asia; and risk management for floods.

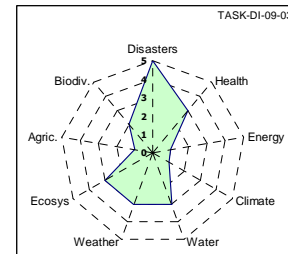
Key related Tasks include: HE-09-01 (Information Systems for Health), WA-06-02 (Droughts, Floods and Water Resource Management)

DI-09-03: Warning Systems for Disasters

a) Tsunami Early Warning System of Systems (former DI-06-04)

This sub-task is led by IOC and UNOSAT

Support the establishment and continuation of a multi-hazard fully-operational global tsunami and mitigation system of systems by: (i) promoting full and open exchange of publicly-funded, unclassified data relevant to tsunami warning/forecasting/mitigation systems and enhancement/ development of mechanisms for real-time data sharing, including seismic and sea level (deep ocean and tide gauge) data; (ii) contributing to the operationalization of comprehensive observing networks (in-situ sea level, seismic stations and remote monitoring) and data management systems (including integration of the global ocean observation system (GOOS), international seismic networks, and related global telecommunication systems; and (iii) defining/promoting standards/protocols for operating observing systems, and managing data exchange/transmission for multiple observing systems relevant to tsunami detection, early warning and mitigation.



b) Implementation of a Fire Warning System at Global Level (former DI-06-13)

This sub-task is led by Portugal and GTOS

Develop a globally-coordinated warning system for fire, including improved prediction capabilities, analysis tools and response support through sensors, information products and risk assessment models. Related activities will include: (i) review of existing warning systems; (ii) assessment to enhance current fire early warning systems; (iii) development of mechanisms for the implementation of an operational global early warning system. Activities will be coordinated with the ISDR initiative on “Wildland Fire Monitoring Network” coordinated by the GMFC (Global Fire Monitoring Center).

2.2 HEALTH

Understanding environmental factors affecting human health and well-being

Health issues with Earth-observation needs include: airborne, marine, and water pollution; stratospheric ozone depletion; persistent organic pollutants; nutrition; and monitoring weather-related disease vectors. GEOSS will improve the flow of appropriate environmental data and health statistics to the health community, promoting a focus on prevention and contributing to continued improvements in human health worldwide.

GEOSS 10-Year Implementation Plan, Section 4.1.2

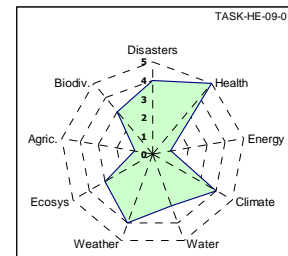
Note: Activities in the Health area are supported by the Air & Health Community of Practice and the Atmospheric Chemistry Theme (IGACO)

HE-09-01: Information Systems for Health

This Task is led by France, IEEE and WHO (*to be confirmed*)

Improve in-situ environmental and health data collection for the utilisation and validation of remotely sensed data relevant to health. Explore how GEOSS will provide for the collection and distribution of information relevant to the diverse needs of the health community. Support the development of a global public health information network database to improve health decision-making at the international, regional, country and district levels. As a priority, integrate WHO's Open Health information tool with other health and environment information systems through the GEO Portal.

Key related Tasks include: DI-06-09 (Use of Satellites for Risk Management), HE-09-02 (Monitoring and Prediction Systems for Health), HE-09-03 (End to End Projects for Health)

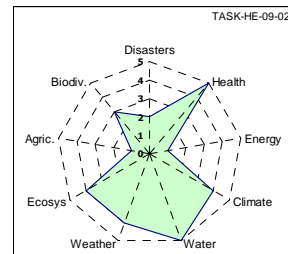


HE-09-02: Monitoring and Prediction Systems for Health

a) Aerosol Impacts on Health and Environment: Research, Monitoring and Prediction (former HE-07-03)

This sub-task is led by WMO

Facilitate research and development activities that lead to the delivery of new services benefiting society and the environment related to monitoring of the atmospheric cycles of various aerosols and their improved forecast in operational numerical models of the atmosphere. Emphasis will be on a reduction of risks due to aerosol influences on health and public safety and on assessing the aerosol effects on marine and terrestrial ecosystems. Continue to support international initiatives such as the Sand and Dust Storm Warning, Advisory and Alert System (SDS-WAS) in developing dust storm warning system and assessments. Review current developments in the modelling and the observation of bioaerosol transport/deposition and in the present understanding of impacts of the atmospheric deposition of dust (iron, phosphorus) to the ecosystem with the goal of extending the societal benefits of improved prediction of dust and aerosol.



b) Air Quality Monitoring Projects for Human Health

This sub-task is led by USA (*to be confirmed*)

Provide atmospheric forecasts of dust, aerosol, and ozone conditions by assimilating Earth observations data into weather models and providing reliable 2-3 day forecasts of air quality so authorities can intervene to reduce human health responses to diseases. Relate statistically the frequency and severity of air quality episodes with health outcomes and records to better understand the transmission pathways of human respiratory diseases. Related activities include: PROtocol MOntoring for the GMES Service Element: Atmosphere (PROMOTE); Ozone Web; PREV'AIR; and AIRNow International.

c) Water Quality Monitoring Projects for Human Health (former HE-07-02 and WA-07-01)

This sub-task is led by USA

Initiate projects to develop and implement operational observation and monitoring systems of water quality, integrating in-situ water quality monitoring methods for terrestrial sources and the coastal ocean with remote-sensed operational systems of global-scale freshwater quality. Identify mechanisms for alerting public health professionals on hazardous conditions identified by the monitoring of these parameters, as well as further informing epidemiological modelling studies.

d) Global Monitoring Plan for Persistent Organic Pollutants (POPs)

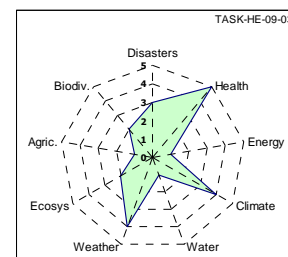
This sub-task is led by UNEP

Develop and implement a global monitoring plan for tracking changing levels of POPs in the natural environment and in human beings (among other benefits, this monitoring will enable the Stockholm Convention on Persistent Organic Pollutants to evaluate the effectiveness of international efforts to reduce releases of POPs). Interlink existing and emerging systems for monitoring air, water, ice caps and human health. Identify, fill in gaps and address a number of technical and financial barriers. Priorities for 2009 include producing 5 regional monitoring reports that will summarize monitoring data for the Convention's 12 POPs in ambient air & human milk or blood for the period 1998-2008.

Key related Tasks include: HE-09-03 (End to End Projects for Health), WE-06-03 (TIGGE), WA-08-01 (Integrated Products for Water Resource Management and Research)

HE-09-03: End to End Projects for Health

Develop and implement health-environment projects to advance the application of observation, monitoring and forecasting systems to improve health decision-making processes, while identifying priority capacity building needs along the value chain. Initiate efforts to establish a global health-climate community of practice in response to the 61st World Health Assembly's resolution on 'climate change and health', with specific reference to the call to promote effective engagement of the health sector and its collaboration with all related sectors, agencies and key partners at national and global levels in order to reduce the current and projected health risks from climate change.



a) Implementation of a Meningitis Decision-Support Tool (former HE-06-03)

This sub-task is led by Switzerland, USA, WHO and WMO

Support the Meningitis Environmental Risk Information Technologies Project (MERIT) which aims to extend current capabilities to more effectively combine environmental information with knowledge of epidemic meningococcal meningitis. MERIT implementation will have an immediate impact on public

health decision-making and outcomes in Africa through increasing the effectiveness of prevention and response control strategies, and ongoing surveillance of meningitis epidemics. Priorities for 2009 include the implementation of an operational decision-support tool for testing in the 2009 meningitis epidemic season in Africa.

b) Implementation of a Malaria Early Warning System

This sub-task is led by CEOS

Initiate a globally coordinated warning system for malaria through the utilization of satellite and in situ data for monitoring environmental conditions conducive to the spread of malaria and to support the development of user training for this technology. Priorities for 2009 include: (i) develop country specific techniques to use satellite data for early malaria detection and monitoring; (ii) provide training to developing countries on satellite-based techniques used to identify mosquito habitat that stimulates the spread of malaria; and (iii) improve techniques by obtaining in situ malaria data and feedback about the accuracy and effectiveness of the satellite data, analyses and services.

Key related Tasks include: HE-09-01 (Information Systems for Health), HE-09-02 (Monitoring and Prediction Systems for Health), CL-09-01 (Environmental information for Decision-Making), CB-09-02 (Building Individual Capacity in Earth Observations)

2.3 ENERGY

Improving management of energy resources

GEOSS outcomes in the energy area will support: environmentally responsible and equitable energy management; better matching of energy supply and demand; reduction of risks to energy infrastructure; more accurate inventories of greenhouse gases and pollutants; and a better understanding of renewable energy potential.

GEOSS 10-Year Implementation Plan, Section 4.1.3

Note: Activities in the Energy area are supported by the Energy Community of Practice

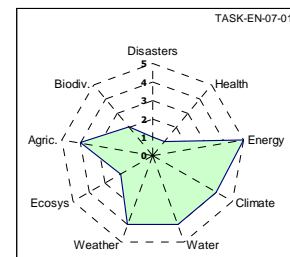
EN-07-01: Management of Energy Sources

This Task is led by Germany and CEOS

Support the development of Earth observation products and services for improving the resource assessment, monitoring and forecast of fluctuating energy sources (e.g. hydro, solar, wind, ocean).

Related activities will include: Promote collaboration between users and providers of Earth observation applications to foster the development of innovative Earth observation services in support of energy management.

This includes the successful integration of renewable energies into the electricity grid and electricity grid management. Expand the use of Earth observations in the development, operation and management of energy production systems. Assess the utility of Earth system models to inform energy sector decision making on the future availability of resources in a changing climate.

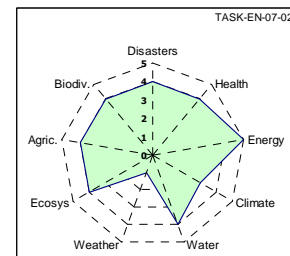


EN-07-02: Energy Environmental Impact Monitoring

This Task is led by the Netherlands

Promote the development of Earth observation systems for the monitoring and prediction of environmental impact from energy resource exploration, extraction, transportation and/or exploitation.

Related activities will include: Promote and develop the use of Earth observation data for impact monitoring. Support the development of modelling systems helping to quantify and anticipate changes e.g. to freshwater, biodiversity, ecosystems, atmospheric and oceanic composition, and ground elevation. Make relevant synergies with carbon sequestration and greenhouse gas monitoring activities.

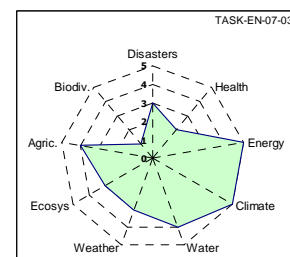


EN-07-03: Energy Policy Planning

This Task is led by France and UNECA

Encourage the use of Earth observations for informed energy-policy planning in developing and developed countries.

Related activities will include: Enhance availability of data and products required to better assess countries' potential for energy production. Support the development of transport infrastructure capacities in Africa, strengthening the continent effort in regional integration, economic development and poverty alleviation. Encourage training of decision-makers at all relevant levels for interpretation of relevant data and products. Encourage the use of Earth science models to support energy scenario assessments.



2.4 CLIMATE

Understanding, assessing, predicting, mitigating, and adapting to climate variability and change

The climate has impacts in each of the other eight societal benefit areas. Coping with climate change and variability demands good scientific understanding based on sufficient and reliable observations. GEOSS outcomes will enhance the capacity to model, mitigate, and adapt to climate change and variability. Better understanding of the climate and its impacts on the Earth system, including its human and economic aspects, will contribute to improved climate prediction and facilitate sustainable development while avoiding dangerous perturbations to the climate system.

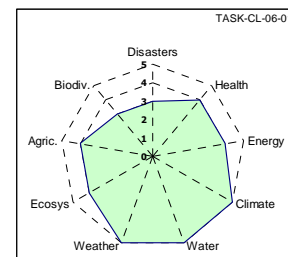
GEOSS 10-Year Implementation Plan, Section 4.1.4

CL-06-01: Sustained Reprocessing and Reanalysis of Climate Data

This Task is led by CEOS and GCOS

Ensure the development of international mechanisms to coordinate and maintain sustained climate data reprocessing and reanalysis efforts. With regard to the reprocessing of historical datasets (to obtain consistent long-time series of satellite records), make relevant synergies with AR-09-03a.

Key related Tasks include: AR-09-03 (Advocating for Sustained Observing Systems), DA-09-01 (Data Management), DA-09-02 (Data Integration and Analysis), DA-09-03 (Global Data Sets), CL-09-01 (Environmental information for Decision-Making)

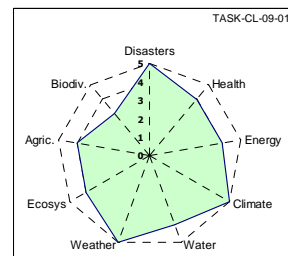


CL-09-01: Environmental Information for Decision-making, Risk Management and Adaptation

a) Towards Enhanced Climate, Weather, Water and Environmental Prediction

This sub-task is led by WMO, WCRP and IGBP

Strengthen the ability worldwide to deliver new and improved climate, weather, water and environmental services and hence increase the capacity of disaster risk-reduction managers and environmental policy makers to make decisions that minimize the societal, economic and environmental vulnerabilities arising from high-impact weather and climate variability. Promote international multi-disciplinary (physics-biology-chemistry) collaboration on the development of a high-resolution seamless weather, climate and Earth system global prediction system. This sub-task includes the continuation of former Task WE-07-01 (Data Assimilation and Modelling for Operational Use).



b) Climate Information for Decision-making, Risk Management and Adaptation

This sub-task is led by GCOS and WCRP

Support the integration of climate risk management into adaptation processes. Coordinate and drive the development of tailored climate products and services. Encourage the use of this information by policy and decision makers (at all levels), and initiate user-oriented activities to do both increase the demand, and foster the supply, of climate services for development decisions.

Related activities will include: (i) promote the resourcing and implementation of the Climate for Development in Africa Programme (ClimDev Africa). This programme is to improve the availability, exchange and use of climate information and services in support of economic growth and achievement

of the Millennium Development Goals in a changing climate – working at national, local and regional levels. The African partners in this programme include the African Union, the UN Economic Commission for Africa, and the African Development Bank, African regional climate institutions, and African National Meteorological and Hydrological Services; and (ii) implement the programme “Climate Observations and Regional Modelling in Support of Climate Risk Management and Sustainable Development.” This programme is to assist the developing and least developed countries of Eastern Africa to undertake and appropriately use climate projections in adaptation planning.

Key related Tasks include: AR-09-01 (GEOSS Common Infrastructure), AR-09-03 (Advocating for Sustained Observing Systems), CB-09-02 (Building Individual Capacity in Earth Observation), CL-06-01 (Sustained Reprocessing and Reanalysis Efforts), WE-06-03 (TIGGE), WE-09-01 (Capacity Building for Weather Prediction).

2.5 WATER

Improving water-resource management through better understanding of the water cycle

Water-related issues addressed by GEOSS will include: precipitation; soil moisture; streamflow; lake and reservoir levels; snow cover; glaciers and ice; evaporation and transpiration; groundwater; and water quality and water use. GEOSS implementation will improve integrated water-resource management by bringing together observations, prediction, and decision-support systems and by creating better linkages to climate and other data. In situ networks and the automation of data collection will be consolidated, and the capacity to collect and use hydrological observations will be built where it is lacking.

GEOSS 10-Year Implementation Plan, Section 4.1.5

Note: Activities in the Water area are supported by the Water Cycle Community of Practice and IGWCO

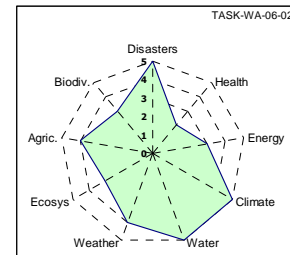
WA-06-02: Droughts, Floods and Water Resource Management

Address decision-making challenges related to the management of hydro-meteorological extremes and sustainable use of water.

a) Forecasting and Early Warning Systems for Droughts and Floods

This sub-task is led by USA

Improve forecasting methods for extreme events (floods, droughts) for use by hydrological services throughout the world, to help bridge the gap between research and user communities. Expand upon regional initiatives such as the North American Drought Monitor (NADM) to establish a Global Drought Early Warning Systems(s) (GDEWS).



b) Impacts from Drought

This sub-task is led by Canada, USA and WCRP

Tracking and analyzing impacts from drought (including feedbacks such as soil drying) will provide a tangible and practical demonstration of the value of integrated water cycle observations by developing a full and operational data cycle of environmental information from “producer-to-consumer” / “source to sink,” and exploring the application of data products in the Water and Agriculture societal benefit areas.

c) ACQWA

This sub-task is led by Switzerland

ACQWA (Assessing Climatic change and impacts on the Quantity and quality of WATER) is a 5-year FP7-funded project to analyze the future of water resources in vulnerable mountain regions in the context of climate change and increasing extreme events. Deliverables range in scope from technical papers on downscaling techniques for Hydrological Modeling to water policy recommendations for decision-makers.

Key related Tasks include: DI-07-01 (Risk Management for Floods), CL-09-01 (Environmental information for Decision-Making)

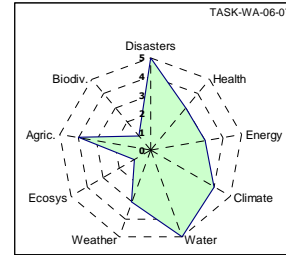
WA-06-07: Capacity Building for Water Resource Management

Initiate capacity building programs in support of water management, to show the value of, and develop tools for, Earth observation data.

a) Latin America

This sub-task is led by Argentina and USA

Develop a proposal, along the lines of ESA/UNESCO TIGER programme, focused on the use of Earth observation data for water resources management (surface waters, groundwater). This to help: (i) identify data and general support from the Space agencies; (ii) identify a coordinating agency to organize calls for proposals and securing reviews and monitoring of the Proposals; (iii) identify further funding sources (e.g. space agencies, UN); and (iv) issue a call for proposals to the research and development community. The program will be initiated in Latin America and will then be extended to Asia and Africa. Linkages with existing GEO efforts will be made.



b) Africa

This sub-task is led by CEOS and USA

In the scope of Phase 2 of the TIGER initiative, assist African countries to overcome problems faced in the collection, analysis and dissemination of water-related geo-information. Exploit the advantages of Earth Observation (EO) technology to build the basis for an independent African capacity and set up sustainable water observation systems. Also, build and extend the Central American “SERVIR” (visualization and monitoring using Earth science data) for hydrologic applications (e.g., flood warning) to East Africa and possibly other parts of the world. Other important projects include the hydrologic data integration and assimilation systems of the ‘Land Information System’ (LIS).

c) Asia

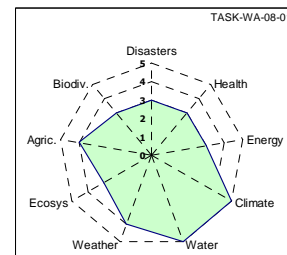
This sub-task is led by Japan

Build upon the Asian Water Cycle Initiative (AWCI) to develop competencies among water management practitioners, researchers, and administrators (AWCI addresses climate change monitoring in Asia through the integration of in-situ and satellite/remote sensing). Also build upon Sentinel Asia to develop disaster management-support systems in the Asia-Pacific region and building capacity for utilization of satellite images.

Key related Tasks include: CB-09-03 (Build Institutional Capacity to use Earth observations), WA-08-01 (Integrated Products for Water Resource Management and Research), DA-09-03 (Global Data Sets)

WA-08-01: Integrated Products for Water Resource Management and Research

Improvements and expansion of in-situ networks, combined with new satellite missions (in addition to existing space-borne earth observation systems) and emerging assimilation and prediction capabilities, are opening the door to a new era in global water cycle monitoring and management.



a) Soil Moisture

This sub-task is led by ESA and WCRP

Establish a global in-situ soil moisture network to aid in further progress for any type of global soil moisture product. This network has a high priority since it currently does not exist.

b) Runoff

This sub-task is led by Switzerland

The Hydrological Applications and Run-Off Network (HARON) Project has the objective of integrating, in a phased approach, dedicated river gauging networks of existing hydrological stations on a global scale into a global runoff observation network. The main result of the HARON project will be strengthened in-situ and satellite monitoring networks of estuaries, rivers, lakes, reservoirs, and groundwater levels.

c) Groundwater

This sub-task is led by Netherlands

Establish a Global Groundwater Monitoring Network (GGMN) for a periodic assessment of global groundwater resources, using information from existing national, regional and global networks in order to represent changes in groundwater resources at scales relevant to regional and global resource assessment.

d) Precipitation

This sub-task is led by CGMS

Under the guidance of CGMS/International Precipitation Working Group (IPWG), promote and advance the development and validation of multi-sensor satellite based precipitation estimates, including snowfall. Inputs from the Precipitation Virtual Constellation (AR-09-02a) will supplement these efforts.

e) Water Cycle Data Integration

This sub-task is led by WCRP

Upcoming satellite launches and plans for new missions provide new global data sets that will supplement the in-situ networks for many water cycle variables. The Coordinated Energy and water cycle Observations Project (CEOP) under the WCRP Global Energy and Water-cycle Experiment (GEWEX) is tailoring and developing tools to access the various data collections and undertake data integration work over the Internet.

f) Pilot Projects for Improved Water Discovery and Quality Assessments

This sub-task is led by IEEE

Conduct pilot projects in cooperation with local and national governments and other organizations to provide water where it is needed, but not now available. These projects will be focused in developing countries and realizable in the field within one year. They will be sustainable, reusable, repeatable, and scalable.

Key related Tasks include: HE-09-02c (Water Quality Monitoring Projects for Human Health), HE-09-03 (End to End Projects for Health), CL-09-01 (Environmental information for Decision-Making), DA-09-03 (Global Data Sets)

2.6 WEATHER

Improving weather information, forecasting and warning

The weather observations encompassed by GEOSS are based on the requirements for timely short- and medium-term forecasts. GEOSS can help fill critical gaps in the observation of, for example, wind and humidity profiles, precipitation, and data collection over ocean areas; extend the use of dynamic sampling methods globally; improve the initialization of forecasts; and increase the capacity in developing countries to deliver essential observations and use forecast products. Every country will have the severe-weather-event information needed to mitigate loss of life and reduce property damage. Access to weather data for the other societal benefit areas will be facilitated.

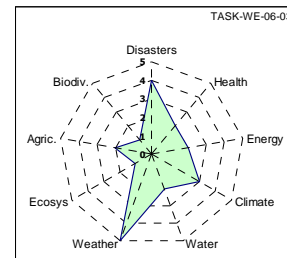
GEOSS 10-Year Implementation Plan, Section 4.1.6

WE-06-03: TIGGE and the Development of a Global Interactive Forecast System (GIFS) for Weather

This Task is led by WMO

Complete THORPEX Interactive Global Grand Ensemble (TIGGE) Phase 1 and commence TIGGE Phase 2, which will consider real-time data exchange, common web interfaces, an improved archiving strategy and a common toolbox to assist the development of useful products. Develop initial products related to probabilistic tropical cyclone warning services and extreme precipitation forecasting that will form the early products of a Global Interactive Forecasting System (GIFS) to internationally coordinate advance warnings and forecasts for high impact weather events.

Key related Tasks include: AR-09-03 (Advocating for Sustained Observing Systems), DA-09-02 (Data Integration and Analysis), DA-09-03 (Global Data Sets), DI-09-03 (Warning Systems for Disasters), CL-09-01 (Environmental information for Decision-Making).

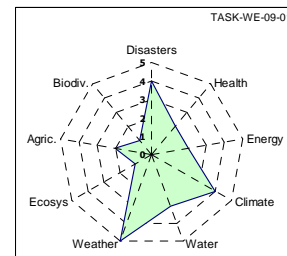


WE-09-01: Capacity Building for Weather Prediction

a) Infrastructure Capacity Building for Numerical Weather Prediction

This sub-task is led by Korea

Facilitate infrastructure development for the operation of Numerical Weather Prediction (NWP) systems in developing countries – building upon WMO programmes for developing countries. Identify gaps and needs to develop improved system infrastructure for NWP operation, and facilitate technical cooperative activities for the exchange of hardware, software, technologies, and expertise. In addition, co-organize a series of regional capacity building workshops with major numerical weather prediction centres to assist developing countries in their utilization of currently available forecasts.



b) Societal and Economic Benefits in Africa from Improved Predictions of High-Impact Weather

This sub-task is led by WMO

Enhance the prediction of high impact weather and help reduce vulnerability to climate variability in Africa through the WWRP-THORPEX Africa initiative – which is designed to do both accelerate

predictive skill and realize the related benefits for African society and the economy through a set of priority demonstration projects.

Key related Tasks include: AR-09-03 (Advocating for Sustained Observing Systems), CB-09-01 (Resource Mobilization), CB-09-02 (Building Individual Capacity in Earth Observations), CB-09-03 (Build Institutional Capacity to Use Earth Observations), CB-09-04 (Infrastructure Development and Technology Transfer for Information Access), HE-09-02 (Monitoring and Prediction Systems for Health)

2.7 ECOSYSTEMS

Improving the management and protection of terrestrial, coastal and marine resources

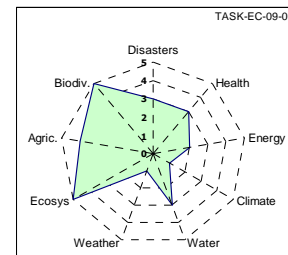
Observations are needed on the area, condition, and natural-resource stock levels of ecosystems such as forests, rangelands, and oceans. GEOSS implementation will seek to ensure that methodologies and observations are available on a global basis to detect and predict changes in ecosystem condition and to define resource potentials and limits. Ecosystem observations will be better harmonized and shared, spatial and topical gaps will be filled, and in situ data will be better integrated with space-based observations. Continuity of observations for monitoring wild fisheries, the carbon and nitrogen cycles, canopy properties, ocean colour, and temperature will be set in place.

GEOSS 10-Year Implementation Plan, Section 4.1.7

Note: Activities in the Ecosystems area are supported by the Forest and Agricultural Monitoring Communities of Practice, and the Global Carbon Cycle Theme (IGCO)

EC-09-01: Ecosystem Observation and Monitoring Network (GEO EcoNet)

Coordinate and improve terrestrial (forest, urban agriculture, woodlands, grasslands, and deserts), freshwater, ice and oceans ecosystem observation, characterization and monitoring especially in terms of acquisition and use of satellite, aerial and in-situ observation. Address the development of a global integrated sampling frame in coordination with the GEOSS Geodesy activities. Promote ecosystem stress monitoring (i.e. the use of Earth observation data to detect the effects of insects, pathogens, water temperature and chemical stresses on ecosystems).



a) Ecosystem Classification and Mapping (former EC-06-02)

This sub-task is led by Paraguay and USA

Continue the work of the Ecosystems Classification Task Force, covering terrestrial, freshwater, and ocean ecosystems, to create a globally agreed, robust, and viable global classification scheme for ecosystems. Establish links to existing databases, such as the Ocean Bio-geographic Information System. In parallel with the classification effort, develop, review, and initiate a mapping approach to spatially delineate the classified ecosystems.

b) Ecosystem Status and Trends

This sub-task is led by the USA

Coordinate the continuing characterization and monitoring of ecosystems status and trends. Using the GEO Ecosystem map as a framework, extract geospatial data on key indicators of all ecosystem's status, health and functioning (key indicators include time series of land cover change, climate variables, population, transportation, water and fragmentation). Major sources will include: (i) The Encyclopedia of Life – an ecosystem of websites that makes all key information about all life on Earth accessible to anyone, anywhere in the world (its goal is to create a web page for every known species on Earth) and (ii) The Encyclopedia of Earth – a new electronic reference about the Earth, its natural environments, and their interaction with society. The *Encyclopedia* is a free, fully searchable collection of articles written by scholars, professionals, educators, and experts who collaborate and review each other's work.

c) Regional Networks for Ecosystems (former EC-06-07)

This sub-task is led by USA, GTOS and POGO

Build upon existing initiatives (e.g. ANTARES in South America and IOC-sponsored regional networks for oceans; GOFC-GOLD regional networks and ILTER for terrestrial domains) to develop a global network of organization-networks for ecosystems, and coordinate activities to strengthen observing capacity in developing countries.

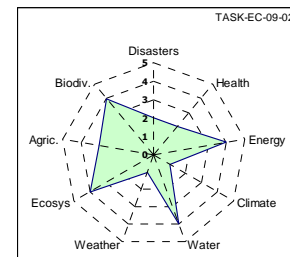
d) Protected Areas Assessment and Monitoring (GEO PAAM)

This sub-task is led by USA, UNEP and UNESCO

Apply Earth observation to the characterization, mapping and monitoring of global protected areas consisting of UNESCO World Heritage sites & Biosphere Reserves; RAMSAR Wetlands, natural areas; and sites of cultural, geological and archaeological significance. Use Earth observation and other geospatial data to support the delineation and update of protected areas boundaries. Improve dissemination of earth observation data to protected area planners and managers.

EC-09-02: Human Dimension of Ecosystem Utilization and Conservation

Identify and assess the risks posed by global change and human development to the environment, society and regional economies. Develop adaptation strategies to reduce these risks and mitigate impacts at local, regional and global levels.



a) Global Mapping of Global Road and Human Settlements on GEO Grid

This sub-task is led by Japan and ICSU

Develop a global road and human settlements map on GEO Grid. Related activities will include: (i) system development of GEO Grid towards sharing, development and distribution of relevant data; (ii) research and development for producing relevant data using satellite images; and (iii) collection, maintenance, and evaluation of relevant remote sensing and GIS data.

b) Tourism Development Impacts on Environmental, Social and Economic Regional Activities

This sub-task is led by Greece

Map the potential impacts of global change on key sectors of the Eastern Mediterranean region's economy and society. These are expected to include (i) climate change impacts on agriculture, fisheries and water supplies; (ii) possible sea-level rise and its impact on tourism, manufacturing, land use, urban areas and employment; (iii) the impact on global change on employment and other economic variables; and (iv) the outlook for both intra-regional and extra-regional migration. Based on this mapping, identify potential measures for mitigating the expected impacts of global change. The tourism-intensive Eastern Mediterranean region features an extensive shoreline, thousand of islands, highly sensitive agricultural lands and an unstable economy. As a result, relatively small environmental changes can negatively affect the region's social and economic conditions.

Key related Tasks include: DI-09-03 (Warning Systems for Disasters), DI-09-02b (Risk Management for Floods), DI-09-01 (Systematic Monitoring to Support Geohazards Risk Assessment), EN-07-01 (Management of Energy Sources), EN-07-03 (Energy Policy Planning), EC-09-01 (Ecosystem Observation and Monitoring Network), BI-07-01 (Biodiversity Observation Network).

2.8 AGRICULTURE

Supporting sustainable agriculture and combating desertification

Issues addressed by GEOSS will include: crop production; livestock, aquaculture and fishery statistics; food security and drought projections; nutrient balances; farming systems; land use and land-cover change; and changes in the extent and severity of land degradation and desertification. GEOSS implementation will address the continuity of critical data, such as high-resolution observation data from satellites. A truly global mapping and information service, integrating spatially explicit socio-economic data with agricultural, forest, and aquaculture data will be feasible, with applications in poverty and food monitoring, international planning, and sustainable development.

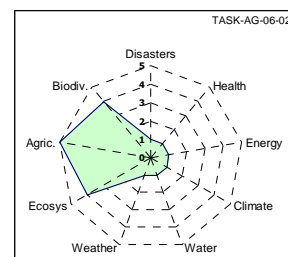
GEOSS 10-Year Implementation Plan, Section 4.1.8

Note: Activities in the Agriculture area are supported by the Forest and Agricultural Monitoring Communities of Practice, and the Global Carbon Cycle Theme (IGCO)

AG-06-02: Data Utilization in Fisheries and Aquaculture

This Task is led by Canada, Spain and POGO

Consult with scientists and experts from the fisheries, aquaculture, coastal zone management and Earth observation communities at international and regional levels to identify opportunities for enhanced utilization of Earth observations in fisheries and aquaculture. Support the implementation of the SAFARI project including the organisation of international workshops and IOCCG monograph. Make relevant synergies with AR-09-02a (Virtual Constellation on Ocean Colour Radiometry which will provide scientific data products related to marine ecosystems and ocean biogeochemistry for near-surface global ocean and coastal waters).

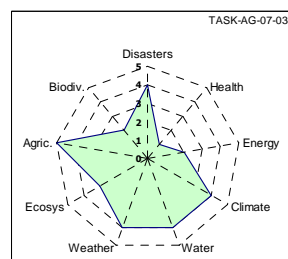


AG-07-03: Global Agricultural Monitoring

a) Global Agricultural Monitoring System (former AG-07-03)

This sub-task is led by USA

Support the development and improvement of a global operational agricultural monitoring system, enhancing current capabilities in the areas of monitoring, famine early warning and food security. Related activities will include: (i) global mapping and monitoring of changes in distribution of cropland area and associated cropping systems; (ii) global monitoring of agricultural production leading to accurate and timely reporting of national agricultural statistics, accurate forecasting of shortfalls in crop production and reduction of risk and increased productivity at a range of scales; (iii) development of early warning systems for famine, enabling timely mobilization of international response in food aid.



b) Agricultural Risk Management (former AG-07-02)

This sub-task is led by WMO

Develop and improve analytical tools and methods for agriculture risk assessment, particularly for crop failure, and establish common standards and formats. Facilitate the implementation of pilot-projects linking Earth system model forecasts to end-user application models (such as crop-yield models) to improve food-supply prediction.

c) Expanding Earth Observation Applications in Agriculture and Promoting Capacity Building in Developing Countries (former AG-06-07)

This sub-task is led by China, Korea and Uganda

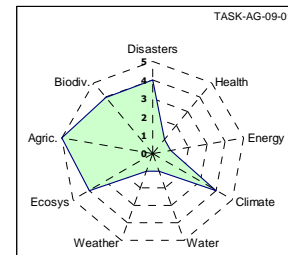
Develop training modules and expand the use of Earth observations for agricultural purposes in Africa, Asia, Latin America, Central and Eastern Europe, and Small Island States. Training modules will be underpinned by practical exercises using multi-source satellite data.

AG-09-01: Forest Mapping and Carbon Tracking

a) Forest Mapping and Change Monitoring (former AG-06-04)

This sub-task is led by USA, GTOS and FAO

Integrate international efforts on assessment and monitoring of forests and forest changes using a combination of ground and satellite information and internationally agreed standards.



b) Forest Carbon Tracking

This sub-task is led by Australia, Japan, Norway, FAO and GTOS

Coordinate the definition, development and validation of robust tools and methodologies for the evaluation of carbon storage in forests. Build upon existing and planned GEO efforts in forest monitoring, carbon observation and associated modeling and foster the actual use of these tools coordinating the timely provision of observations required for their operational use. Promote and facilitate the development of reference, coherent and validated databases. Preliminary activities will include: (i) coordinated assessment of tools and methodologies; (ii) coordination of observations, including securing their continuity; (iii) coordination of the production of reference datasets; (iv) improvement of access to observations, datasets, tools and expertise; (v) demonstration or pilot initiatives to show capabilities; and (vi) associated Capacity Building activities.

c) Integrated Global Carbon Observation (IGCO) (former EC-06-01)

This sub-task is led by USA

Support the development of a global Integrated Global Carbon Observation system (IGCO), including improved global networks of in-situ CO₂ observations and absorption of CO₂ by the oceans and resulting acidification.

Key related Tasks include: AR-09-02a (Virtual Constellations), AR-09-03 (Advocating for Sustained Observing Systems), DA-09-02a (Global Land Cover), EC-09-01 (Global Ecosystem Observation and Monitoring Network)

2.9 BIODIVERSITY

Understanding, monitoring and conserving biodiversity

Issues in this area include the condition and extent of ecosystems, distribution and status of species, and genetic diversity in key populations. Implementing GEOSS will unify many disparate biodiversity-observing systems and create a platform to integrate biodiversity data with other types of information. Taxonomic and spatial gaps will be filled, and the pace of information collection and dissemination will be increased.

GEOSS 10-Year Implementation Plan, Section 4.1.9

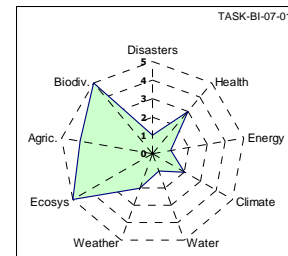
Note: Activities in the Biodiversity area are supported by the Biodiversity Community of Practice

BI-07-01: Biodiversity Observation Network (GEO BON)

a) Biodiversity Observation Network (GEO BON)

This sub-task is led by USA and DIVERSITAS International

Implement the GEO Biodiversity Observation Network that was launched in April 2008. Targets are spatially and topically prioritized, based on analysis of existing information, identifying unique or highly diverse ecosystems, those supporting migratory, endemic or globally threatened species, and those whose biodiversity is of socio-economic importance, and which can support the 2010 CBD target. Specific objectives include: (i) develop a strategy for assessing biodiversity at both the species and ecosystems level; (ii) facilitate the establishment of monitoring systems that enable frequent, repeated, globally coordinated assessment of trends and distributions of species and ecosystems of special conservation merit; and (iii) facilitate consensus on data collection protocols and the coordination of the development of interoperability among monitoring programs. The marine biodiversity component will be made as strong as possible to animate mutually-beneficial dialogue between terrestrial and marine components.



b) Invasive Species Monitoring System (former BI-07-02)

This sub-task is led by USA

Characterize, monitor and predict changes in the distribution of invasive species. Characterize the current requirements and capacity for invasive species monitoring, identify gaps, and develop strategies for implementing cross search functionality among existing online invasive species information systems from around the globe. Invasive alien species (IAS) threaten biodiversity and exert a tremendous cost on society for IAS prevention and eradication. They endanger natural ecosystem functioning and seriously impact biodiversity and agricultural production. The Task will be coordinated by members of the Global Invasive Species Information Network (GISIN).

c) Capturing Historical Biodiversity Data (former BI-06-03)

This sub-task is led by GBIF

Implement the strategic plan for capturing historical biodiversity data from natural history collections and the research community.

ACRONYMS

ACQWA	Assessing Climatic change and impacts on the Quantity and quality of Water
AG	Agriculture
AMDAR	Aircraft Meteorological Data Relay
ANTARES	A Network for the Enhancement of the Education and Scientific Research
APEC	Asia-Pacific Economic Cooperation
APFM	Associated Programme on Flood Management
AR	Architecture
ASEAN	Association of Southeast Asian Nations
ASI	Italian Space Agency
AVHRR	Advanced Very High Resolution Radiometer
AWCI	Asian Water Cycle Initiative
BI	Biodiversity
CB	Capacity Building
CBD	Convention on Biological Diversity
CEOP	Coordinated Energy and Water Cycle Observations Project
CEOS	Committee on Earth Observation Satellites
CGMS	Coordination Group for Meteorological Satellites
CIESIN	Center for International Earth Science Information Network
CL	Climate
CoP	Community of Practice
CSIR	Council for Scientific and Industrial Research, South Africa
DA	Data Management
DEM	Digital Elevation Model
DI	Disasters
DIVERSITAS	An international programme of biodiversity science
EC	European Commission
EC	Ecosystems
EN	Energy
EO	Earth Observations
ESA	European Space Agency
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
FAO	Food and Agriculture Organization
FAPAR	Fraction of Absorbed Photosynthetically Active Radiation
FDSN	International Federation of Digital Seismograph Networks
FP7	European Union 7 th Framework Programme
FPAR	Fraction Photosynthetically Available Radiation
GAW	Global Atmosphere Watch
GBIF	Global Biodiversity Information Facility
GCI	GEOSS Common Infrastructure
GCOS	Global Climate Observing System
GDEWS	Global Drought Early Warning Systems

GEO	Group on Earth Observations
GEOBENE	Global Earth Observation Benefit Estimation: Now, Next and Emerging
GEOSS	Global Earth Observation System of Systems
GEWEX	Global Energy and Water Cycle Experiment
GGMN	Global Groundwater Monitoring Network
GIFS	Global Interactive Forecast System
GIS	Geographical Information System
GISIN	Global Invasive Species Information Network
GMES	Global Monitoring for Environment and Security
GNSS	Global Navigation Satellite System
GOFC-GOLD	Global Observation of Forest and Land Cover Dynamics
GOOS	Global Ocean Observing System
GOS	Global Observing System
GPM	Global Precipitation Measurement
GSN	Global Seismographic Network
GTOS	Global Terrestrial Observing System
HARON	Hydrological Applications and Run-Off Network
HE	Health
IAG	International Association of Geodesy
IAS	Invasive Alien Species
ICSU	International Council for Science
IEEE	Institute of Electrical and Electronics Engineers
IGACO	International Global Atmospheric Chemistry Observations
IGBP	International Geosphere-Biosphere Programme
IGCO	Integrated Global Carbon Observation
IGOS	Integrated Global Observing Strategy
IGWCO	Integrated Global Water Cycle Observations (former IGOS Water Theme)
IIASA	International Institute for Applied Systems Analysis
ILTER	International Long Term Ecological Research network
InSAR	Interferometric Synthetic Aperture Radar
INTA	Instituto Nacional de Técnica Aeroespacial, Spain
IOC	Intergovernmental Oceanographic Commission
IOCCG	International Ocean Colour Coordinating Group
IPWG	International Precipitation Working Group
IPY	International Polar Year
IRI	International
ISCGM	International Steering Committee for Global Mapping
ISDR	International Strategy for Disaster Reduction
ISLSCP	International Satellite Land-Surface Climatology Project
ISSG	IUCN/SSC Invasive Species Specialist Group
ITC	International Training Centre
ITU	International Telecommunication Union

IUCAF	Scientific Committee on Frequency Allocations for Radio Astronomy and Space Science
IUCN	International Union for the Conservation of Nature and Natural Resources (World Conservation Union)
IUGG	International Union of Geodesy and Geophysics
LAI	Leaf Area Index
LAM	Limited Area Model
LIS	Land Information System
MERIS	Medium Resolution Imaging Spectrometer
MERIT	Meningitis Environmental Risk Information Technologies
MODIS	Moderate Resolution Imaging Spectroradiometer
NADM	North American Drought Monitor
NARSS	National Authority for Remote Sensing and Space Sciences, Egypt
NASA	National Aeronautics and Space Administration
NBII	National Biological Information Infrastructure
NEPTUNE	The North-east Pacific Time-series Undersea Network Experiments
NMHS	National Meteorological and Hydrological Service
NPP	Net Primary Productivity
NWP	Numerical Weather Prediction
OGC	Open Geospatial Consortium
OS	Open Source
OSS	Open Source Software
PAAM	Protected Areas Assessment and Monitoring
POGO	Partnership for Observation of the Global Ocean
POPs	Persistent Organic Pollutants
PROMOTE	PROtocol MONiTORing (for the GMES Service Element: Atmosphere)
RAMSAR	Convention on Wetlands, Ramsar, Iran, 1971
SAFARI	Societal Applications in Fisheries & Aquaculture using Remotely-Sensed Imagery
SAR	Synthetic Aperture Radar
SBA	Societal Benefit Area
SDI	Space Data Infrastructure
SDI	Spatial Data Infrastructure
SDS	Sand and Dust Storm
SIF	Standards and Interoperability Forum
SPOT	Système Probatoire d'Observation Terrestre
SPOT-VGT	SPOT Vegetation
SSC	Species Survival Commission
SST	Sea Surface Temperature
TerraLib	Open source GIS software library
TerraView	GIS application built on the TerraLib GIS library
THORPEX	The Observing-system Research and Predictability Experiment
TIGGE	THORPEX Interactive Global Grand Ensemble

UK	United Kingdom
UN	United Nations
UNECA	United Nations Economic Commission for Africa
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational Scientific and Cultural Organization
UNOOSA	United Nations Office for Outer Space Affairs
UNOSAT	United Nations Operational Satellite Applications Programme
US	User Engagement
USA	United States of America
USGS	United States Geological Survey
VENUS	Victoria Experimental Network Under the Sea
VI	Vegetation Index
WA	Water
WCRP	World Climate Research Programme
WE	Weather
WHO	World Health Organization
WIS	WMO Information System
WMO	World Meteorological Organization
WWRP	World Weather Research Programme