

# **GEO 2009-2011 WORK PLAN**

**13 January 2009**

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# GEO 2009-2011 WORK PLAN

## 1 BUILDING AN INTEGRATED GEOSS

### 1.1 ARCHITECTURE

In this Section, Task implementation and sub-task cross-coordination within a Task are under the guidance of the Architecture and Data Committee

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

Address the core architectural principles in GEOSS as a function of user needs. 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 EC (EuroGEOSS), USA (FGDC, ddnebert@fgdc.gov) and IEEE

Facilitate and support the deployment and operation of the GCI, including the incorporation of contributed components and services consistent with the GEOSS architecture; the GCI consists of GEO web portal(s) providing user access to information and services related to the nine societal benefit areas, clearinghouse(s) for searching data, information and services, and registries containing information about GEOSS components and associated standards and best practices. Define and solicit support for a contributed-systems (e.g. components, services) facilitator function. Expand the existing GEO 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). With support from the User Interface Committee, 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 with GEOSS; and (iii) provide consultation to the contributed-systems facilitator. The registries in the GCI will be components and services registries, standards and special arrangement registries, best practices registry, requirements registry, and others as needed to support the core operations requirements of GEOSS. Address integration and user issues emerging from the initial operating capability of the GCI. Document the GEOSS convergence and interoperability supporting the high-level strategic and tactical guidelines of GEOSS implementation. Update and maintain the Strategic and Tactical Guidance Documents to reflect current practices and implementation of the GEOSS Architecture.

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

This sub-task is led by USA (FGDC) and OGC (gpercivall@opengeospatial.org)

Develop and pilot new process and infrastructure components for the GCI and the broader GEOSS architecture through continuation of existing efforts and new activities solicited through Architecture Implementation Pilot (AIP) calls for participation and other means. Facilitate continuation of the Interoperability Process Pilot Project (IP3) as a means of coordinating cross-disciplinary interoperability studies and pilots. Coordinate societal benefit area support by the IP3 Pilots. As appropriate, incorporate GEOSS contributed infrastructure components into pilot implementations of the GEOSS Architecture in coordination with Task AR-09-01a. Develop a capacity building registry

infrastructure to include relevant information on existing Earth observation capacity building efforts and resources (the Capacity Building Committee will supply the content for this registry). Provide phased delivery of components to operations under 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 (University of Tokyo) and IEEE (rduerr@nsidc.org)

Support the operation and upgrade of the GEOSS Best Practices Registry. The registry should be capable of including best practices in observation, modelling and analyses, ontologies, capacity building, cost-benefit sharing mechanisms, and other relevant GEO best practices (e.g. data sharing, cooperative data acquisition, joint development, joint flight, collaborative sciences) and other relevant GEO best practices. This sub-task will work in coordination with the four GEO Committees and Members & Participating Organizations, who will provide the content for the registry.

d) Ontology and Taxonomy Development

This sub-task is led by Japan (University of Tokyo, shiba@csis.u-tokyo.ac.jp), ESA and IEEE

As part of the Best Practices Registry, create an Ontology and Taxonomy section to get an overview of available ontologies and taxonomies. Compare and analyze ontologies and taxonomies such as to avoid unnecessary overlaps and conflicts. As appropriate, develop ontologies and taxonomies stored in the Best Practices Registry into standards. Assist in the deployment of a reference able ontology for Earth observation to link the User Requirements Registry with the Components and Services Registry. Assess how to use the ontology and taxonomy section of the best practices registry for discovery composition and access in the frame of the GEOSS architecture.

## **AR-09-02: Interoperable Systems for GEOSS**

Address the various interoperability aspects of contributing systems, including observing, modelling and information systems.

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

This sub-task is led by CEOS (mary.kicza@noaa.gov) and GTOS (GOF-C-GOLD)

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, designed to ensure the relevant synergy with High Resolution Multispectral Imager Continuity;
- 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 (pending on final approval by CEOS Members);
- 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 (pending on final approval by CEOS Members)

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 (dthomas@wmo.int)

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. Extend and further improve the existing WMO Global Telecommunications System (GTS) services to ensure time and operational-critical exchange of weather, water, climate and hydro-meteorological disaster data, warnings and products in response to identified user requirements. Implement procedures and mechanisms to provide to all national and international programmes and user communities data discovery and access services, including metadata compliant with relevant international standards. Improve connectivity and access to environmental information among WMO's Member Countries, and interoperability through registration in the relevant GEOSS registers – to facilitate timely decision making and exploitation of WMO's rich information base.

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

This sub-task is led by South Africa (CSIR, tvzyl@csir.co.za)

Foster the development of space-borne, air-borne, sea-based and ground-based sensing networks (advances in communication technology and ground-based in-situ technologies have made it feasible to consider webs of sensors on all types of platforms with rapid access to observations; this technology is referred to as 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.

#### d) Model Web Development

This sub-task is led by USA (NASA, gary.n.geller@jpl.nasa.gov) and IEEE

Develop a dynamic modelling 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.

### **AR-09-03: Advocating for Sustained Observing Systems**

Establish actions for the maintenance and expansion of GEOSS-underpinning observing systems, including atmospheric, terrestrial and oceanic, both in-situ and space-based. Promote stable, reliable and long-term operations of Earth observing networks within the framework of national policies and international obligations. In line with the “Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC”, accelerate the implementation of the Global Climate Observing System (GCOS) through enhanced support for the Global Ocean Observing System (GOOS), the Global Terrestrial Observing System (GTOS), the WMO Global Observing System (GOS) and Global Atmospheric Watch (GAW), and the global hydrological networks.

a) Global Terrestrial Observations (former CL-06-03)

This sub-task is led by GTOS (reuben.sessa@fao.org)

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.

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

This sub-task is led by WCRP (vryabinin@wmo.int), and is supported by the Cryosphere Community of Practice

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.

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

This sub-task is led by GOOS (b.lee@unesco.org), IEEE and POGO, and is supported by the Coastal Zone Community of Practice

Enhance and improve the coordination of coastal/open-ocean observations and modelling initiatives, in support of a global ocean observation system.

Related activities will include: Improve the global coverage and data accuracy of the coastal/open ocean observing systems as well as the management and archiving of the resulting data and information. Contribute to the implementation of 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. Building on existing capabilities, develop a global coordinated information and data system for deep-ocean monitoring to better understand the dynamics of the ocean processes throughout the ocean water column.

d) Global Observing System (GOS) (former WE-06-01 and WE-06-02)

This sub-task is led by WMO

Achieve a complete and stable Global Observing System (GOS). The surface-based component should include in-situ, airborne, land and possibly ocean measurements; 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. The space-based component should include operational geostationary and polar components building upon WMO efforts to (i) increase spatial and temporal resolution for geostationary imagers and sounders, and (ii) provide a broader availability of polar Doppler wind profiles for initial operational testing.

*Key related Tasks in SBAs include: CL-06-01 (A Climate Record for Assessing Variability and Change), CL-09-01 (Environmental Information for Decision-making, Risk Management and Adaptation), WA-06-02 (Droughts, Floods and Water Resource Management), WA-08-01 (Integrated Products for Water Resource Management and Research), WE-06-03 (TIGGE), WE-09-01 (Capacity Building for High-Impact Weather Prediction), EC-09-01 (Ecosystem Observation and Monitoring Network)*

### **AR-09-04: Dissemination and Distribution Networks**

Develop and foster synergies between diverse communication networks established to distribute and disseminate GEOSS data, information and products.

#### a) GEONETCast

This sub-task is led by China (CMA), USA (NOAA, linda.moodie@noaa.gov), EUMETSAT and WMO

Establish GEONETCast as a distribution system for GEOSS related data, information and products using communication satellites and low cost, self contained, stand alone, off-the-shelf reception stations. GEONETCast is particularly useful in distributing operational or project data where a large number of users can benefit and where Internet access has low bandwidth or is non-existent. GEONETCast has been established on a demonstration basis, and will evolve to a fully operational global system with cross-cutting data serving all GEOSS Societal Benefit Areas. EUMETCast and GEONETCast America will, within their bandwidth capabilities, redistribute FENGYUNCast data and products to all interested users in Europe and America. Similarly, FENGYUNCast will, within its bandwidth capabilities, redistribute EUMETCast and GEONETCast America data and products to all interested users in Asia. This will ensure that data is exchanged among all GEONETCast regional hubs.

#### b) GEONET

This sub-task is led by ESA (mirko.albani@esa.int)

Establish GEONET as a global communication network of interconnected networks by which GEOSS related information, data and products can be circulated and distributed in response to users and providers needs. GEONET is based on the sharing of national, regional and global telecommunications networks and will serve all GEOSS Societal Benefit Areas. GEONET comprises User Access, Data Exchange and Dissemination services. GEONET will be based on communication network typologies, satellite and terrestrial, considered most suitable to meet the service requirements, providing access points for users and data providers at identified locations. Within the task, an inventory of the available networks for access, exchange and dissemination as candidates for GEONET will be performed, the draft architecture of GEONET will be defined and a demonstrator based on the available networks will be set-up as a first step towards a full operational system.

### **AR-06-11: Radio Frequency Protection**

This Task is led by WMO (philippe.tristant@meteo.fr)

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 DATA MANAGEMENT

In this Section, Task implementation and sub-task cross-coordination within a Task are under the guidance of the Architecture and Data Committee

### DA-06-01: GEOSS Data Sharing Principles

This Task is led by ICSU (CODATA, [codata@dial.oleane.com](mailto:codata@dial.oleane.com))

Identify steps required to further the practical application of the agreed GEOSS Data Sharing Principles: (1) There will be full and open exchange of data, metadata, and products shared within GEOSS, recognizing relevant international instruments and national policies and legislation; (2) All shared data, metadata, and products will be made available with minimum time delay and at minimum cost; (3) All shared data, metadata, and products being free of charge or no more than cost of reproduction will be encouraged for research and education.

Under the guidance of the Data Sharing Principles Task Force, define near-term milestones needed to come to consensus on *Implementation Guidelines for the GEOSS Data Sharing Principles* and move expeditiously towards the development of working data sharing policies and procedures for GEOSS. This will require an iterative process, whereby initial experience with data sharing policies and procedures will provide important lessons. Throughout this process, ensure data access for capacity building and work in close connection with DA-09-02a (GEOSS Quality Assurance Strategy).

### DA-09-01: Data Management

This Task involves the (i) planning, development, implementation, and administration of systems for the acquisition, storage, and retrieval of data, and the (ii) maintenance and updating of data & information (including access and confidentiality, conformity and quality, and content). Also included is the timely and economical acquisition of data; and management of data assets after receipt.

#### a) GEOSS Quality Assurance Strategy (former DA-06-02)

This sub-task is led by CEOS ([stephen.g.ungar@nasa.gov](mailto:stephen.g.ungar@nasa.gov)) 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 area.

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

This sub-task is led by USA (USGS) and CEOS ([kenneth.mcdonald@noaa.gov](mailto:kenneth.mcdonald@noaa.gov))

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.

### DA-09-02: Data Integration and Analysis

Coordinate data management approaches from input to processing, archiving, and dissemination. Enable users to (i) utilize large volumes of data from heterogeneous data sources in cooperation with existing data centers and (ii) more effectively define an action, perform the action at a desired time, monitor the execution status, and view the results.



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

This sub-task is led by Japan (University of Tokyo, koike@hydra.t.u-tokyo.ac.jp)

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

This sub-task is led by UK (Met Office)

Facilitate the development of demonstration projects promoting the use of ensemble-based techniques in disciplines other than weather forecasting.

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

This sub-task is led by IAG (hpplag@unr.edu)

Ensure the availability of accurate, homogenous, long-term, stable, global geodetic reference frames as a mandatory framework and the metrological basis for Earth observation. Identify steps towards such consistent high-accuracy global geodetic reference frames for Earth observation and the observing systems contributing to GEOSS.

d) Atmospheric Model Evaluation Network

This sub-task is led by USA (EPA, keating.terry@epa.gov)

Demonstrate the use of web services to compare global and regional atmospheric models (including atmospheric chemistry/air quality models). Apply to a variety of Earth observations from distributed archives using standardized approaches to evaluate and improve model performance. Draw upon and contribute to the work of the Task Force on Hemispheric Transport of Air Pollution under the Convention on Long-range Transboundary Air Pollution, the IGAC-SPARC Atmospheric Chemistry and Climate Initiative, AeroCOM, and the Air Model Evaluation International Initiative.

### **DA-09-03: Global Data Sets**

Provide a suite of global datasets based on improved and validated data sources. Initiate regular analysis and reporting. Facilitate interoperability among data sets.

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

This sub-task is led by USA (USGS), CEOS and GTOS (GOF-C-GOLD, m.h@uni-jena.de)

Provide a suite of global land cover datasets, initially based on improved and validated moderate resolution land cover maps and eventually including land-cover change at high resolution. This activity will benefit directly from the establishment of the Land Surface Imaging virtual constellation (see AR-09-02a).

b) Global Meteorological and Environmental Data

This sub-task is led by China (CMA, zhangp@cma.gov.cn)

Implement the Chinese Meteorological Satellite Program for global weather and environmental monitoring. This Program will (i) provide users worldwide with low-resolution multiple-source observation data; (ii) develop integrated multi-source satellite retrieval products shared with users; and (iii) enhance capabilities to acquire and apply Chinese meteorological satellite data and products.

c) Digital Geological Map Data

This sub-task is led by UK (BGS, shm@bgs.ac.uk)

Make web-accessible the best available geological map data worldwide. Build upon the OneGeology project to (i) create global dynamic digital geological map data and (ii) make existing geological map data accessible in whatever digital format is available in each country. The target scale is 1:1 million but the project will be pragmatic and accept a range of scales and the best available data. Ninety four countries and a dozen international scientific organizations contribute to the OneGeology Project.

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

This sub-task is led by UK (BNSC, UCL, jpm@mssl.ucl.ac.uk) 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.

### 1.3 CAPACITY BUILDING

In this Section, Task implementation and sub-task cross-coordination within a Task are under the guidance of the Capacity Building Committee

#### **CB-09-01: Resource (or Seville Roadmap) Mobilization**

This Task is led by Spain (AEMET, mangoloti@inm.es)

Implement the Seville Roadmap on Resource Mobilization<sup>1</sup>. The road map aims to mobilize resources for building the capacity of the three key contributors to Earth observations: individuals, institutions and infrastructure. It also works to strengthen links between the user and donor communities.

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

Identify education and training opportunities across GEOSS societal benefit areas. Develop synergies, encourage cross-fertilization and address common challenges.

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

This sub-task is led by Netherlands (ITC, molenaar@itc.nl)

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 (IRI, mthomson@iri.columbia.edu)

Develop a sustainable “Summer Institute on Climate Information for Public Health” building on the efforts of 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 will offer 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/GEO Summer Schools on Space-based Solutions for Disaster Management and Emergency Response

This sub-task is led by UNOOSA (georg.magerl@unoosa.org)

Build upon the outcome of GEO 2007-2009 Task CB-07-02 (Knowledge Sharing for Improved Disaster Management and Emergency Response) to establish and support regional training and capacity building programmes related to disaster management and emergency response.

##### d) CBERS/GEO Capacity Building Network

This sub-task is led by Brazil (INPE, hilcea@dpi.inpe.br) and China (CMA)

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<sup>1</sup> Document available at [http://www.earthobservations.org/ag\\_cbc.shtml](http://www.earthobservations.org/ag_cbc.shtml)

Develop and implement a training program for the African end-users of the CBERS images. The programme will foster (i) the use of freeware and open-source geo-processing software (e.g. SPRING and TerraView), and (ii) the development of remote-sensing applications using CBERS images. Initial focus will be on users in Lusophone African countries.

e) Earth Observation Game for Youth

This sub-task is led by IEEE (tamashiro@ieee.org)

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.

f) GLOBE/GEO Climate Education Project

This sub-task is led by USA (UCAR, egeary@globe.gov)

Develop a student research campaign to foster the use of Earth observation and better prepare the future work force in dealing with changes in the global environment – through collaboration between the GEO community and the worldwide community of educators, students, and partners of the GLOBE (Global Learning and Observations to Benefit the Environment) Program. The GLOBE/GEO Student Climate Research Campaign (SCRC) will complete its planning in 2009 and implement the school-based pilot project in 2010. The latter will serve as a model for potential (future) GLOBE/GEO education-research campaigns on topics such as Water, Health, Biodiversity and Energy.

g) GEONETCast Training

This sub-task is led by China (CMA), USA (NOAA, linda.moodie@noaa.gov), EUMETSAT and WMO

Enhance GEONETcast capacity building and user engagement activities, particularly in developing countries. In particular, develop the GEONETCast Training Channel that will focus on (i) training end-users to use products for specific purposes and to disseminate data via GEONETCast; (ii) linking GEONETCast products and product navigator (inside portal) with specific training material; (iii) transmitting training materials via GEONETCast to local trainers; and (iv) disseminating training materials on GEOSS-related environmental data.

### **CB-09-03: Building Institutional Capacity to Use Earth Observations**

Coordinate, strengthen and sustain existing capacity building networks within Earth observation communities. As appropriate facilitate the construction of new networks.

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

This sub-task is led by UNEP (norberto.fernandez@unep.org)

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/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. In addition, improve in-country coordination among national statistical organisations, 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 (ITC, mannaerts@itc.nl)

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 services delivered by those institutions will be embedded in national higher-education systems (accredited, e.g. in European Union area), and internationally recognized by professionals and/or other bodies. GEO will have a coordination role using e.g. its web portal capacity building services and GEONETCast system.

**c) Building Capacity for Non-technical Decision-makers in the Use and Impact of Earth Observation**

This sub-task is led by IEEE (paul.e.racette@nasa.gov)

Maintain a GEOSS-focused web-based magazine for the general public and non-technical managers & decision-makers to complement existing capacity building efforts in GEO. Update the magazine(s) on a routine basis to inform and provide an understanding of the impacts of Earth observations on societal conditions and the benefits of global observation. Expand on existing GEOSS-focused web-pages to incorporate more material from developing countries. Enable access to the magazine(s) through the GEOPortal (AR-09-01a).

**d) Building Capacity for Operational Oceanography**

This sub-task is led by Denmark (DMI, js@dmi.dk)

Facilitate ocean data sharing and use by stimulating a global cooperation on operational oceanography, especially in developing countries. In the first stage, establish a global operational oceanography network connecting advanced operational forecasting centres in developed countries and quasi-operational centres in e.g. Asia, Africa and Latin America. In the second stage, establish regional cooperation projects (between advanced and less-developed operational centres). The first cooperation example will be based on EU project YEOS, a cooperation among China, EU and Korea.

**CB-09-04: Capacity Building Needs and Gap Assessment**

Engage the user community in identifying their capacity building needs for accessing, using and producing Earth observations for societal benefit. 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 (ITC, mannaerts@itc.nl)

Through the engagement of user and expert networks, build registry and database content for the existing components, services and best practices registries of Task AR-09-01. This content will include current and planned capacity building activities, best practices, and identified gaps and needs. Moreover this will include, as needed, observation, modelling and implementation best practices. Best practice examples will for instance relate to open-content courses, e-learning material, and downloadable data & products that support the use of GEOSS and 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 GEOPortal (AR-09-01a) and GEOSS Best Practices Registry (AR-09-01c).

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

This sub-task is led by Morocco (DMN) and IOC (j.berque@unesco.org)

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 (ITC) and IEEE (jsp@sprintmail.com)

Organize a series of workshops to demonstrate the GEOSS Common Infrastructure to users in all societal benefit areas. Continue series of global and regional workshops to provide avenues for user inputs into the GEOSS requirements and feedback on the operational aspects of GEOSS; approximately five workshops per year will be organized which should support outreach on GEOSS capabilities. In addition, organize capacity building workshops to expose regional and local stakeholders to best practices in capacity building and to the benefits of the GEONETCast data dissemination system – in combination with open source web-based applications and service deliveries, for the various societal benefit areas, and GEOSS observation networks.

**CB-09-05: 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 (INPE, karine@dpi.inpe.br)

Encourage the development of open-source solutions across and along the Earth observation value chain – by building upon existing efforts and drawing upon networks of Open Source Software (OSS) developers. As a starting point, use the TerraView and Terralib platform to encourage the development of OSS for end-users dealing with integrated Earth observation and GIS data. Related activities will include: (1) Provide new versions of the SPRING image processing software and GIS software for use with CBERS images, TerraView and Terralib; (2) Develop 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; and (3) Translate 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 (INPE, julio@dpi.inpe.br), China (CMA) and CEOS

Establish and upgrade the capacity of ground stations with a footprint in Africa to receive, process, store and distribute CBERS (China-Brazil Earth Resources Satellite) 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: Maspalomas, operated by INTA (Spain), and Hartebeeshoek, operated by CSIR (South Africa). Other possibilities, still requiring negotiation, include: 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 (NASA, USAID, cstokes@usaid.gov)

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 (i) early warnings of thunderstorms, flash floods, and vector-borne diseases; (ii) climate prediction mapping; and (iii) 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 and online decision-support tools to interpret, map and visualize (3D) this data. It is used to monitor weather, forest fires, and ecological changes, as well as to respond to severe events such as red tides, tropical storms, and flooding.

d) Geo-resources Services for Africa

This sub-task is led by EC (AEGOS, m.urvois@brgm.fr)

Build upon the AEGOS project to design a pan-African infrastructure of interoperable data and user-oriented services to strengthen the sustainable use of geo-resources in Africa. Safeguard, share, valorise the knowledge and data archived in African and European geological surveys. Support geoscientific communities and institutional decision-makers in the design and implementation of sustainable development public policies.

## 1.4 SCIENCE AND TECHNOLOGY

In this Section, Task implementation is under the guidance of the Science and Technology Committee

### **ST-09-01: Catalyzing Research and Development (R&D) Funding for GEOSS**

This Task is led by EC (DG-RTD, gilles.ollier@ec.europa.eu) and IIASA

Encourage national governments and international organizations to address GEOSS Science and Technology needs in their R&D programmes. As stated in "The Role of Science and Technology in GEOSS"<sup>2</sup>, it should be a priority for GEO Members and Participating Organizations to involve research institutions and funding agencies in GEOSS implementation. To this end, GEO Members and Participating Organizations will be encouraged to: (i) plan and conduct R&D activities in support of GEOSS implementation; (ii) Contribute relevant R&D activities (planned or ongoing) to GEOSS implementation; (iii) Identify and earmark funding sources for those activities; and (iv) promote GEOSS throughout the process.

Related activities will include: Develop proposals and guidelines to assist R&D agencies in addressing GEO needs. Engage a dialogue with decision makers and funding agencies. Identify programmes relevant to GEOSS Science and Technology needs and encourage them to collaborate with one another.

### **ST-09-02: Promoting Awareness and Benefits of GEO in the Science and Technology Community**

This Task is led by EC (DG-RTD, gilles.ollier@ec.europa.eu), COSPAR and IIASA

Engage the research community in GEOSS to achieve breakthroughs in the understanding of the Earth's changing environment and global integrated Earth system. The nine interdependent GEOSS societal benefit areas require an inter-disciplinary scientific approach cutting across observations, research, knowledge and information. The scientific community should collaborate within GEO to address interactions between the components of the global integrated Earth system, and connect natural and socioeconomic sciences.

A strong GEO engagement from the Science and Technology community would contribute to: (i) Connect disciplines to address the complex issues of the global integrated Earth system; (ii) Improve interoperability between global observing systems, modelling systems, and information systems; (iii) Facilitate data sharing, data archiving, data dissemination, and reanalysis; (iv) Optimize recording of observations, assimilation of data into models, and generation of data products to improve understanding of the global integrated Earth system for prediction of environmental phenomena; (v) Enhance value of global observations from individual observing systems through their integration in the societal benefit areas; and (vi) Harmonize well-calibrated, high-accuracy, stable, sustained in-situ and satellite observations of the same variable recorded by different sensors and different agencies.

Related activities will include: Form links with major scientific research enterprises in each societal benefit area. Actively encourage relevant scientists and technical experts to contribute to GEOSS in a truly participatory way. Reach out to the world's diverse scientific and technological communities and make GEOSS more visible and attractive to them. Contact universities and laboratories to involve them in GEOSS activities. Organize a GEO presence at major symposia and other meetings, for example through plenary presentations or side events.

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<sup>2</sup> Document available at [http://www.earthobservations.org/ag\\_stc.shtml](http://www.earthobservations.org/ag_stc.shtml)



## 1.5 USER ENGAGEMENT

In this Section, Task implementation and sub-task cross-coordination within a Task are under the guidance of the User Interface Committee

### US-09-01: User Engagement

Involve users in reviewing and assessing requirements for Earth Observation data, products and services. Create an appropriate mechanism for coordinating user requirements across societal benefit areas. Foster partnerships among and within societal benefit areas, making use of user communities where they exist and catalyzing the formation of new ones where they do not.

#### a) Identifying Synergies between Societal Benefit Areas

This sub-task is led by USA (EPA, NASA, lfriedl@nasa.gov)

Develop a GEO process for identifying critical Earth observation needs 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.

#### b) Communities of Practice and Partnership Development

This sub-task is led by USA (EPA, foley.gary@epamail.epa.gov) and IAG

Develop GEO Communities of Practice to identify and refine user needs, in particular for cross-cutting areas – building upon GEO's initial experience of Communities of Practice, information provided by national, regional and project-level surveys, and the extensive work of the Integrated Global Observing Strategy Partnership (IGOS-P), now transitioned into GEO. The following Communities of Practice have been recognized by the User Interface Committee: Air Quality and Health, Coastal Zone, Energy, Forest, Geohazards, Global Agriculture Monitoring, and Water and Health.

### US-09-02: Socio-Economic Indicators

Develop socio-economic data and products. Support the development of methods, models and tools required to produce GEOSS-relevant socio-economic indicators.

#### a) Socio-Economic Benefits of GEO and GEOSS

This sub-task is led by IIASA (oberstei@iiasa.ac.at)

Build upon the GEOBENE project (Global Earth Observation - Benefit Estimation: Now, Next and Emerging) to assess Earth observation benefits and GEOSS added-value (including cooperation and data sharing). Define test-cases and develop methodologies and analytical tools in each of the nine GEOSS societal benefit areas. In particular develop integrated models that will also serve as effective decision-making tools to evaluate impacts and benefits of multiple scenarios across societal benefit areas. Such models will be also used in the framework of the European project EuroGEOSS – to assess the GEOSS added value to multi-disciplinary interoperability and modelling.

#### b) Socio-economic and Demographic Global Data

This sub-task is led by UNECA (ezigbalike.uneca@un.org)

Develop global spatially-enabled socio-economic databases with an initial focus on Africa. Support the development of tools and methods for building, visualizing, and analyzing socioeconomic indicators for informed decisionmaking, policy formulation, and operational strategies for development.

c) Global Road and Human Settlements Mapping on GEO Grid

This sub-task is led by Japan (AIST, iwao.koki@aist.go.jp) 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, developing and distributing data; (ii) Research & development for producing relevant data using satellite images; and (iii) Collection, maintenance, and evaluation of relevant remote sensing and GIS data.

### US-09-03: Cross-Cutting Products and Services

Foster the development and use of Earth observation products and services across the societal benefit areas of GEOSS, especially in developing countries.

a) Development of Global Map for GEOSS Societal Benefit Areas (former DA-06-05)

This sub-task is led by Japan (GSI, fukushima@gsi.go.jp) and ISCGM

Foster the use of Global Map in societal benefit areas such as Disasters, Health, Agriculture, Biodiversity and Water. Identify the needs for basic geographic data and reflect these needs in new specifications. Global Map datasets provide a full and consistent coverage of land on the Earth – at 1 km resolution. They are composed of the following thematic layers: elevation, vegetation, land-cover, land-use, transportation drainage systems, boundaries and population centers.

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

This sub-task is led by USA (NASA, USDA Forest Service, USGS), GTOS (GOFC-GOLD) and FAO (mette.loychewilkie@fao.org), and supported by the Forest Community of Practice

Integrate international efforts on assessment and monitoring of forests and forest changes using a combination of ground and satellite information and internationally agreed standards. Make relevant synergies with CL-09-03b (Forest Carbon Tracking) and DI-09-03b (Implementation of a Fire Warning System at Global Level).

c) Bio-geophysical, Soil & Land Surface Data

This sub-task is led by EC (e-SOTER, vincent.vanEngelen@wur.nl), USA (NASA) and WCRP

Coordinate the collection, processing and distribution of bio-geophysical and land surface parameter data (e.g. Leaf Area Index (LAI), Vegetation Index (VI), Fraction Photosynthetically Available Radiation (FPAR) and Net Primary Productivity (NPP)). Deliver this data as a service to the global modelling communities; there is a heritage of this type of effort (ISLSCP 1 and 2).

Support the development a Global Soil Information System (GLOSIS) building upon the work of the International Soil Reference and Information Centre (ISRIC). Incorporate the various existing regional initiatives into a coherent system for soil data – to support implementation of major multilateral environmental agreements (e.g. UNFCCC, UNCCD and CBD) and provide harmonized & policy-relevant information to users at the regional and national level. As the European contribution to GLOSIS, e-SOTER will deliver a web-based regional pilot platform with data, methodology, and applications, using remote sensing to validate, augment and extend existing data.

d) Global Phenology Data

This sub-task is led by Austria (ZAMG, elisabeth.koch@zamg.ac.at) and USA (NPN, University of Wisconsin)

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. Changes in vegetation phenology impact biodiversity, net primary productivity, species distribution, albedo, biomass and ultimately the global climate.

## 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*

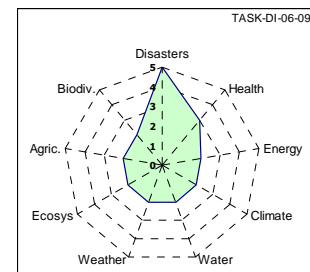
#### DI-06-09: Use of Satellites for Risk Management

This Task is led by Canada (CSA, [guy.seguin@asc-csa.gc.ca](mailto:guy.seguin@asc-csa.gc.ca)), China (CARSA, NSMC), CEOS and UNOOSA, and supported by the Geohazards Community of Practice

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 analyze the coverage for critical observations and, in the medium-long term, to implement the user interface for products ordering/retrieval and data integration/re-processing.

Deliverables will include: (i) Constellation requirement definition and performance assessment, through the full involvement of users and the participation of “champions” from the Geohazards Community of Practice; (ii) Actions towards the Board of the International Charter and relevant CEOS members, to identify possible strengthening of Charter mechanisms and options for widening its scope; and (iii) Cross-cutting use of satellites for health risk management and emergency response.

*Key related Tasks in other SBAs include: HE-09-01 (Information Systems for Health), HE-09-02 (Monitoring and Prediction Systems for Health), WA-06-02 (Droughts, Floods and Water Resource Management), WA-06-07 (Capacity Building for Water Resource Management)*



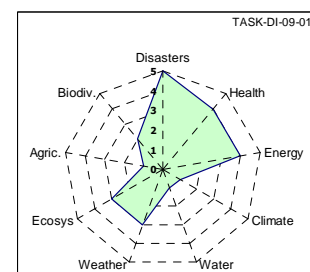
#### DI-09-01: Systematic Monitoring for Geohazards Risk Assessment

Define and implement a unified and integrated approach to geohazards risk assessment. Build upon synergies and integrate data from global in-situ seismographic networks and remote sensing. Coordinate multi-level efforts and implement decision-support tools to facilitate and support data access for selected “Supersites” locations.

##### a) Vulnerability Mapping and Risk Assessment (former DI-06-03 and DI-06-07)

This sub-task is led by China (CENC), France (BRGM), Italy (EUCENTRE, ISPRA, [fabio.dellacqua@eucentre.it](mailto:fabio.dellacqua@eucentre.it)), ESA, UNOSAT and WMO, and supported by the Geohazards Community of Practice

Facilitate access to the remote-sensing & in-situ data required to perform systematic geohazards vulnerability mapping and risk assessment. Related activities will include: (i) Retrieval, integration and systematic access to remote sensing & in-situ data in selected regional areas exposed to geological



threats (“Supersites”); the initial objective will be to dramatically enhance access to SAR data and integration of InSAR & GPS data; and (ii) Development, testing and application of global seismic vulnerability mapping to “Supersites” areas.

Concerning seismic hazard assessment, in-situ data related to earthquakes environmental effects will be provided by a catalogue compiled at global level by several research and academic institutions worldwide in the frame of an international cooperation within INQUA (International Union for Quaternary Research).

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

This sub-task is led by China (CENC), EC (EMSO), USA (USGS), FDSN and ISC, and supported by the Geohazards Community of Practice

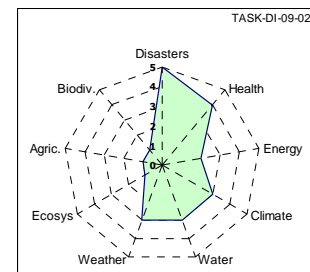
Improve the capabilities of global seismographic networks such as GSN, FDSN (including regional and global components), GNSS networks and new ocean bottom networks such as VENUS, NEPTUNE and ESONET. Facilitate sharing of data and event products among GEO members. Expand and coordinate efforts to provide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

Broaden the scope of this activity to identify and build upon synergies across in-situ observing network types (e.g. seismological, GNSS, hydrological). 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.

*Key related Tasks in other SBAs include: EC-09-02 (Ecosystem Vulnerability to Global Change)*

**DI-09-02: Multi-Risk Management and Regional Applications**

Define and implement an integrated approach to all phases of disaster management. Develop a framework for regional disaster management applications.



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

This sub-task is led by France (BRGM) and WMO, and supported by the Geohazards Community of Practice

Define and implement an integrated and comprehensive approach to systematically address all risk and disaster phases, including risk assessment and mapping. Support ISDR in the implementation of the Hyogo Framework for action and promote the development 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 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 France (BRGM), and supported by the Geohazards and Water Cycle Community of Practice

Implement regional and cross-cutting end-to-end projects. Potential areas of application will include: Famine and drought early warnings for Africa (to 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 such as prompt implementation of flood forecasting and analysis system for poorly-gauged river basins under the concept of GFAS-Streamflow proposed by IFNet using IFAS (Integrated Flood Analysis System) with the combination of satellite-based rainfall data and in-situ field observational data. Build upon GMES projects in the area of emergency response.

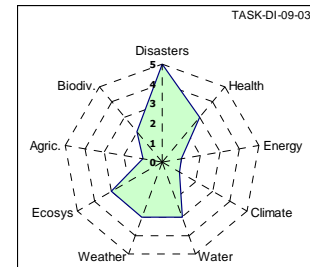
*Key related Tasks in other SBAs include: HE-09-01 (Information Systems for Health), HE-09-03 (End to End Projects for Health), EN-07-02 (Energy Environmental Impact Monitoring), WA-06-02 (Droughts, Floods and Water Resource Management), WA-06-07 (Capacity Building for Water Resource Management), WA-08-01 (Integrated Products for Water Resource Management and Research), EC-09-02 (Ecosystem Vulnerability to Global Change), AG-07-03 (Global Agricultural Monitoring)*

### DI-09-03: Warning Systems for Disasters

Support the development, improvement and coordination of early warning systems for natural disasters.

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

This sub-task is led by IOC (p.koltermann@unesco.org) and UNOSAT, and supported by the Geohazards and Coastal Zone Communities of Practice



Support the establishment and continuation of a multi-hazard fully-operational global tsunami early warning and mitigation system of systems. Promote full and open exchange of publicly-funded, unclassified data relevant to tsunami warning/mitigation systems and enhancement/development of mechanisms for real-time data sharing, including seismic and sea level (deep ocean and tide gauge) data. Contribute 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 observing system (GOOS), international seismic networks, and related global telecommunication systems). Define and promote standards/protocols for operating observing systems, and managing data exchange/transmission for multiple observing systems relevant to tsunami detection, early warning and mitigation. Build upon GMES projects in the area of emergency response and marine aspects.

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

This sub-task is led by Canada (CFS), Portugal (INOV) and GTOS (GOFC-GOLD, bill.degroot@NRCan.gc.ca), and supported by the Geohazards and Forest Communities of Practice

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” and the GFMC (Global Fire Monitoring Center). They will also build upon the European Forest Fire Information System (EFFIS) – providing fire danger forecasts and analyses of forest fire damages for the pan-European area and GMES projects in the area of emergency response.

*Key related Tasks in other SBAs include: HE-09-02 (Monitoring and Prediction Systems for Health), WE-06-03 (TIGGE), WE-09-01 (Capacity Building for High-Impact Weather Prediction), CL-09-03 (Global Carbon Observation and Analysis System), EC-09-01 (Ecosystem Observation and Monitoring Network), EC-09-02 (Ecosystem Vulnerability to Global Change), AG-07-03 (Global Agricultural Monitoring), BI-07-01 (Biodiversity Observation Network)*

## 2.2 HEALTH

### Understanding environmental factors affecting human health and well-being

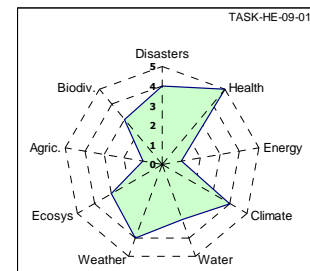
Health issues with Earth-observation needs include: airborne, marine, and water pollution; stratospheric ozone depletion; persistent organic pollutants; nutrition; and monitoring weather-related disease vectors. GEOSS will improve the flow of appropriate environmental data and health statistics to the 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*

#### HE-09-01: Information Systems for Health

This Task is led by France (CNES), IEEE and WHO (firthem@who.int)

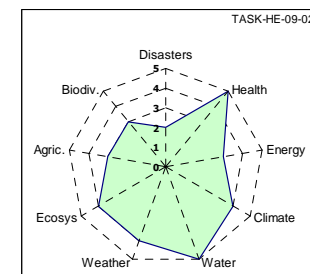
Improve in-situ environmental and health data collection for the utilization and validation of remotely-sensed data. Explore how GEOSS will support the collection & distribution of information and meet the diverse needs of the health community. Develop a global public health information network database to improve health decision-making at the international, regional, country and district levels. As a priority, connect WHO's Open Health information tool and other health and environmental information systems to the GEO Portal and GEOSS Common Infrastructure (GCI).



*Key related Tasks in other SBAs 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), CL-09-01 (Environmental Information for Decision-making, Risk Management and Adaptation), WA-06-02 (Droughts, Floods and Water Resource Management), WE-06-03 (TIGGE), WE-09-01 (Capacity Building for High-Impact Weather Prediction)*

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

Support the development of operational health-related applications. Connect established and emerging cross-cutting observing systems to monitoring and prediction systems for health. Include and gradually consolidate contributions from different, not yet coordinated systems. This Task will feed into HE-09-01 and HE-09-03.



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

This sub-task is led by WMO (dparsons@wmo.int), and supported by the Air Quality & Health and Atmospheric Chemistry (former IGACO) Communities of Practice

Facilitate research and development activities that lead to the delivery of new services related to monitoring of the atmospheric cycles of various aerosols and their improved forecast in operational numerical models of the atmosphere. Reduce risks due to aerosol influences on health and public safety and assess aerosol effects on marine and terrestrial ecosystems. 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 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 Observations, Forecasting and Public Information**

This sub-task is led by USA (EPA, dickerson.phil@epa.gov), and supported by the Air Quality & Health and Atmospheric Chemistry (former IGACO) Communities of Practice

Provide near real-time air quality observations and forecasts for the purposes of air quality and public health management, research and public information. Assimilate Earth observations data into weather models and provide reliable 2-3 day forecasts of air quality. Harmonize standards for sharing air quality observations, forecasts, and related indices and maps for public information so authorities can intervene to reduce human health responses to diseases. Relate statistically the frequency and severity of air quality episodes with health outcomes & records to better understand the transmission pathways of human respiratory diseases. Related activities will include: Protocol Monitoring for the GMES Service Element: Atmosphere (PROMOTE); Ozone Web; PREV' AIR; and AIRNow International

**c) Global Monitoring Plan for Persistent Organic Pollutants (POPs)**

This sub-task is led by UNEP (fouane@pops.int), and supported by the Air Quality & Health and Atmospheric Chemistry (former IGACO) Communities of Practice

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.

**d) Global Monitoring Plan for Atmospheric Mercury**

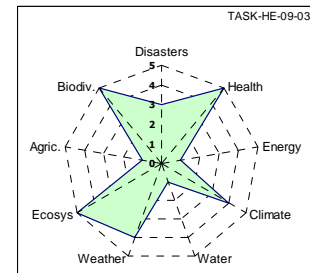
This sub-task is led by Italy (CNR-IIA, pirrone@iia.cnr.it) and USA (EPA), and supported by the Air Quality & Health, Atmospheric Chemistry (former IGACO), Biodiversity and Forest Communities of Practice

Develop a global monitoring network for mercury by harmonizing standard operating procedures for monitoring mercury and its compounds in air, atmospheric deposition, water, soil, sediments, vegetation and biota. The sharing of data from this network, allowing access to comparable and long-term data from a wide array of locations, will help understand temporal and spatial patterns of mercury transport and deposition to, and evasion from, terrestrial and aquatic ecosystems. The data produced will support the validation of regional and global atmospheric mercury models for use in evaluations of different policy options for reducing mercury pollution impacts on human health and ecosystems. Build upon the contributions of, among others, the UNEP Mercury Programme, the Hemispheric Transport of Air Pollutants Task Force (TF HTAP), and the European Monitoring and Evaluation Program (EMEP). Moreover build upon the US MercNet initiative and international monitoring and modelling efforts led by Italy, Japan and South Africa.

*Key related Tasks in other SBAs include: HE-09-03 (End to End Projects for Health), CL-09-01 (Environmental Information for Decision-making, Risk Management and Adaptation), WA-06-07 (Capacity Building for Water Resource Management), WE-06-03 (TIGGE), WE-09-01 (Capacity Building for High-Impact Weather Prediction)*

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

Develop and implement end-to-end health-environment projects to advance the application of observation, monitoring and forecasting systems to health decision-making processes. 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' to promote effective engagement of the health sector in all related sectors – at national and global levels in order to reduce the 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 (HCF, drogers@bluewin.ch), USA (IRI), WHO and WMO, and supported by the Air Quality & Health and Atmospheric Chemistry (former IGACO) Communities of Practice

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 include the implementation of an operational decision-support tool for testing the 2009 meningitis epidemic season in Africa.

#### b) Towards a Globally Coordinated Malaria Warning System

This sub-task is led by France (CNES), USA (NOAA) and CEOS (ivan.petiteville@esa.int)

Initiate a globally coordinated warning system for malaria. Foster the utilization of satellite and in-situ data for monitoring environmental conditions conducive to the spread of malaria and support the development of user training for this technology. Priorities 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.

Related activities will include: (1) Build support for the development of a “Globally Coordinated Malaria Warning System” ; (2) Demonstrate new NOAA/NESDIS satellite-based method for early warning of environmental conditions conducive to the development and spread of malaria; (3) Advocate for bringing other parties to share their experience in malaria monitoring.

#### c) Ecosystems, Biodiversity and Health: Decision-Support Tools and Research

This sub-task is led by USA (EPA, pongsiri.montira@epa.gov) and supported by the Air Quality & Health, Atmospheric Chemistry (former IGACO), Biodiversity and Forest Communities of Practice

Implement research activities that foster the application of tools (e.g. indicators, models) to informed decision-making and help reduce the emergence & spread of infectious diseases. Through an interdisciplinary team approach (which also includes end-users such as decision-makers), characterize the dynamics and mechanisms underlying the relationship between social stressors, changes in biodiversity, and disease transmission to humans. This sub-task is unique in its interdisciplinary “Community of Practice” approach, and in encouraging the coordination of Earth observations with field data to study this relationship.

*Key related Tasks in other SBAs 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), WA-06-02 (Droughts, Floods), WE-06-03 (TIGGE), WE-09-01 (High-Impact Weather Prediction), EC-09-01 (Ecosystem Observation and Monitoring Network), BI-07-01 (Biodiversity Observation Network)*



## 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*

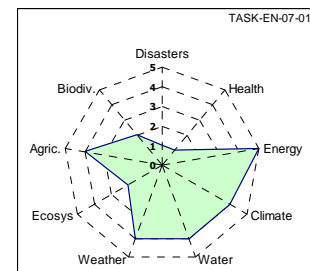
#### EN-07-01: Management of Energy Sources

This Task is led by Germany (DLR, marion.schroedter-homscheidt@dlr.de), CEOS and IEEE, and is supported by the Energy Community of Practice

Support the development of Earth observation products and services for the resource assessment, monitoring and forecasting of fluctuating energy sources (e.g. hydro, solar, wind, ocean). Consider end-to-end systems including generation, transmission, distribution, and integrated operations (e.g. efficient integration of energy sources into the electricity grid, and electricity grid management).

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. 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.

*Key related Tasks in other SBAs include: EN-07-03 (Energy Policy Planning), WA-06-02 (Droughts, Floods and Water Resource Management), WA-08-01 (Integrated Products for Water Resource Management and Research), WE-06-03 (TIGGE)*



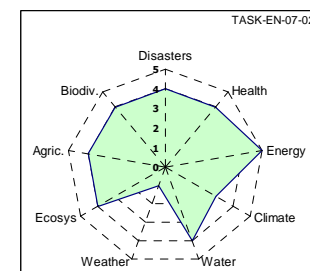
#### EN-07-02: Energy Environmental Impact Monitoring

This Task is led by EC (EnerGEO, emile.elewaut@tno.nl), and is supported by the Energy Community of Practice

Promote the development of Earth observation systems for the monitoring and prediction of environmental impact from energy resource exploration, extraction, transportation and/or exploitation. Build upon the contribution of the European project EnerGEO (Earth observation for monitoring and assessment of the environmental impact of energy use).

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 Task CL-09-03 (Global Carbon Observation and Analysis System) and carbon sequestration & greenhouse gas monitoring activities.

*Key related Tasks in other SBAs include: HE-09-02 (Monitoring and Prediction Systems for Health), EN-07-03 (Energy Policy Planning), CL-09-03 (Global Carbon Observation and Analysis System), WA-06-07 (Capacity Building for Water Resource Management), WA-08-01 (Integrated Products for Water Resource Management and Research), EC-09-02 (Ecosystem Vulnerability to Global Change), BI-07-01 (Biodiversity Observation Network)*

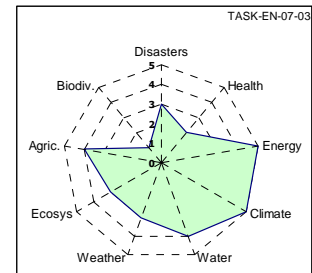


### EN-07-03: Energy Policy Planning

This Task is led by France (ENSMP, thierry.ranchin@ensmp.fr), and is supported by the Energy Community of Practice

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. Encourage training of decision-makers at all relevant levels for interpreting relevant data and products. Encourage the use of Earth science models to support energy scenario assessments.



*Key related Tasks in other SBAs include: EN-07-01 (Management of Energy Sources), EN-07-02 (Energy Environmental Impact Monitoring), WA-06-02 (Droughts, Floods and Water Resource Management), WA-06-07 (Capacity Building for Water Resource Management)*

## 2.4 CLIMATE

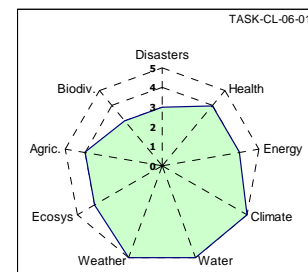
### Understanding, assessing, predicting, mitigating, and adapting to climate variability and change

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: A Climate Record for Assessing Variability and Change

Extend and improve the quality of the past climate record through advanced data reanalysis and reconstruction in the atmosphere, ocean, land and sea ice domains. Generate high-quality temporally-homogeneous estimates of the past climate to support analyses of climate variability and change.



##### a) Sustained Reprocessing and Reanalysis of Climate Data

This sub-task is led by CEOS, GCOS and WCRP (trenbert@ucar.edu)

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).

##### b) Extending the Record of Climate Variability at Global Scale

This sub-task is led by IGBP (PAGES, thorsten.kiefer@pages.unibe.ch)

Support and coordinate activities towards a global coverage of high-resolution, well-dated reconstructions of past climate parameters (e.g. temperature, precipitation, pressure) in the ocean and on land to better understand past modes of climate variability. Focus on the last 2000 years and the extension of instrumental records. Encourage activities that promote proxy calibration, quantitative data-model comparisons, and better understanding of interdecadal and longer climate change at global and regional scales.

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

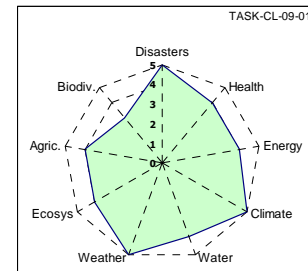
This sub-task is led by USA (NASA, NOAA, mitch.goldberg@noaa.gov), CEOS, GCOS and WMO

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

*Key related Tasks in other SBAs include: CL-09-01 (Environmental Information for Decision-making, Risk Management and Adaptation), AR-09-03 (Sustained Observing Systems), WA-06-02 (Droughts, Floods and Water Resource Management), WE-06-03 (TIGGE), EC-09-02 (Ecosystem Vulnerability to Global Change)*

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

Support the integration of climate and environmental 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 and environmental services for development.



### a) Towards Enhanced Climate, Weather, Water and Environmental Prediction (former CL-07-01)

This sub-task is led by Australia (BOM), WMO (jcaughey@wmo.int), WCRP and IGBP

Strengthen the ability worldwide to deliver new and improved climate, weather, water and environmental services. Key research activities relate to: (i) Seamless weather, climate and Earth system prediction; (ii) Multi-scale organization of tropical convection and interaction with the global circulation; (iii) Data assimilation for coupled models as a prediction and validation tool for weather and climate research; and (iv) Information to assess risks, and benefits of climate/weather predictions, for society and the global economy. 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

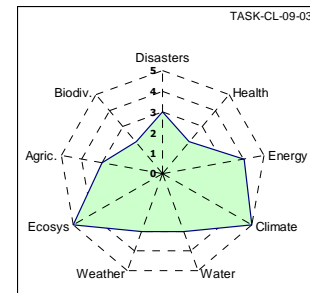
This sub-task is led by GCOS (wwestermeyer@wmo.int) and WCRP

Promote the resourcing and implementation of the Climate for Development in Africa Programme (ClimDev Africa). The programme is to improve the availability, exchange and use of climate information & services at national, local and regional levels – in support of economic growth and achievement of the Millennium Development Goals. African partners include the African Union, the UN Economic Commission for Africa, the African Development Bank, and the African National Meteorological and Hydrological Services. In addition, 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 in other SBAs include: DI-09-03 (Warning Systems for Disasters), HE-09-03 (End to End Projects for Health), AR-09-03 (Sustained Observing Systems), WA-06-02 (Droughts, Floods and Water Resource Management), WA-06-07 (Capacity Building for Water Resource Management), WA-08-01 (Integrated Products for Water Resource Management and Research), WE-06-03 (TIGGE), WE-09-01 (Capacity Building for High-Impact Weather Prediction), EC-09-02 (Ecosystem Vulnerability to Global Change), BI-07-01 (Biodiversity Observation Network)*

### CL-09-03: Global Carbon Observation and Analysis System

Implement a global carbon observation and analysis system addressing the three components of the carbon cycle (atmosphere, land and ocean) and providing high-quality regional information on CO<sub>2</sub> and CH<sub>4</sub> concentrations and emission variations. Combine observations, reanalysis and product development to develop tools for carbon tracking and carbon storage evaluation. Build upon 2004 internationally accepted strategies and the work of the WMO Global Atmospheric Watch (GAW) to implement the atmospheric component of those strategies.



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

This sub-task is led by EC (COCOS) and USA (NOAA, USGS), and supported by the Carbon Cycle Community of Practice (former IGCO including GAW, rogerd@unimelb.edu.au)

Support the development of an integrated global carbon observation system, including improved global networks of atmospheric CO<sub>2</sub> observations, air-surface exchange flux networks as well as surface ocean CO<sub>2</sub> and related marine biochemistry observations. Encourage the development of high-resolution global and regional data-assimilation and modelling systems to enhance the utility of the spatial and temporal resolution of those observations and provide relevant regional-scale information.

#### b) Forest Carbon Tracking

This sub-task is led by Australia (CSIRO, alex.held@csiro.au), Japan (NIES), Norway (NSC), CEOS, FAO and GTOS (GOF-C-GOLD), and supported by the Carbon Cycle (former IGCO including GAW) and Forest Communities of Practice

Coordinate the definition, development and validation of robust tools and methodologies for the evaluation of carbon storage in forests, considering also impacts of forest fires. Build upon GEO efforts in forest monitoring, carbon observation and modelling to foster the 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) Coordination of tools and methodologies assessment; (ii) Coordination of observations (securing continuity); (iii) Coordination of reference datasets production; (iv) Improvement of access to observations, datasets, tools and expertise; (v) Pilot initiatives to demonstrate capabilities; and (vi) Capacity building.

#### c) Global Monitoring of Greenhouse Gases from Space

This subtask is led by Japan (JAXA, rtanabe@mext.go.jp), USA (NASA), CEOS and ESA, and supported by the Carbon Cycle (former IGCO including GAW) and Forest Communities of Practice

Foster the use of space-based greenhouse gas (GHG) observations and consolidate data requirements for the next-generation GHG monitoring missions. Establish an international group in close cooperation with the CEOS Atmospheric Composition constellation and the Carbon Cycle Community of Practice, to initially generate and implement plans for the end-to-end utilization of space-based GHG data, particularly those of GOSAT and OCO to be launched in early 2009. Coordinate these efforts with ground-based systems for validation and build upon, as appropriate, existing observations and products to date – from satellites (e.g. SCIAMACHY and AIRS), aircrafts, and surface-based instruments (in-situ and total column).

*Key related Tasks in other SBAs include: DI-09-03 (Warning Systems for Disasters), EN-07-02 (Energy Environmental Impact Monitoring), EN-07-03 (Energy Policy Planning), EC-09-01 (Ecosystem Observation and Monitoring Network), EC-09-02 (Ecosystem Vulnerability to Global Change)*

## 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.

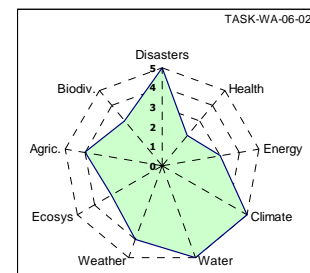
*GEOSS 10-Year Implementation Plan, Section 4.1.5*

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

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

##### a) Forecasting for Droughts and Floods

This sub-task is led by USA (NOAA, john.schaake@noaa.gov), and supported by the Water Cycle Community of Practice (former IGWCO)



Improve forecasting methods for extreme events (floods, droughts) used by hydrological services throughout the world to help bridge the gap between research and user communities. Expand upon initiatives such as (i) HEPEX (Hydrological Ensemble Prediction Experiment) (ii) the European Flood Alert System EFAS to produce twice-daily 10-day early flood warnings for Europe, and (iii) GMES projects related to land management (GEOLAND).

##### b) Impacts from Drought

This sub-task is led by Canada (University of Manitoba, lawford@umbc.edu), EC (CEOP-AEGIS), USA (NOAA) and WCRP, and supported by the Water Cycle Community of Practice (former IGWCO)

Track and analyze impacts from drought (including feedbacks such as soil drying) to provide a tangible and practical demonstration of the value of integrated water cycle observations. Develop a full and operational data cycle of environmental information from “producer-to-consumer”/“source to sink,” and explore the application of data products to Water and Agriculture.

##### c) Mountain Water Resources

This sub-task is led by EC (ACQWA, martin.beniston@unige.ch), and supported by the Water Cycle Community of Practice (former IGWCO)

Analyze the future of water resources in vulnerable mountain regions in the context of climate change and increasing extreme events. Build upon the European project ACQWA (Assessing Climatic change and impacts on the Quantity and quality of Water) to deliver among others, technical papers on downscaling techniques for hydrological modelling and water policy recommendations for decision-makers.

##### d) Prototype Regional Drought Early Warning Test Beds

This sub-task is led by USA (NIDIS, NOAA, roger.pulwarty@noaa.gov)

Explore expanding the concept of the North American Drought Monitor and drought portal through prototype drought early warning test bed activities in specific international river basins, such as on the

US-Canada border, basins in Central America and the Caribbean, the Mediterranean, and other drought-sensitive regions.

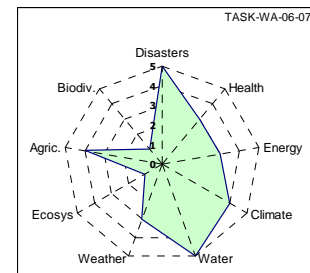
*Key related Tasks in other SBAs include: DI-06-09 (Use of Satellites for Risk Management), DI-09-02 (Multi-Risk Management and Regional Applications), CL-09-01 (Environmental Information for Decision-making, Risk Management and Adaptation), WA-06-07 (Capacity Building for Water Resource Management), WA-08-01 (Integrated Products for Water Resource Management and Research), WE-06-03 (TIGGE), WE-09-01 (Capacity Building for High-Impact Weather Prediction), AG-07-03 (Global Agricultural Monitoring)*

### **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 (CONAE), Canada (University of Manitoba, lawford@umbc.edu) and USA (NASA), supported by the Water Cycle Community of Practice (former IGWCO)



Develop a proposal along the lines of the 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 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; and (iv) Issue a call for proposals to the research and development community. The program will be initiated in Latin America and then be extended to Asia and Africa. Linkages with existing GEO efforts will be made.

#### b) Africa

This sub-task is led by USA (NASA) and CEOS (diego.fernandez@esa.int), and supported by the Water Cycle Community of Practice (former IGWCO)

In the scope of Phase 2 of the TIGER initiative (focusing on the use of space technology for water resource management in Africa), 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. In addition, 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

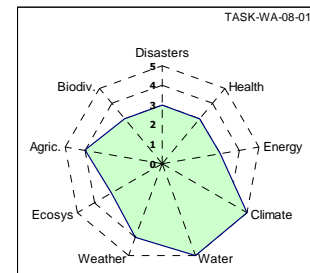
This sub-task is led by Japan (JAXA, University of Tokyo, tkoike@hydra.t.u-tokyo.ac.jp), and supported by the Water Cycle Community of Practice (former IGWCO)

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). In addition, 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 in other SBAs include: CL-09-01 (Environmental Information for Decision-making, Risk Management and Adaptation), WA-06-02 (Droughts, Floods and Water Resource Management), WA-08-01 (Integrated Products for Water Resource Management and Research)*

## 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 observing systems) and emerging assimilation and prediction capabilities, are opening the door to a new era in global water-cycle management.



### a) Soil Moisture

This sub-task is led by ESA and WCRP (peter.vanoevelen@gewex.org), and supported by the Water Cycle Community of Practice (former IGWCO)

Establish a global soil moisture network suitable for the development of multi-purpose soil moisture products. Apply in-situ based products to the calibration and validation of remotely-sensed observations. Such a global network is still to be established and is as such a high priority. Make relevant synergies with Task US-09-03 (Cross-cutting Products and Services).

### b) Runoff

This sub-task is led by Japan (University of Tokyo), Switzerland (University of Geneva) and WMO (wgrabs@wmo.int), and supported by the Water Cycle Community of Practice (former IGWCO)

Integrate, in a phased approach, dedicated river gauging networks of existing hydrological stations into a global runoff observation network. The main output of the HARON project (Hydrological Applications and Run-Off Network) 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 (IGRAC, sophie.vermooten@deltares.nl), and supported by the Water Cycle Community of Practice (former IGWCO)

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 (parkin@essic.umd.edu), and supported by the Water Cycle Community of Practice (former IGWCO)

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 EC (CEOP-AEGIS) and WCRP (GEWEX, tkoike@hydra.t.u-tokyo.ac.jp), and supported by the Water Cycle Community of Practice (former IGWCO)

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 (lyonjohn@aol.com), and supported by the Water Cycle Community of Practice (former IGWCO)

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 on developing countries and realizable in the field within one year. They will be sustainable, reusable, repeatable, and scalable.

g) Global Water Quality Monitoring (former WA-07-01)

This sub-task is led by Australia (CSIRO) and USA (EPA, State of Wisconsin, steven.greb@Wisconsin.gov), and supported by the Water Cycle Community of Practice (former IGWCO)

Initiate projects to develop operational observation and monitoring systems of water quality, integrating in-situ water quality monitoring methods for terrestrial sources & the coastal ocean with remote-sensed operational systems of global-scale freshwater quality. Ensure that resulting information systems are compatible and interoperable as part of the system of systems. Make relevant synergies with HE-07-02 and develop models that relate water quality databases to exposure and health effects data; and identify mechanisms for alerting public health professionals on hazardous conditions identified by the monitoring of these parameters.

*Key related Tasks in other SBAs include: HE-09-02 (Monitoring and Prediction Systems for Health), CL-06-01 (A Climate Record for Assessing Variability and Change), CL-09-01 (Environmental Information for Decision-making, Risk Management and Adaptation), AR-09-03 (Sustained Observing Systems), WA-06-02 (Droughts, Floods and Water Resource Management), WA-06-07 (Capacity Building for Water Resource Management), WE-06-03 (TIGGE), EC-09-01 (Ecosystem Observation and Monitoring Network), AG-07-03 (Global Agricultural Monitoring)*

## 2.6 WEATHER

### Improving weather information, forecasting and warning

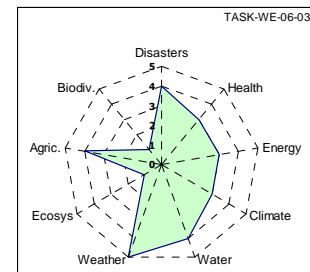
The weather observations encompassed by GEOSS are based on the requirements for timely short- and medium-term forecasts. GEOSS can help fill critical gaps in the observation of, for example, wind and humidity profiles, precipitation, and data collection over ocean areas; extend the use of dynamic sampling 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 for Weather

This Task is led by WMO (jcaughey@wmo.int)

Complete THORPEX Interactive Global Grand Ensemble (TIGGE) Phase 1 and commence TIGGE Phase 2. TIGGE is a global operational multi-model ensemble prediction system incorporating easily accessible databases. Development of TIGGE will be an important contribution to a number of Tasks related to risk management, early warning systems, major hazards and associated impacts. Related activities will include: Foster real-time data exchange, construct common web interfaces, design an improved archiving strategy, and develop a common toolbox to assist the development of user-driven products such as probabilistic tropical-cyclone warning services and extreme-precipitation forecasting; the latter will form the early products of a Global Interactive Forecasting System (GIFS) to internationally coordinate advance warnings and forecasts for high- impact weather events. Make use of data available from GMES projects in the area of marine and atmospheric monitoring.



*Key related Tasks in other SBAs include: DI-09-03 (Warning Systems for Disasters), HE-09-01 (Information Systems for Health), HE-09-02 (Monitoring and Prediction Systems for Health), HE-09-03 (End to End Projects for Health), EN-07-01 (Management of Energy Sources), CL-09-01 (Environmental Information for Decision-making, Risk Management and Adaptation), AR-09-03 (Sustained Observing Systems), WA-06-02 (Droughts, Floods and Water Resource Management), WE-09-01 (Capacity Building for High-Impact Weather Prediction), AG-07-03 (Global Agricultural Monitoring)*

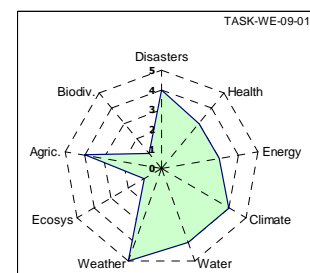
#### WE-09-01: Capacity Building for High-Impact Weather Prediction

Develop capability for numerical weather prediction in developing countries. Focus on high-impact weather events (including, but not limited to, extremes) and foster rapid progress through enhanced infrastructure and training.

##### a) Infrastructure for Numerical Weather Prediction

This sub-task is led by Korea (KMA, jcnam@kma.go.kr)

Develop improved system-infrastructures for the operation of numerical weather prediction in developing countries – building upon relevant WMO programmes. Identify gaps & needs 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 centers to assist developing countries in their utilization of currently available forecasts.

b) Socio-economic Benefits in Africa from Improved Predictions of High-Impact Weather

This sub-task is led by WMO (dparsons@wmo.int)

Improve the prediction of high-impact weather and help reduce vulnerability to climate variability and change in Africa through the WWRP-THORPEX Africa initiative. The latter 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 in other SBAs include: CL-09-01 (Environmental Information for Decision-making, Risk Management and Adaptation), AR-09-03 (Sustained Observing Systems for Climate), WA-06-02 (Droughts, Floods and Water Resource Management), WA-06-07 (Capacity Building for Water Resource Management), WE-06-03 (TIGGE)*

## 2.7 ECOSYSTEMS

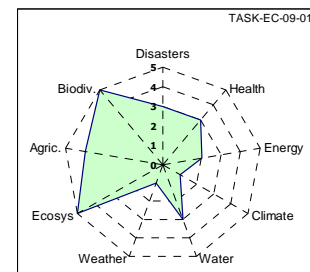
### Improving the management and protection of terrestrial, coastal and marine resources

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*

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

Coordinate and improve the observation, characterization and monitoring of terrestrial (forest, urban agriculture, woodlands, grasslands, and deserts), freshwater, ice and oceans ecosystems – especially in terms of acquisition and use of satellite/aerial/in-situ observation. Develop a global integrated sampling frame in coordination with the GEOSS Geodesy activities.



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

This sub-task is led by Paraguay (Guyra Paraguay) and USA (USGS, rsayre@usgs.gov), and supported by the Forest and Global Agricultural Monitoring Communities of Practice

Continue efforts to produce a standardized, robust, and practical classification and map of global ecosystems at management-appropriate scales for terrestrial, freshwater, and marine environments. Integrate the global ecosystems product with existing ecosystem maps and databases, and support ecosystem (GEO Trends Analysis Network) and biodiversity (GEO Biodiversity Observation Network) monitoring approaches.

##### b) Ecosystem Status and Trends

This sub-task is led by USA (USGS, dmuchoney@usgs.gov), and supported by the Forest and Global Agricultural Monitoring Communities of Practice

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 ecosystems' 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 Global Biodiversity Information Facility (GBIF); (ii) the IUCN World Conservation and Monitoring Center; (iii) The Encyclopedia of Life – an ecosystem of websites that makes key information about all life on Earth accessible to anyone, anywhere in the world; and (iv) 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.

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

This sub-task is led by GTOS and POGO (shubha@Dal.Ca), and supported by the Coastal Zone Community of Practice

Build upon the successful extension of the regional-scale ANTARES project (South America) to the global-scale ChloroGIN project – under POGO and IOCCG. Further develop existing initiatives (e.g.

IOC-sponsored regional networks; GOF-C-GOLD regional networks and ILTER for terrestrial domains).

d) Protected Areas Assessment and Monitoring (GEO PAAM)

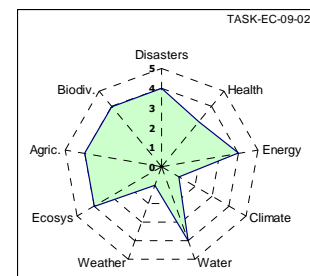
This sub-task is led by EC (JRC), USA (NASA, Nature Conservancy, NPCA, USGS), IUCN, UNEP (WCMC, [jorn.scharlemann@unep-wcmc.org](mailto:jorn.scharlemann@unep-wcmc.org)) and UNESCO, and supported by the Forest and Global Agricultural Monitoring Communities of Practice

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.

*Key related Tasks in other SBAs include: HE-09-03 (End to End Projects for Health), EN-07-02 (Energy Environmental Impact Monitoring), CL-09-01 (Environmental Information for Decision-making, Risk Management and Adaptation), AR-09-03 (Sustained Observing Systems), CL-09-03 (Global Carbon Observation and Analysis System), AG-07-03 (Global Agricultural Monitoring), BI-07-01 (Biodiversity Observation Network)*

**EC-09-02: Ecosystem Vulnerability to Global Change**

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



a) Impact of Tourism on Environmental and Socio-Economic Activities

This sub-task is led by Greece (MKFES, [greekgeo@admin.noa.gr](mailto:greekgeo@admin.noa.gr))

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

b) Impact of Transport Infrastructure Development

This sub-task is led by UNECA ([tguiebo@uneca.org](mailto:tguiebo@uneca.org))

Identify, map and assess environmental risks to support the development of transport infrastructure in Africa, strengthening the continent effort in regional integration, economic development and poverty alleviation. In particular produce a comprehensive geo-spatial database, with appropriate applications, to support the preparation of an integrated, all-modes transport infrastructure master plan for Africa.

c) Vulnerability of Sea Basins

This sub-task is led by EC (EnviroGRIDS, [anthony.lehmann@unige.ch](mailto:anthony.lehmann@unige.ch))

Develop a collaborative management system to store, analyze, visualize and disseminate crucial information on past, present and future states of European seas – to assess their sustainability and vulnerability. Build upon the European project EnviroGRIDS (gridded management system for

environmental sustainability and vulnerability) to develop a Black Sea basin observation and assessment system. Make relevant synergies with AR-09-01 (GCI). EnviroGRIDS will rely on ultra-modern technology using the largest gridded computing infrastructure in the world.

d) Vulnerability of Mountain Regions

This sub-task is led by Italy (Ev-K2-CNR, [evk2cnr@evk2cnr.org](mailto:evk2cnr@evk2cnr.org)) and WCRP (CEOP-HE), and supported by the Water Cycle Community of Practice (former IGWCO)

Implement a high elevation climate and environment monitoring network, starting with the existing SHARE: Stations at High Altitude for Research on the Environment network. Provide high-quality, reliable, long-term climatic and environmental data for the scientific community and decision-makers for the assessment of climate change and its impacts, especially in terms of vital human and economic resources from mountain areas already adversely affected by global change (e.g. water, energy, food, forest products, tourism).

*Key related Tasks in other SBAs include: EN-07-02 (Energy Environmental Impact Monitoring), CL-09-01 (Environmental Information for Decision-making, Risk Management and Adaptation), WA-06-02 (Droughts, Floods and Water Resource Management), EC-09-01 (Ecosystem Observation and Monitoring Network), AG-06-02 (Data Utilization in Fisheries and Aquaculture), AG-07-03 (Global Agricultural Monitoring), 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.

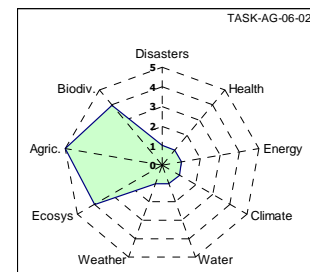
*GEOSS 10-Year Implementation Plan, Section 4.1.8*

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

This Task is led by Canada (BIO, forgetmh@mar.dfo-mpo.gc.ca), Spain (IEO) and POGO, and supported by the Coastal Zone Community of Practice

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

*Key related Tasks in other SBAs include: EN-07-02 (Energy Environmental Impact Monitoring), EN-07-03 (Energy Policy Planning), CL-09-01 (Environmental Information for Decision-making, Risk Management and Adaptation), AR-09-03 (Sustained Observing Systems), EC-09-01 (Ecosystem Observation and Monitoring Network), EC-09-02 (Ecosystem Vulnerability to Global Change), BI-07-01 (Biodiversity Observation Network)*



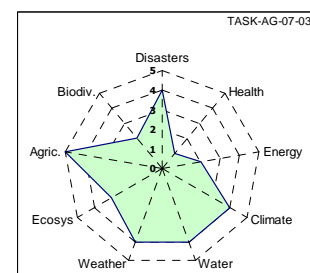
#### AG-07-03: Global Agricultural Monitoring

Support sustainable agriculture management and improve food security through the increased use of Earth observation data. Enhance current global capabilities in the areas of agriculture monitoring, famine early warning, food-supply prediction and agriculture risk assessment. Build the capacity necessary to utilize Earth observation information, especially within the developing world.

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

This sub-task is led by EC (JRC), USA (University of Maryland, justice@hermes.geog.umd.edu), and supported by the Global Agricultural Monitoring Community of Practice

Develop and improve 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 & 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 (rstefanski@wmo.int), and supported by the Global Agricultural Monitoring Community of Practice

Develop and improve analytical tools and methods for agriculture risk assessment, particularly for crop failure. Establish common standards and formats. Facilitate the implementation of pilot-projects linking Earth system models 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 (IRSA), Korea (KMA) and Uganda (DPRTRP, johnson.owaro@gmail.com), and supported by the Global Agricultural Monitoring Community of Practice

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.

*Key related Tasks in other SBAs include: DI-09-02 (Multi-Risk Management and Regional Applications), DI-09-03 (Warning Systems for Disasters), EN-07-02 (Energy Environmental Impact Monitoring), CL-09-01 (Environmental Information for Decision-making, Risk Management and Adaptation), CL-09-03 (Global Carbon Observation and Analysis System), WA-06-02 (Droughts, Floods and Water Resource Management), WA-06-07 (Capacity Building for Water Resource Management), WA-08-01 (Integrated Products for Water Resource Management and Research), WE-06-03 (TIGGE), WE-09-01 (Capacity Building for High-Impact Weather Prediction), EC-09-01 (Ecosystem Observation and Monitoring Network), EC-09-02 (Ecosystem Vulnerability to Global Change)*



## 2.9 BIODIVERSITY

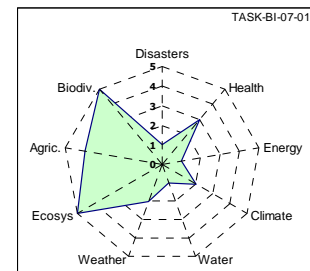
### Understanding, monitoring and conserving biodiversity

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*

#### BI-07-01: Developing a Global Biodiversity Observation Network

Coordinate and improve biodiversity (animals, plants, genes, etc) observation, assessment and conservation – especially in terms of acquisition and use of satellite, aerial and in-situ observation. Develop a global observation network to facilitate coordination among information users and providers. Improve the quality and quantity of observation and advocate for a better understanding of trends and conservation.



##### a) Biodiversity Observation Network (GEO BON)

This sub-task is led by EC (EBONE), USA (NASA) and DIVERSITAS (anne@diversitas-international.org), and supported by the Biodiversity Community of Practice

Further develop the GEO Biodiversity Observation Network that was launched in April 2008. GEO BON will provide a global, scientifically-robust framework for observations designed to detect biodiversity change by coordinating the data gathering and delivery of biodiversity change information. GEO BON should build upon existing systems (such as GBIF and WCMC) and based on analysis of existing information, highlight areas of importance (e.g. those supporting migratory, endemic or globally threatened species, and those whose biodiversity is of socio-economic importance) for further targeted data collection and monitoring.

Specific objectives include: (i) Develop a strategy for assessing biodiversity at the genetic, species and ecosystems level; (ii) Facilitate the establishment of monitoring systems that enable frequent, repeated, 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 (NASA, USGS, asimpson@usgs.gov), and supported by the Biodiversity Community of Practice

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 and New Biodiversity Data (former BI-06-03)

This sub-task is led by GBIF (vchavan@gbif.org), and supported by the Biodiversity Community of Practice

Develop a strategic plan for the capture and mobilisation of various types of “fit-for-use” historical and new biodiversity data through multi-cultural, heterogenous and distributed data custodians. Develop criteria for Data Rescue Centres. Develop strategies for industrialisation of capture, digitisation and mobilisation of primary biodiversity data. Develop strategies for mobilisation of biodiversity data generated through “ad-hoc” and “non-primary” projects. Promote uptake of Global Biodiversity Resources Discovery System (GBRDS). Review and develop primary biodiversity data capture standards. Implement the strategic plan for capturing historical biodiversity data from natural history collections and the research community.

*Key related Tasks in other SBAs include: DI-09-03 (Warning Systems for Disasters), HE-09-03 (End to End Projects for Health), EN-07-02 (Energy Environmental Impact Monitoring), CL-09-01 (Environmental Information for Decision-making, Risk Management and Adaptation), AR-09-03 (Sustained Observing Systems), EC-09-01 (Ecosystem Observation and Monitoring Network), EC-09-02 (Ecosystem Vulnerability to Global Change), AG-06-02 (Data Utilization in Fisheries and Aquaculture)*

## APPENDIX A: GEO COMMUNITIES OF PRACTICE

### DEFINITION

A Community of Practice (CoP) is a user-led community of stakeholders, from providers to the final beneficiaries of Earth observation data and information, with a common interest in specific aspects of societal benefits to be realized by GEOSS implementation.

### OBJECTIVES

Each CoP will have slightly different objectives, however common objectives will include:

- a. Identify, gather, and seek agreement on their particular user community requirements;
- b. Provide a forum for cooperation of activities where GEOSS adds value to existing initiatives, to identify linkages and opportunities for collaborative strategic and technical projects and to coordinate the delivery of some GEOSS targets to enable the realization of societal benefits.
- c. Report on progress and provide updates to the User Interface Committee, GEO and other stakeholder communities as appropriate;
- d. Advise the User Interface Committee, other CoPs and GEO on matters relating to their particular area of interest or societal benefit, and on cross-cutting issues of interest to the CoP.
- e. Provide an informal point of contact for members or other jurisdictions on the specific benefit or interest area that affect more than one organization;

### PARTICIPANTS

Each Community of Practice should include representatives from GEO Members, Participating Organizations and any other stakeholders that have similar interests, goals, and or objectives - working closely together to create a forum for efficient and effective intelligence and advice to be provided to GEO for the successful implementation of GEOSS. Both developing and developed countries will be represented.

#### *Air Quality and Health*

*Participants:* Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Switzerland, UK, USA, CEOS, EEA, ESA, ECMWF, ICSU, ISPRS, WMO

*Contact:* Gary Foley (foley.gary@epa.gov)

#### *Atmospheric Chemistry* (former IGOS Atmospheric Chemistry theme – IGACO)

Under development

#### *Biodiversity*

*Participants:* Australia, Botswana, Brazil, Canada, Columbia, Denmark, Estonia, France, Germany, Ghana, Hungary, India, Iran, Israel, Italy, Japan, Mexico, Namibia, Netherlands, Nicaragua, Niger, Nigeria, Norway, Panama, Philippines, Portugal, South Africa, Switzerland, Thailand, Tunisia, UK, Ukraine, Uruguay, USA, ASEAN Centre for Biodiversity, BioNET-INTERNATIONAL, BirdLife International, Conservation International, DIVERSITAS, ESRI, GBIF, Guyra Paraguay, IUCN, LIFEWATCH, The Nature Conservancy, UNEP, UNESCO

*Contact:* Woody Turner (woody.turner@nasa.gov), Anne Larigauderie (anne@diversitas-international.org)

#### *Carbon Cycle* (former IGOS Carbon theme – IGCO)

Under development

*Contact:* Roger Dargaville (rogerd@unimelb.edu.au)

**Coastal Zone** (reflecting former IGOS Coastal theme)

*Participants:* Algeria, EC, Egypt, Germany, Greece, Italy, Israel, Spain, Sweden, USA, IOC

*Contact:* Michael Bruno (Michael.Bruno@stevens.edu), Paul DiGiacomo (Paul.DiGiacomo@noaa.gov), Hans-Peter Plag (hpplag@unr.edu)

**Cryosphere** (former IGOS Cryosphere theme)

Under development

*Contact:* Jeff Key (jeff.key@noaa.gov)

**Energy**

*Participants:* Australia, Belgium, Canada, China, Denmark, EC, Egypt, France, Germany, India, Italy, Korea, Netherlands, Russia, Switzerland, Thailand, USA, European Wind Energy Association, ESA, GOOS, International Energy Agency, IIEE

*Contact:* Ellsworth LeDrew (ells@watleo.uwaterloo.ca), Thierry Ranchin (thierry.ranchin@ensmp.fr), Marion Schroedter-Homscheidt, (marion.schroedter-homscheidt@dlr.de)

**Forest**

*Participants:* Australia, Brazil, Canada, China, EC, Finland, France, Germany, Italy, Japan, Korea, Niger, Norway, Portugal, Russia, South Africa, Thailand, USA, CEOS, EEA, ESA, EUMETSAT, FAO, GOFC-GOLD, GTOS, ISCGM

*Contact:* Michael Brady (MBrady@NRCan.gc.ca)

**Geohazards** (former IGOS Geohazards theme)

*Participants:* France, Italy, Japan, UK, USA, ESA, GGOS, UNESCO

*Contact:* Gonéri Le Cozannet (g.lecozannet@brgm.fr)

**Global Agricultural Monitoring** (former IGOS Land sub-theme)

*Participants:* Argentina, Australia, Austria, Belgium, Brazil, China, EC, ESA, FAO, France, India, Italy, Netherlands, South Africa, USA, CGIAR, WMO

*Contact:* Chris Justice (justice@hermes.geog.umd.edu), Jai Singh Parihar (Parihar\_jaisingh@yahoo.com)

**Water Cycle** (former IGOS Water Cycle Theme – IGWCO)

*Participants:* Argentina, Australia, Canada, China, Finland, France, Germany, Japan, Netherlands, Panama, Portugal, Switzerland, UK, USA, UNESCO, WMO

*Contact:* Rick Lawford (lawford@umbc.edu)

## APPENDIX B: ACRONYMS

ACQWA	Assessing Climatic change and impacts on the Quantity and quality of Water
AEgis	Asian-monsoon systEm with Ground satellite Image data and numerical Simulations
AEgOS	African-European Georesources Observation System
AEMET	Spanish Meteorological Agency
AeroCOM	Aerosol Comparisons between Observations and Models
AG	Agriculture
AIP	Architecture Implementation Pilot
AIRNow	A cross-agency Web site on Air Quality News
AIST	National Institute of Advanced Industrial Science and Technology
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
BGR	German Geological Survey
BGS	British Geological Survey
BI	Biodiversity
BIO	Biotechnology Industry Organization
BioNET-Intl	Global Network for Taxonomy
BirdLife-Intl	Global Partnership of conservation organizations
BNSC	British National Space Centre
BOM	Australian Bureau of Meteorology
BRGM	French Geological and Mining Research Bureau
CARSA	China Association for Remote Sensing Application
CB	Capacity Building
CBD	Convention on Biological Diversity
CBERS	China-Brazil Earth Resources Satellite
CENC	China-Europe GNSS Technology Training and Cooperation Center
CEOP	Coordinated Energy and Water Cycle Observations Project
CEOS	Committee on Earth Observation Satellites
CFS	Canadian Forest Service
CGIAR	Consultative Group on International Agricultural Research
CGMS	Coordination Group for Meteorological Satellites
ChloroGIN	Chlorophyll Ocean Globally Integrated Network
CIESIN	Center for International Earth Science Information Network

CL	Climate
ClimDev Africa	Climate for Development in Africa
CMA	Chinese Meteorological Administration
CNES	French Space Agency
CNR-IIA	Italy National Research Council - Institute for Atmospheric Pollution
COCOS	Coordination of Carbon Observing Systems
CODATA	ICSU Interdisciplinary Scientific Committee on Data for Science and Technology
CONAE	Argentinean National Commission of Space Activities
Conservation Intl	Organization applying solutions to protect Air, Water and Resources
CoP	Community of Practice
CSA	Canadian Standards Association
CSIR	Council for Scientific and Industrial Research, South Africa
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DA	Data Management
DEM	Digital Elevation Model
DevCoCast	Provides processed land and ocean satellite data and value-added products in Developing Countries
DG-RTD	EC Directorate-General for Research and Technological Development
DI	Disasters
DIVERSITAS	An international programme of biodiversity science
DLR	German Aerospace Center
DMI	Danish Meteorological Institute
DMN	Morocco Direction de la Météorologie Nationale
DPRTRP	Disaster Preparedness and Refugees Transition and Recovery Programme for North and Eastern Uganda
EBONE	European Biodiversity Observation Network
EC	Ecosystems
EC	European Commission
ECMWF	European Centre for Medium-range Weather Forecasts
EcoNet	Ecosystem Observation and Monitoring Network
EEA	European Environmental Agency
EFAS	European Flood Alert System
EFFIS	European Forest Fire Information System
EMEP	European Monitoring and Evaluation Program
EMSO	European Multidisciplinary Seas Observation
EN	Energy
EnerGEO	EO for monitoring and assessment of the environmental impact of energy use
ENSMP	Mines National College of Paris
EnviroGRIDS	Gridded management system for environmental sustainability and vulnerability
EO	Earth Observations
EPA	United States Environmental Protection Agency
ESA	European Space Agency
ESONET	European Seas Observatory Network

e-SOTER	Web-based Regional Pilot Platform with data, methodology, and applications, using remote sensing to validate, augment and extend existing data
ESRI	Environmental Systems Research Institute
EUMETCast	EUMETSAT Broadcast System for Environmental Data
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
EuroSITES	European Ocean Observatory Network
Ev-K2-CNR	High Altitude Scientific and Technological Research
FAO	Food and Agriculture Organization
FAPAR	Fraction of Absorbed Photosynthetically Active Radiation
FDSN	International Federation of Digital Seismograph Networks
FENGYUNCast	CMA contribution to GEONETCast; utilises the AsiaSat 4 satellite beam to broadcast data and products to a user community in the Asia Pacific region
FGDC	Federal Geographic Data Committee
FP7	European Union 7 <sup>th</sup> Framework Programme
FPAR	Fraction Photosynthetically Available Radiation
GAW	Global Atmosphere Watch
GBIF	Global Biodiversity Information Facility
GBRDS	Global Biodiversity Resources Discovery System
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
GEO BON	Group on Earth Observations Biodiversity Observation Network
GEONETCast	Near real time, global network of satellite-based data dissemination systems designed to distribute space-based, air-borne and in situ data, metadata and products to low-cost receiving stations maintained by users
GEO PAAM	Group on Earth Observations Protected Areas Assessment and Monitoring
GEOSS	Global Earth Observation System of Systems
GEOTOPS	GEO Training Opportunity Networks
GEWEX	Global Energy and Water Cycle Experiment
GFMC	Global Fire Monitoring Center
GGMN	Global Groundwater Monitoring Network
GHG	Greenhouse Gas
GIFS	Global Interactive Forecast System
GIS	Geographical Information System
GISIN	Global Invasive Species Information Network
GLOBE	Global Learning and Observations to Benefit the Environment
GLOSIS	Global Soil Information System
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
GOSAT	Greenhouse gases Observing SATellite
GPM	Global Precipitation Measurement
GPS	Global Positioning System
GSI	Geological Survey Institute
GSN	Global Seismographic Network
GTOS	Global Terrestrial Observing System
GTS	Global Telecommunications System
Guyra Paraguay	Non governmental organization that promote and coordinate progress towards the conservation and sustainable use of biodiversity
HARON	Hydrological Applications and Run-Off Network
HCF	Health and Climate Foundation
HE	Health
HTAP	Hemispheric Transport of Air Pollutants
IAG	International Association of Geodesy
IAS	Invasive Alien Species
ICSU	International Council for Science
IEEE	Institute of Electrical and Electronics Engineers
IEO	Spanish Institute of Oceanography
IGACO	International Global Atmospheric Chemistry Observations
IGAC-SPARC	International Global Atmospheric Chemistry - Stratospheric Processes And their Role in Climate
IGBP	International Geosphere-Biosphere Programme
IGCO	Integrated Global Carbon Observation
IGOS	Integrated Global Observing Strategy
IGOS-P	Integrated Global Observing Strategy Partnership
IGRAC	International Groundwater Resources Assessment Centre
IGWCO	Integrated Global Water Cycle Observations (former IGOS Water Theme)
IIASA	International Institute for Applied Systems Analysis
ILTER	International Long Term Ecological Research network
INM	Spanish National Meteorological Institute
INOV	Portuguese Innovative Company on Electronics and Telecommunications
INPE	Brazilian National Institute for Space Research
InSAR	Interferometric Synthetic Aperture Radar
INTA	Instituto Nacional de Técnica Aeroespacial, Spain
IOC	Intergovernmental Oceanographic Commission
IOCCG	International Ocean Colour Coordinating Group
IP3	GEOSS Interoperability Process Pilot Projects
IPWG	International Precipitation Working Group
IPY	International Polar Year
IRI	International Research Institute for Climate and Society
IRSA	Institute of Remote Sensing Applications
ISC	International Seismological Centre



ISCGM	International Steering Committee for Global Mapping
ISDR	International Strategy for Disaster Reduction
ISLSCP	International Satellite Land-Surface Climatology Project
ISPRA	Italy Institute for Environmental Protection and Research
ISPRS	International Society for Photogrammetry and Remote Sensing
ISRIC	International Soil Reference and Information Centre
ISSG	IUCN/SSC Invasive Species Specialist Group
ITC	International Institute for Geo-Information Science and Earth Observation
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
JAXA	Japan Aerospace Exploration Agency
JRC	Joint Research Center of the European Commission
KMA	Korea Meteorological Administration
LAI	Leaf Area Index
LAM	Limited Area Model
LIFEWATCH	e-Science and Technology Infrastructure for Biodiversity Data and Observatories
LIS	Land Information System
MercNet	Web access information straight from Mercury's system
MERIS	Medium Resolution Imaging Spectrometer
MERIT	Meningitis Environmental Risk Information Technologies
MKFES	Mariolopoulos-Kanaginis Foundation of Environmental Sciences
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
NIDIS	USA National Integrated Drought Information System
NIES	Japan National Institute for Environmental Studies
NOOA	National Oceanic and Atmospheric Administration
NPCA	National Parks Conservation Association
NPN	US National Phenology Network
NPP	Net Primary Productivity
NSC	Norwegian Space Centre
NSMC	China National Satellite Meteorological Center
NWP	Numerical Weather Prediction
OCO	Orbiting Carbon Observatory

OGC	Open Geospatial Consortium
OS	Open Source
OSS	Open Source Software
PAAM	Protected Areas Assessment and Monitoring
PAGES	Past Global Changes
POGO	Partnership for Observation of the Global Ocean
POPs	Persistent Organic Pollutants
PREV' AIR	Air Quality Forecasts and Observations in France and Europe
PROMOTE	PROtocol MOniTORing (for the GMES Service Element: Atmosphere)
R&D	Research and Development
RAMSAR	Convention on Wetlands
SAFARI	Societal Applications in Fisheries & Aquaculture using Remotely-Sensed Imagery
SAR	Synthetic Aperture Radar
SBA	Societal Benefit Area
SCRC	Student Climate Research Campaign
SDI	Spatial Data Infrastructure
SDS	Sand and Dust Storm
SERVIR	Regional Visualization and Monitoring System
SIF	Standards and Interoperability Forum
SPOT	Système Probatoire d'Observation Terrestre
SPOT-VGT	SPOT Vegetation
SPRING	Freeware and Open-Source Geo-Processing Software
SSC	Species Survival Commission
SST	Sea Surface Temperature
TerraLib	Open source GIS software library
TerraView	GIS application built on the TerraLib GIS library
TF	Task Force
THORPEX	The Observing-system Research and Predictability Experiment
TIGER	ESA-launched initiative focusing on the use of space technology for water resource management in Africa
TIGGE	THORPEX Interactive Global Grand Ensemble
TNO	Netherlands Organization for Applied Scientific Research
UCAR	University Corporation for Atmospheric Research
UCL	UK University College London
UK	United Kingdom
UN	United Nations
UNCCD	United Nations Convention to Combat Desertification
UNECA	United Nations Economic Commission for Africa
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNOOSA	United Nations Office for Outer Space Affairs

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UNOSAT	United Nations Operational Satellite Applications Programme
US	User Engagement
USA	United States of America
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
USGS	United States Geological Survey
VENUS	Victoria Experimental Network Under the Sea
VI	Vegetation Index
WA	Water
WAS	Warning, Advisory and Alert System
WCRP	World Climate Research Programme
WCMC	UNEP World Conservation Monitoring Centre
WE	Weather
WHO	World Health Organization
WIS	WMO Information System
WMO	World Meteorological Organization
WWRP	World Weather Research Programme
ZAMG	Austria Central Institute for Meteorology and Geodynamics

## Evolution Table for 2007-2009 Work Plan Tasks

Task	Title in GEO 2007-2009 Work Plan (V6)	Status in GEO 2009-2011 Work Plan (GEO-V Document 12)	Status in GEO 2009-2011 Work Plan (Rev1)
DI-06-02	Seismographic Networks Improvement and Coordination	<b>Consolidated</b> under DI-09-01b	<b>Consolidated</b> under DI-09-01b
DI-06-03	Integration of InSAR Technology	<b>Merged</b> into DI-09-01a	<b>Merged</b> into DI-09-01a
DI-06-04	Tsunami Early Warning System of Systems	<b>Consolidated</b> under DI-09-03a	<b>Consolidated</b> under DI-09-03a
DI-06-07	Multi-hazard Zonation and Maps	<b>Merged</b> into DI-09-01a	<b>Merged</b> into DI-09-01a
DI-06-08	Multi-hazard Approach Definition and Implementation	<b>Consolidated</b> under DI-09-02a	<b>Consolidated</b> under DI-09-02a
DI-06-09	Use of Satellites for Risk Management	<b>Continued</b> as DI-06-09	<b>Continued</b> as DI-06-09
DI-06-13	Implementation of a Fire Warning System at Global Level	<b>Consolidated</b> under DI-09-03b	<b>Consolidated</b> under DI-09-03b
DI-07-01	Risk Management for Floods	<b>Merged</b> into DI-09-02b	<b>Merged</b> into DI-09-02b
HE-06-03	Forecasting and Monitoring Environmental Health Hazards	<b>Consolidated</b> under HE-09-03a	<b>Consolidated</b> under HE-09-03a
HE-07-01	Strengthen Observation and Information Systems for Health	<b>Merged</b> into HE-09-01	<b>Merged</b> into HE-09-01
HE-07-02	Environment and Health Monitoring and Modelling	<b>Merged</b> into HE-09-01 and HE-09-02	<b>Merged</b> into HE-09-01 and HE-09-02
HE-07-03	Multihazard Risk Reduction due to Atmospheric Aerosols	<b>Consolidated</b> under HE-09-02a	<b>Consolidated</b> under HE-09-02a
EN-06-04	Using New Observation Systems for Energy	<b>Closed.</b> Task completed	<b>Closed.</b> Task completed
EN-07-01	Management of Energy Sources	<b>Continued</b> as EN-07-01	<b>Continued</b> as EN-07-01
EN-07-02	Energy Environmental Impact Monitoring	<b>Continued</b> as EN-07-02	<b>Continued</b> as EN-07-02
EN-07-03	Energy Policy Planning	<b>Continued</b> as EN-07-03	<b>Continued</b> as EN-07-03
CL-06-01	Sustained Reprocessing and Reanalysis Efforts	<b>Consolidated</b> under CL-06-01a	<b>Consolidated</b> under CL-06-01a

<b>Task</b>	<b>Title in GEO 2007-2009 Work Plan (V6)</b>	<b>Status in GEO 2009-2011 Work Plan (GEO-V Document 12)</b>	<b>Status in GEO 2009-2011 Work Plan (Rev1)</b>
CL-06-02	Key Climate Data from Satellite Systems	<b>Consolidated</b> under CL-09-02a	<b>Consolidated</b> under CL-06-01c
CL-06-03	Key Terrestrial Observations for Climate	<b>Consolidated</b> under CL-09-02b	<b>Consolidated</b> under AR-09-03a
CL-06-05	GEOSS IPY Contribution	<b>Consolidated</b> under CL-09-02c	<b>Consolidated</b> under AR-09-03b
CL-06-06	Global Ocean Observation System	<b>Consolidated</b> under CL-09-02d	<b>Consolidated</b> under AR-09-03c
CL-07-01	Seamless Weather and Climate Prediction System	<b>Consolidated</b> under CL-09-01a	<b>Consolidated</b> under CL-09-01a
WA-06-02	Forecast Models for Drought and Water Resource...	<b>Consolidated</b> under WA-06-02a	<b>Consolidated</b> under WA-06-02a
WA-06-07	Integrated Earth Observation Water Resource Management	<b>Continued</b> as WA-06-07	<b>Continued</b> as WA-06-07
WA-07-01	Global Water Quality Monitoring	<b>Consolidated</b> under WA-06-07d	<b>Consolidated</b> under WA-08-01g
WA-08-01	Integration of In-situ and Satellite Data	<b>Continued</b> as WA-08-01	<b>Continued</b> as WA-08-01
WE-06-01	Surface-based Global Observing System for Weather	<b>Merged</b> into CL-09-02e	<b>Merged</b> into AR-09-03d
WE-06-02	Space-based Global Observing System for Weather	<b>Merged</b> into CL-09-02e	<b>Merged</b> into AR-09-03d
WE-06-03	THORPEX Interactive Global Grand Ensemble (TIGGE)	<b>Continued</b> as WE-06-03	<b>Continued</b> as WE-06-03
WE-06-05	Numerical Weather-Prediction Capacity Building	<b>Merged</b> into WE-09-01a	<b>Merged</b> into WE-09-01a
WE-07-01	Data Assimilation and Modelling for Operational Use	<b>Merged</b> into CL-09-01a	<b>Merged</b> into CL-09-01a
WE-07-02	Weather Demonstration Project Beijing 2008 Olympics	<b>Closed.</b> Task completed	<b>Closed.</b> Task completed
EC-06-01	Integrated Global Carbon Observation (IGCO)	<b>Consolidated</b> under CL-09-03a	<b>Consolidated</b> under CL-09-03a
EC-06-02	Ecosystem Classification and Mapping	<b>Consolidated</b> under EC-09-01a	<b>Consolidated</b> under EC-09-01a
EC-06-07	Regional Networks for Ecosystems	<b>Consolidated</b> under EC-09-01c	<b>Consolidated</b> under EC-09-01c
EC-07-01	Global Ecosystem Observation and Monitoring Network	<b>Closed.</b> No reported activities	<b>Closed.</b> No reported activities
AG-06-01	GEOSS Agriculture Strategic Plan	<b>Closed.</b> No reported activities	<b>Closed.</b> No reported activities

<b>Task</b>	<b>Title in GEO 2007-2009 Work Plan (V6)</b>	<b>Status in GEO 2009-2011 Work Plan (GEO-V Document 12)</b>	<b>Status in GEO 2009-2011 Work Plan (Rev1)</b>
AG-06-02	Data Utilization in Aquaculture	<b>Continued</b> as AG-06-02	<b>Continued</b> as AG-06-02
AG-06-04	Forest Mapping and Change Monitoring	<b>Consolidated</b> under US-09-03b	<b>Consolidated</b> under US-09-03b
AG-06-07	Training Modules for Agriculture	<b>Merged</b> into AG-07-03c	<b>Merged</b> into AG-07-03c
AG-07-01	Improving Measurements of Biomass	<b>Merged</b> into CL-09-03b	<b>Merged</b> into CL-09-03b
AG-07-02	Agricultural Risk Management	<b>Consolidated</b> under AG-07-03b	<b>Consolidated</b> under AG-07-03b
AG-07-03	Operational Agricultural Monitoring System	<b>Consolidated</b> under AG-07-03a	<b>Consolidated</b> under AG-07-03a
BI-06-03	Capturing Historical Biodiversity Data	<b>Consolidated</b> under BI-07-01c	<b>Consolidated</b> under BI-07-01c
BI-07-01	Biodiversity Observation Network	<b>Consolidated</b> under BI-07-01a	<b>Consolidated</b> under BI-07-01a
BI-07-02	Invasive Species Monitoring System	<b>Consolidated</b> under BI-07-01b	<b>Consolidated</b> under BI-07-01b
US-06-01	Identify Priorities and Synergies between SBAs	<b>Consolidated</b> under US-09-01a	<b>Consolidated</b> under US-09-01a
US-06-02	Pilot Communities of Practice	<b>Consolidated</b> under US-09-01b	<b>Consolidated</b> under US-09-01b
AR-06-11	Radio Frequency Protection	<b>Continued</b> as AR-06-11	<b>Continued</b> as AR-06-11
AR-07-01	Enabling Deployment of a GEOSS Architecture	<b>Consolidated</b> under AR-09-01a	<b>Consolidated</b> under AR-09-01a
AR-07-02	GEOSS Architecture Implementation Pilot	<b>Consolidated</b> under AR-09-01b	<b>Consolidated</b> under AR-09-01b
AR-07-03	Global Geodetic Reference Frames	<b>Consolidated</b> under DA-09-02c	<b>Consolidated</b> under DA-09-02c
AR-07-04	WIS - GEOSS Operational Exemplar	<b>Consolidated</b> under AR-09-02b	<b>Consolidated</b> under AR-09-02b
DA-06-01	GEOSS Data Sharing Principles	<b>Continued</b> as DA-06-01	<b>Continued</b> as DA-06-01
DA-06-02	GEOSS Quality Assurance Strategy	<b>Consolidated</b> under DA-09-01a	<b>Consolidated</b> under DA-09-01a
DA-06-03	Ensemble-Technique Forecasting Demonstrations	<b>Consolidated</b> under DA-09-02b	<b>Consolidated</b> under DA-09-02b
DA-06-04	Data, Metadata and Products Harmonisation	<b>Consolidated</b> under DA-09-01b	<b>Consolidated</b> under DA-09-01b

<b>Task</b>	<b>Title in GEO 2007-2009 Work Plan (V6)</b>	<b>Status in GEO 2009-2011 Work Plan (GEO-V Document 12)</b>	<b>Status in GEO 2009-2011 Work Plan (Rev1)</b>
DA-06-05	Guidance Document for Basic Geographic Data	<b>Consolidated</b> under US-09-03a	<b>Consolidated</b> under US-09-03a
DA-06-09	GEOSS Best Practices Registry	<b>Consolidated</b> under AR-09-01c	<b>Consolidated</b> under AR-09-01c
DA-07-01	DEM Interoperability	<b>Consolidated</b> under DA-09-03d	<b>Consolidated</b> under DA-09-03d
DA-07-02	Global Land Cover	<b>Consolidated</b> (& Continued) under DA-09-03a	<b>Consolidated</b> (& Continued) under DA-09-03a
DA-07-03	Virtual Constellations	<b>Consolidated</b> under AR-09-02a	<b>Consolidated</b> under AR-09-02a
DA-07-04	Sensor Web Enablement for In-Situ Observing Network	<b>Consolidated</b> under AR-09-02c	<b>Consolidated</b> under AR-09-02c
DA-07-05	Higher Level Data Product Tools	<b>Closed.</b> Scope refocused under US-09-03c	<b>Closed.</b> Scope refocused under US-09-03c
DA-07-06	Data Integration and Analysis System	<b>Consolidated</b> under DA-09-02a	<b>Consolidated</b> under DA-09-02a
CB-06-04	GEONETCast	<b>Consolidated</b> under CB-06-04a	<b>Consolidated</b> under AR-09-04a and CB-09-02g
CB-07-01a	Engaging Donors	<b>Continued</b> as a CB-09-01	<b>Continued</b> as a CB-09-01
CB-07-01b	Identifying Best Practices, Gaps and Needs	<b>Consolidated</b> under CB-09-04a	<b>Consolidated</b> under CB-09-04a
CB-07-01c	Capacity building Performance Indicators	<b>Consolidated</b> under CB-09-04b	<b>Consolidated</b> under CB-09-04b
CB-07-01d	Building National and Regional Capacity	<b>Consolidated</b> under CB-09-03a	<b>Consolidated</b> under CB-09-03a
CB-07-01e	Open Source Software	<b>Consolidated</b> under CB-09-05a	<b>Consolidated</b> under CB-09-05a
CB-07-02	Knowledge Sharing for Improved Disaster Management and Emergency Response	<b>Closed.</b> Training activities will continue under CB-09-02c	<b>Closed.</b> Training activities will continue under CB-09-02c
CB-08-01	Recognition of Cross Border Education...	<b>Consolidated</b> under CB-09-02a	<b>Consolidated</b> under CB-09-02a