



GROUP ON  
EARTH OBSERVATIONS

## GEO-XI

13-14 November 2014

Assessment of Progress – Targets and Tasks

Document 9(Rev1)

*As approved at GEO-XI.*



## **Assessment of Progress – Targets and Tasks**

This document is divided in two parts

### **PART I**

#### **2014 Assessment of Progress Against the GEOSS 2015 Strategic Targets**

##### **Target Assessment**

### **PART II**

#### **GEO 2012-2015 Work Plan Implementation Report**

##### **Task Assessment**

## PART I

# 2014 Assessment of Progress Against the GEOSS 2015 Strategic Targets

## Target Assessment

### INTRODUCTION

This 2014 Assessment of Progress is the third attempt by the GEO Implementation Boards to respond to the need for an evaluation of GEOSS implementation progress against the 2015 Strategic Targets. This need was expressed in the Terms of Reference of the Implementation Boards accepted by the GEO-VIII Plenary in November 2011.

The Target assessment is divided in two sub-parts:

- First, a summary assessment at the level of the Target featuring a pyramid diagram (see below), rationale for Target rating, and key actions/intervention needed from GEO Members and Participating Organizations;
- Second, an annex outlining analysis, and linkages between recommended actions and Strategic Target outcomes.

### PYRAMID DIAGRAM

The pyramid diagram aims to provide a compact and comprehensive view of GEOSS implementation progress. It is based on a color-coded representation of the:

- Strategic Target (*top of the pyramid*);
- Underpinning Strategic Target Outcomes/“Demonstrated by” bullets (*middle level of the pyramid*);
- Related Work Plan Tasks (*base of the pyramid*) [Task information may be found in Part II of this document (Task Assessment)].

Color codes indicate the degree of progress and levels of priority for intervention as follows:

G	Green: Expected to be achieved. Some actions/intervention may be required
Y	Yellow: At risk of not being achieved without additional actions/intervention
R	Red: Not expected to be achieved without significant actions/intervention

To understand linkages between Targets and Tasks, it is useful to note that relationships are often diverse and complex. In effect, achieving the Outcomes of a particular Target depends on both the definition and implementation of the related Tasks. So whereas Tasks may be green (meaning that Task implementation is in line with the Work Plan), the overarching Target may be yellow or red (meaning that the orientation of these Tasks may need to be realigned in order to reach the Target).

Also, among the various Tasks geared towards the Outcomes of a given Target, some may be more relevant to those Outcomes than others. This situation may translate into a pyramid that features one red Task at the bottom (typically offset by one or more green Tasks) and a green Target at the top.

## **APPROACH**

The present Target assessment is jointly performed by the three GEO Implementation Boards:

- Infrastructure Board for the Architecture and Data Management Targets;
- Institutions and Development Board for the Capacity Building, User Engagement, and Science & Technology Targets;
- Societal Benefits Board for the nine Societal Benefit Area Targets (Agriculture, Biodiversity, Climate, Disasters, Ecosystems, Energy, Health, Water, Weather).

Sources of information for conducting this assessment include: (i) Direct Task Coordinator reports; (ii) Online Task Component Sheets (see [http://www.earthobservations.org/geoss\\_imp.php](http://www.earthobservations.org/geoss_imp.php)); and (iii) GEO Secretariat Work Plan Implementation Report (Part II of this document).

The main part of the assessment relies on qualitative analysis by Implementation Board members. Objective quantitative indicators have been used to the extent that they could be meaningfully defined (e.g. for Architecture and Data Management Targets).

Strategic Targets and underpinning Outcomes (Demonstrated by bullets) are drawn from GEO-VI Document 12(Rev1). The distribution of Tasks under each Target derives from the “Related GEOSS Strategic Targets” sections featured in the 2012-2015 Work Plan (minor adjustments have been made by Implementation Boards).

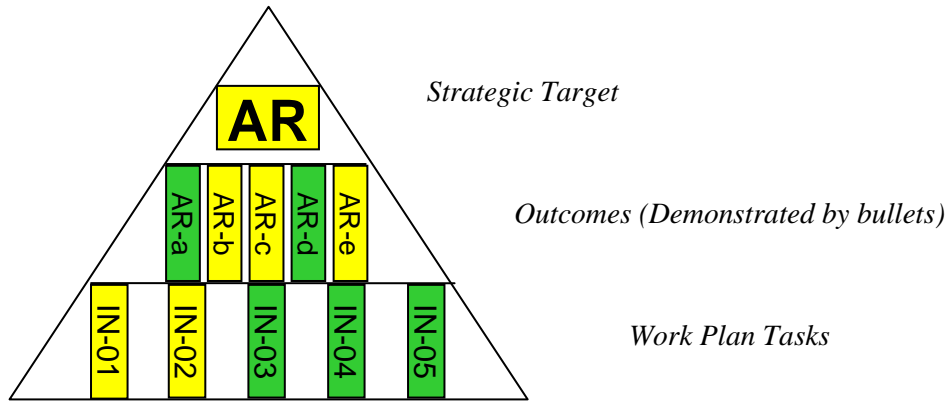
### Three-Year Evolution (2012-2014) Target Assessment

<b><i>GEOSS 2015 Strategic Targets</i></b>					
<b>Strategic Target</b>		<b>2012 (GEO-IX)</b>	<b>2013 (GEO-X)</b>	<b>2014 (GEO-XI)</b>	<b>Trend</b>
Architecture	AR	Y	Y	Y	↔
Data Management	DM	Y	Y	Y	↔
Capacity Building	CB	Y	G	G	↔
Science & Technology	ST	Y	Y	Y	↔
User Engagement	UE	Y	G	G	↔
Agriculture	AG	Y	G	G	↔
Biodiversity	BI	G	Y	Y	↔
Climate	CL	Y	Y	Y	↔
Disasters	DI	Y	Y	Y	↔
Ecosystems	EC	R	Y	Y	↔
Energy	EN	G	G	G	↔
Health	HE	Y	Y	Y	↔
Water	WA	G	Y	G	↑
Weather	WE	Y	Y	Y	↔

## 2014 Target Assessment

## ARCHITECTURE

Achieve sustained operation, continuity and interoperability of existing and new systems that provide essential environmental observations and information, including the GEOSS Common Infrastructure (GCI) that facilitates access to, and use of, these observations and information.



### Rationale for Target Rating

Resources discoverable and accessible via the GEOSS Common Infrastructure have grown significantly however very few people from the Societal Benefit Areas and related Tasks seem to be using them. A concerted effort is now needed not only to continue improving the infrastructure and available datasets in the GEOSS Data CORE, but above all in bridging the gap with the user community. The GEOSS Common Infrastructure requires continuous development to keep pace with a fast-moving digital landscape (emerging and evolving technologies) and a growing number of data infrastructure initiatives. Also, whereas coordination of space-based observing systems is improving, coordination of in-situ networks and new data sources is facing hurdles.

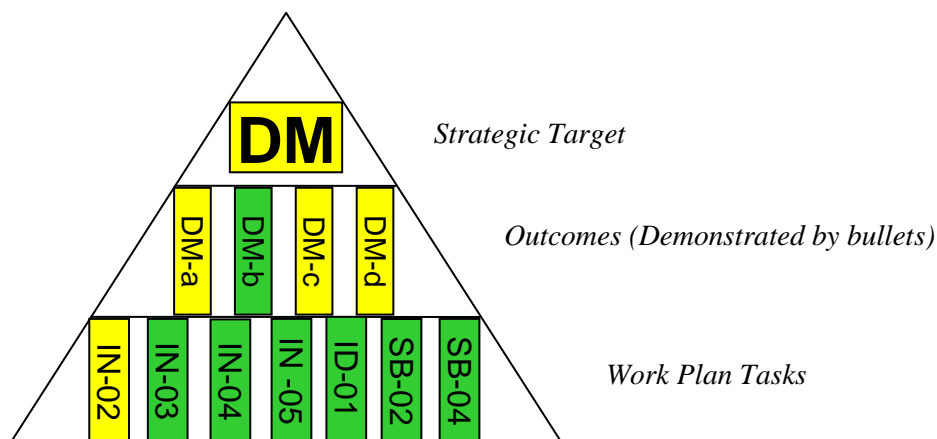
### Recommended Actions for GEO Members and Participation Organizations

- **AR1.** Sustain the operations and evolution of the GEOSS Common Infrastructure (GCI), and assess continuity of commitments from GCI providers beyond 2015 (GCI providers include: ESA for the GEOSS Portal, Italy (CNR) for the Discovery and Access Broker, and the USA (USGS/George Mason University) and IEEE for the Registries). Shift focus from discovery to valorisation of the resources available through the GCI, working closely with Societal Benefit Areas and related Tasks to make data access/use easier, and demonstrate the value of the GCI;
- **AR2.** Increase efforts to coordinate the provision, and improve the integration, of space-based and in-situ data at global, regional, and national levels; ensuring operations of underpinning observing systems so that gaps in availability and access are minimized. In particular, in-situ coordination should be encouraged building on the European Copernicus space/in-situ coordination efforts;
- **AR3.** Ensure that initiatives aimed at developing research data infrastructures (e.g. e-infrastructures in Europe and Australia, cyber-infrastructures in the USA, Digital China) are made interoperable and accessible through GEOSS;
- **AR4.** Seek opportunities to enhance GEOSS with new data sources (e.g. sensor networks and citizen-contributed information), working with the research community to deliver prototypes to be transitioned to operations post-2015;
- **AR5.** More collaboration between Infrastructure providers and Societal Benefit Area actors (and Communities of Practice) is needed to develop a comprehensive gap analysis. Encourage the development of Essential Variables, check availability against existing datasets, and prioritize gap-filling on the basis of Societal Benefit Area requirements.



## DATA MANAGEMENT

Provide a shared, easily accessible, timely, sustained stream of comprehensive data of documented quality, as well as metadata and information products, for informed decision-making.



### Rationale for Target Rating

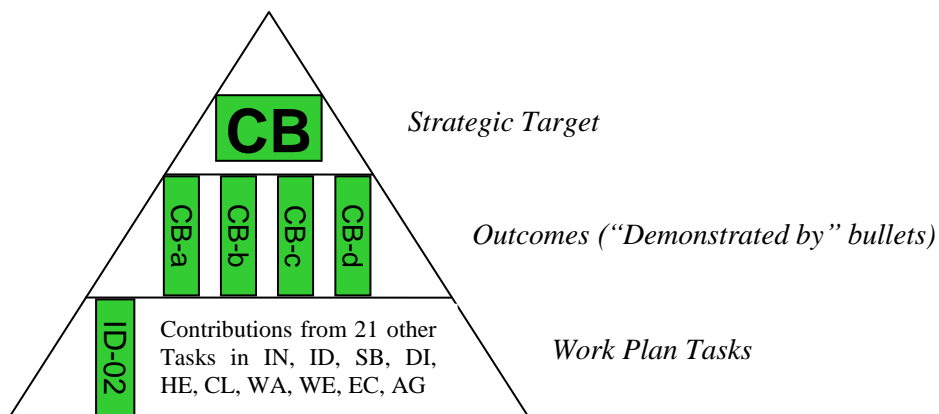
Data management is progressing on a number of fronts (e.g. processing, validation, quality control, modelling, visualization), and the establishment of a Task Force to develop Data Management Principles is a very welcome step towards reducing gaps and variations in practices that vary a lot from country to country and organization. Whereas access to key environmental datasets (with metadata) is improving, harmonization is often lacking and gaps remain in historical data, model outputs and socio-economic data. On the other hand, the ability to extract information from historical, current and future source data is increasing significantly.

### Recommended Actions for GEO Members and Participation Organizations

- **DM1.** Contribute to the work of the GEOSS Data Management Principles Task Force so that a broad consensus is reached by the GEO-XI Plenary;
- **DM2.** Awareness and use of both, the GEOSS Common Infrastructure (GCI) and the GEOSS Data CORE, are still low in the user community. More effort is needed to bring data users from the Societal Benefit Areas (the demand side) together with data providers via the GCI, and Data CORE. Data providers should also be encouraged to further improve the quality of the data sets made accessible through GEOSS, and to respond to related prioritized user requests;
- **DM3.** Work towards harmonization of key global datasets contributing to Societal Benefit Area Essential Variables in collaboration with existing initiatives in GEOSS, and new activities proposed in the framework of Global Geospatial Information Management (UN GGIM);
- **DM4.** Encourage data providers to provide access through the GEOSS Common Infrastructure to (i) historical datasets for longitudinal analysis, and (ii) outcomes of modelling and forecasting activities for future scenario analysis;
- **DM5.** Ensure adequate representation on the Data Sharing Working Group from the Middle East, South America, and Asia-Pacific regions.

## **CAPACITY BUILDING**

Enhance the coordination of efforts to strengthen individual, institutional and infrastructure capacities, particularly in developing countries, to produce and use Earth observations and derived information products.



### **Rationale for Target Rating**

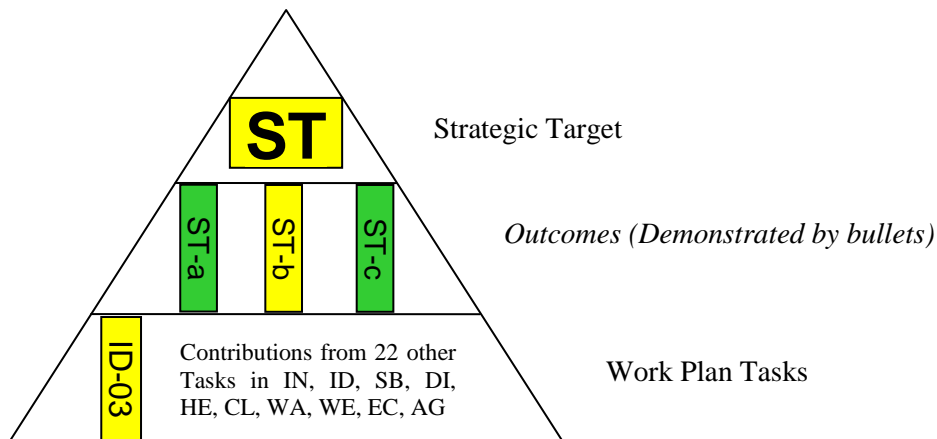
Capacity building activities are increasing in number and forces helping to enhance capacity building initiatives. Twenty-two of the Work Plan Tasks have elements of capacity building activity, responding in some way to one or more of the ‘‘Demonstrated by’’ bullets of the Target. The activity level between these varies from small to robust. The spread of capacity building activities in the Work Plan further highlights the cross-cutting nature of capacity building and the need for more robust coordination. The integration of the capacity development resource facility in the GEOSS Portal and initiatives in the framework of AfriGEOSS will give a further boost to capacity building.

### **Recommended Actions for GEO Members and Participation Organizations**

- **CB1.** Participate and contribute to national, regional, and international capacity building activities;
- **CB2.** Actively support capacity building efforts directed at the introduction of the GEOSS Discovery and Access Broker (DAB) approach – to increase the number of datasets available through GEOSS and facilitate access to capacity building funding;
- **CB3.** Provide capacity building resources, material and information to populate the Global Earth Observation Capacity Building (GEOCAB) Portal and CEOS Inventory (that will be incorporated into GEOCAB);
- **CB4.** Raise awareness of the use of the GEOSS Data-CORE nationally and regionally;
- **CB5.** Stimulate the uptake of the GEO Data Sharing Principles at national, regional and international levels.

## SCIENCE AND TECHNOLOGY

Ensure full interaction and engagement of relevant science and technology communities such that GEOSS advances through integration of innovations in Earth observation science and technology, enabling the research community to fully benefit from GEOSS accomplishments.



### Rationale for Target Rating

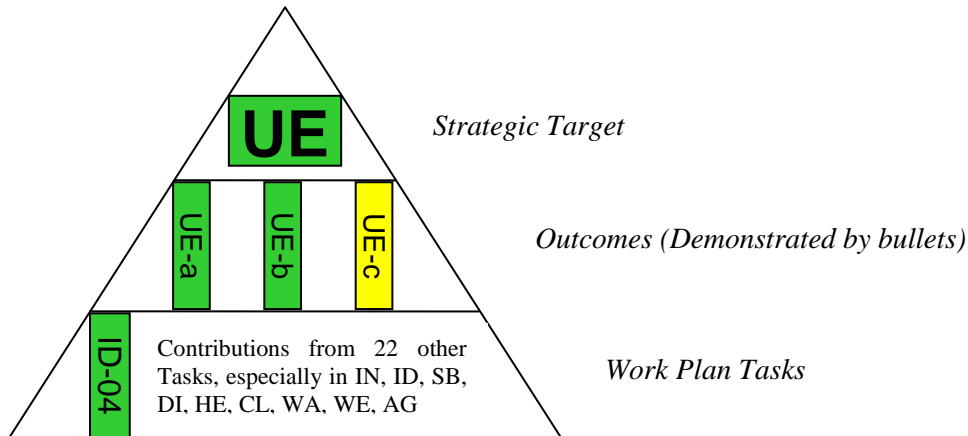
Most GEO Work Plan Tasks (23 out of 26) contribute to the Science and Technology Target. Taken together, Task-related activities indicate an increased use of GEOSS data by the research community. However, more support is needed for the adoption of a transverse approach to Science and Technology in GEOSS and the implementation of the GEO Science & Technology Roadmap.

### Recommended Actions for GEO Members and Participation Organizations

- **ST1.** Support the implementation of the GEO Science & Technology Roadmap and encourage new contributions to Work Plan activities from Asia and Africa;
- **ST2.** Establish links with national and regional activities on Future Earth and the broader Sustainable Development Goal (SDG) agenda;
- **ST3.** Inform the Science & Technology Task (ID-03) of any national, regional and international GEO and/or GEOSS related scientific meetings or sessions.

## **USER ENGAGEMENT**

Ensure critical user information needs for decision making are recognized and met through Earth observations.



### **Rationale for Target Rating**

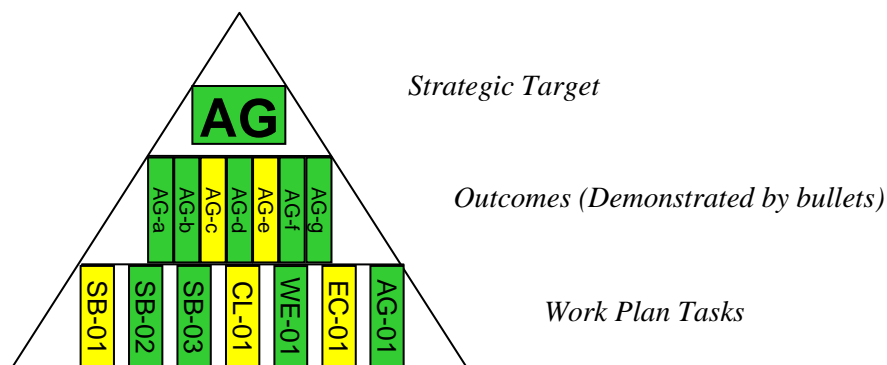
User engagement is increasing. Twenty-three of the Work Plan tasks have some kind of user engagement activity, from small to robust. Those listed in the triangle have more robust activities and serve as examples for how to denote many different kinds of engagement. The increased use of geo-spatial data in all Societal Benefit Areas and in particular in developing Countries (UE-c) is expected to be achieved through the anticipated success of the five Societal Benefits Tasks (SB-01 to SB-05).

### **Recommended Actions for GEO Members and Participation Organizations**

- **UE1.** Provide national and organizational user perspectives to illustrate the richness of the cross-cutting user engagement;
- **UE2.** Support at least one User Engagement Session per year (linked to one or more Work Plan Tasks) – to capture the work and needs of the users in a specific region;
- **UE3.** Encourage national or regional user engagement sessions collocated with relevant conferences to capture contributions from developing countries and feedbacks on user needs;
- **UE4.** Results from those meetings should be included into the larger user engagement information and disseminated as appropriate.

## **AGRICULTURE**

Improve the utilization of Earth observations and expanded application capabilities to advance sustainable agriculture, aquaculture, fisheries and forestry in areas including early warning, risk assessment, food security, market efficiency, and, as appropriate, combating desertification.



### **Rationale for Target Rating**

GEOGLAM data requirements have been established and coordination with the Committee on Earth Observation Satellites is progressing, in particular with regard to the JECAM (pilot) sites and the European SIGMA project. Since Sept 2013, GEOGLAM has been delivering monthly global crop outlooks to AMIS (Agricultural Market Information System) based on Earth observation and information, and focusing on the G20+7 main producer exporters. This enabled the development of tools (CROP monitor) nomenclature and products welcomed by the users, that helped consolidate contributing experts and institutions and identify gaps and future developments. Implementation of coordinated activities in “countries at risk” has been delayed due to a lack of resources. The desertification issue is starting to be addressed through a new Task Component on “Rangeland and Pasture Productivity” gaining momentum and visibility.

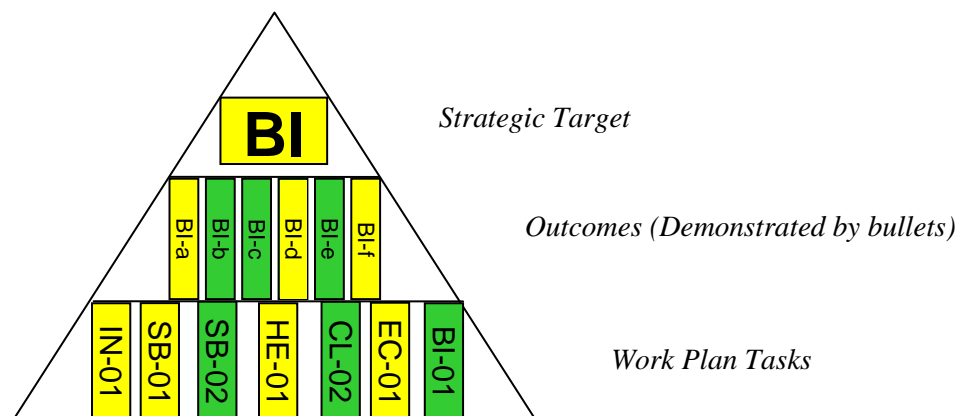
### **Recommended Actions for GEO Members and Participating Organizations**

- **AG1.** Support coordination of GEOGLAM activities by (i) appointing national contacts, (ii) providing financial and technical support for the reinforcement of GEOGLAM coordination office, and (iii) developing information flow and procedure to increase traceability and transparency;
- **AG2.** Identify key agencies/institutions to (i) complete the national/international network for agricultural resource management and food security and (ii) host regional targeted workshops for GEOGLAM;
- **AG3.** Provide commercial data, as in-kind contribution to GEO GLAM, to support availability of satellite data for food security related issues (in particular at Very High Resolution);
- **AG4.** Conduct crop mask updates and coordinate in-country to ensure that these updates are shared and accessible through the GEOSS Common Infrastructure;
- **AG5.** Support the maintenance of, and make datasets available through, the GEO Global Land Cover Information Portal; Communicate data requirements for Land Cover Land Use to the Land Cover Task Team (SB-02);
- **AG6.** For Members and Organizations advanced in Land Cover Land Use (LCLU) monitoring (e.g. Australia, Brazil, Germany, France, Russia, and CEOS): Provide technical and financial support for LCLU methodologies and the organisation of related capacity building activities (3 workshops per year mainly in developing countries);

- **AG7.** Contribute to the new GEO activities on Land Cover for Africa ;
- **AG8.** i) Propose contributions related to rangeland/pasture management; ii) Liaise with key stakeholder/users and identify the best perspective/focus for this activity (where Earth observations/information fill gaps), e.g. natural rangeland ecosystems.

## **BIODIVERSITY**

Establish, in conjunction with a comprehensive ecosystem monitoring capability, a worldwide biodiversity observation network to collect, manage, share and analyze observations of the status and trends of the world's biodiversity, and enable decision-making in support of the conservation and improved management of natural resources.



### **Rationale for Target Rating**

While there is significant progress on biodiversity activities and more of the outcomes are being achieved, progress towards the overall Target is impaired, not only by a lack of resources for capacity building and coordination, but also by a lack of alignment between the outcomes and the target. Furthermore, support is needed for the routine collection of long-term, in-situ and remotely-sensed biodiversity observations, as well as the implementation of Essential Biodiversity Variable (EBV) monitoring and development of a 'tool box' for biodiversity monitoring i.e. BON-in-a-box.

### **Recommended Actions for GEO Members and Participating Organizations**

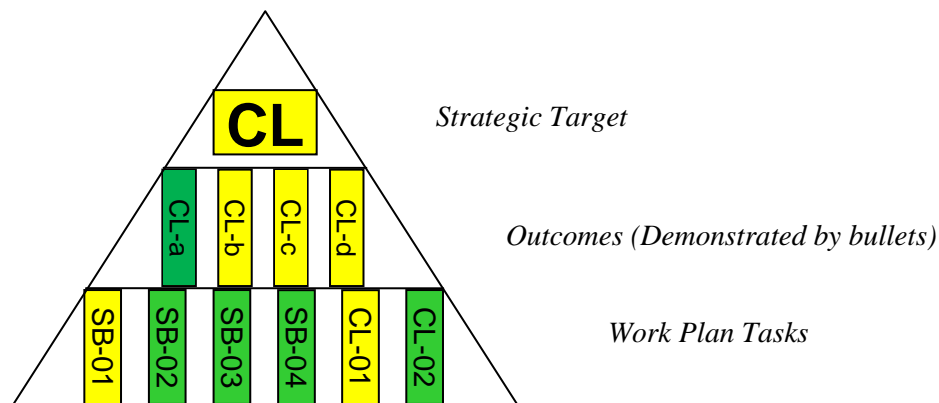
- **BI1.** Support development of national or regional Biodiversity Observation Networks (BONs; these will help countries meet their decision-making and reporting requirements, e.g. under the CBD and other MEAs) by:
  - i. appointing national contacts to GEO BON;
  - ii. identifying key agencies and institutions that are involved with or can facilitate biodiversity monitoring;
  - iii. jointly hosting workshops and other activities that foster development of national or regional BONs;
  - iv. supporting GEO BON partners to increase capacity and make wider use of citizen science.
- **BI2.** Host workshops and other activities that support the development of "BON-in-a-Box" (BiaB) by defining requirements and engaging stakeholders (BiaB will simplify development of national and regional BONs, by providing tools, guidelines and resources for monitoring changes in biodiversity);
- **BI3.** Engage with GEO BON partners to facilitate development of the Global Wetland Observing System (GWOS);
- **BI4.** Once available, adopt the Essential Biodiversity Variables (EBVs) for the monitoring of biodiversity change, by both in-situ and remote sensing means;
- **BI5.** Participate in development of the biodiversity field site network (for Genes, Species and Ecosystems), which will enhance coordination of existing field site activities and improve capacity;

- **BI6.** Support full and open access to data and information relevant to biodiversity by:
  - i. Providing commercial data as in-kind contribution to support availability of satellite data for biodiversity change monitoring;
  - ii. Providing access through GEOSS to in-situ biodiversity data.
- **BI7.** Support maintenance of, and make datasets available through, the GEO Global Land Cover Information Portal; Communicate data requirements for Land Cover Land Use to the Land Cover Task Team (SB-02);
- **BI8.** Support global coordination activities through the GEO BON office by:
  - i. Secondment of experts to the distributed international GEO BON office;
  - ii. Supporting and/or hosting GEO BON Advisory Board meetings, Implementation Committee meetings, and GEO BON all-hands meetings, 1 each per year (Germany is currently providing some support for the office).



## CLIMATE

Achieve effective and sustained operation of the global climate observing system and reliable delivery of climate information of a quality needed for predicting, mitigating and adapting to climate variability and change, including for better understanding of the global carbon cycle.



### Rationale for Target Rating

Specific requirements for climate observations, including satellite and in-situ, exist through the concept of GCOS Essential Climate Variables; the process for periodic updates and adequacy is critical and has been implemented and exercised by the GCOS programme since 1998 using continuous Improvement and Assessment Cycle. The GCOS Implementation Plan identifies observational gaps (in both climate and carbon observations) and outlines a work plan to secure the continuity of observing systems for climate. Although the quality and length of the climate record is increasing (e.g. through reanalysis and some key climate datasets, e.g. paleo), not all datasets meet good quality standards. Significant improvements in modelling and predictions and access to these data are being strengthened through several member institutions now working with GEO (e.g. US NOAA, China). New satellite missions have been recently launched (e.g. NASA OCO-2) or planned (e.g. ESA-Biomass). There have been significant advances in the area of carbon observation and analysis system in support of monitoring based decision-making and related environmental treaty obligations. The global carbon budgets (considering both CO<sub>2</sub> and CH<sub>4</sub>) are regularly updated with a reduced uncertainty. However advances are still needed to address the needs of policy and decision makers in a form they can use for mitigation and adaptation purposes.

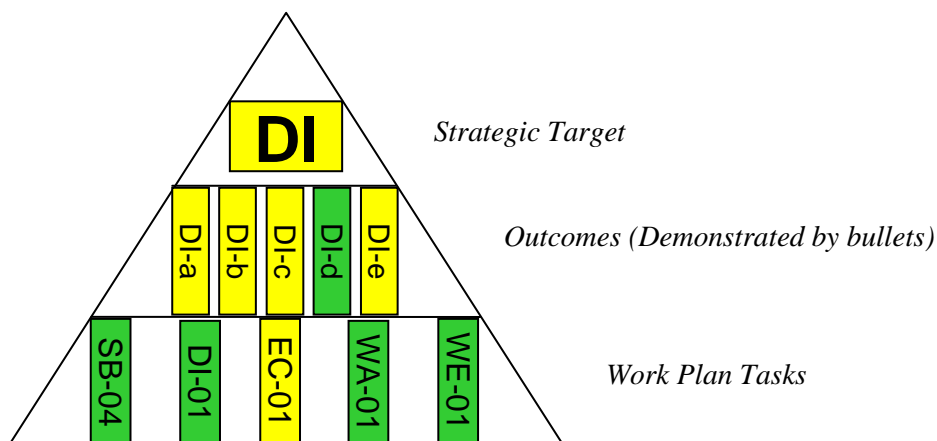
### Recommended Actions for GEO Members and Participating Organizations

- **CL1.** Continue to implement the recommended actions of the GCOS Implementation Plan (2010, GCOS-138);
- **CL2.** Participate and contribute to the GCOS Improvement and Assessment cycle ;
- **CL3.** Advance architectures for climate monitoring using guidelines outlined in “A Strategy towards an Architecture for Climate Monitoring from Space” (Joint CEOS, CGMS, WMO, Published in 2013). It is a foundation for the observation and monitoring pillar of the Global Framework for Climate Services (GFCS);
- **CL4.** For members that generate or archive numerical model outputs (including Atmosphere-Ocean Global Circulation Models), advance improved access to models and end-user applications, and in a form that can be used in adaptation decisions (e.g., ESGF, NOMADS); and advance the development of Earth System Models and associated reanalyses;
- **CL5.** Develop “Practical Guidance” of climate information for use at all levels of expertise (e.g. policy/decision makers, scientists, educators, citizen scientists);

- **CL6.** Support the development of Climate and Earth System Models and associated downscaling techniques (e.g. Coordinated Regional Climate Downscaling Experiment, CORDEX), and of seamless weather-climate predictions from sub-seasonal to decadal time-scales;
- **CL7.** For Members and Organizations that own climate or carbon-related data: Align data policies with the GEOSS Data Sharing Principles; make the data accessible through the GEOSS Portal. Data policies should allow free, full and open access to national climate-relevant data, and data owners need to ensure effective and easy access to the data and link to the GEOSS Common Infrastructure. Owners of Essential Climate Variable (ECV) climate data records should help populating the joint CGMS/CEOS/WMO ECV inventory in order to improve access to these records and facilitate the establishment of a physical architecture for climate monitoring from Space;
- **CL8.** Support the development and maintenance of carbon monitoring networks and systems (e.g. for carbon pools and fluxes both in vegetation and soil, as well as in the oceans) especially in less developed regions (e.g. Africa, South-East Asia) and less studied seas;
- **CL9.** The European Commission, as well as other GEO Members, is encouraged to continue supporting the GEO Carbon Office and its activities (e.g. coordination of the global carbon community, dissemination of scientific results to appropriate national authorities);
- **CL10.** Contribute activities supporting the Research and Development Implementation Plan of the Global Forest Observation Initiative (GFOI). Support the delivery of forest carbon data to developing countries through the GFOI;
- **CL11.** Improve coordination between GEO and the Global Framework for Climate Services (GFCS); Build linkages at national level between activities implemented under the two frameworks;
- **CL12.** Promote participation of national institutions in GEO Work Plan Task CL-02 “Global Carbon Observation and Analysis”.

## DISASTERS

Enable the global coordination of observing and information systems to support all phases of the risk management cycle associated with hazards (mitigation and preparedness, early warning, response, and recovery).



### Rationale for Target Rating

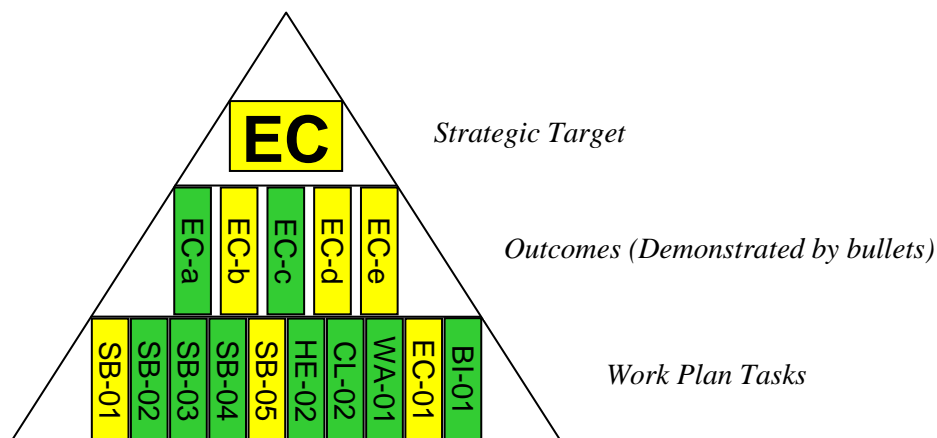
Despite increased evidence of the application of Earth observations and information to disaster management, additional actions are required from the GEO community: (i) Expand the use of satellite imagery and surface data to reduce exposure/vulnerability to disaster risks posed by natural and man-made hazards; and (ii) Ensure that Earth observations and space-based information (as a complement to socio-economic data) are supporting the post-2015 Disaster Risk Reduction framework and strategies, which include mechanisms to provide timely access to data, information and tools.

### Recommended Actions for GEO Members and Participating Organizations

- **DI1.** For Members and Organizations that own data, software systems and products relevant to disaster risk reduction (including calibration/validation data and ancillary data): Increase the level of contribution to and participation in the Disasters Work Plan Task (DI-01);
- **DI2.** Encourage the contributions by space agencies and space companies of very-high-resolution and high-resolution satellite data (in the range of 0.5m-10m spatial resolution) to the development of a Global Human Settlement Layer (GHSL). The GHSL plays a key role in assessing exposure and vulnerability to disasters risk and supporting crisis management operations;
- **DI3.** Support the Geohazards Supersites and National Laboratories initiative by providing easy access to 3 types of data: (i) satellite (SAR and optical) data; (ii) *Global Navigation Satellite System* (GNSS) data; and (iii) Seismic data;
- **DI4.** Maintain efforts in support of a universal access to the International Charter on Space and Major Disasters; Register as “Authorized User” to validate national access to Charter assets for disaster response;
- **DI5.** Support the implementation of the Hyogo Framework and the upcoming post-2015 DRR (Disaster Risk Reduction) framework with concrete activities and pilot projects involving national and local users.

## ECOSYSTEMS

Establish, in conjunction with a comprehensive biodiversity observation network, a wide-ranging monitoring capability for all ecosystems and the human impacts on them, to improve the assessment, protection and sustainable management of terrestrial, coastal and marine resources and the delivery of associated ecosystem services.



### Rationale for Target Rating

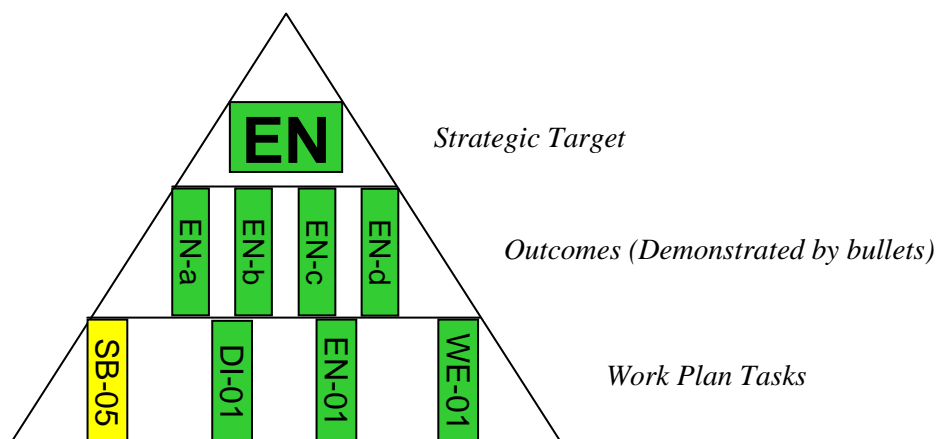
Activities of the Ecosystems Work Plan Task continue to progress through the contributions of numerous projects. Also, new initiatives were launched to better address the Ecosystems Target. More interactions across Work Plan Tasks (in particular, with Biodiversity, Water and Blue Planet) are needed to further accelerate progress.

### Recommended Actions for GEO Members and Participating Organizations

- **EC1.** Support the Blue Planet initiative for the coordination of activities, organization of workshops, and development and maintenance of the website (specific funding for Blue Planet coordination ceased in March 2013);
- **EC2.** Provide technical and financial support for in-water observations in synergy with related satellite observations (e.g. through the ChloroGIN network);
- **EC3.** For Members with coastal zones (e.g. Southern Asia and Africa): Participate in coastal ecosystem management activities;
- **EC4.** For Members with arid and semi-arid areas: Participate in the development of a global dryland observation network (in collaboration with UNCCD);
- **EC5.** For Members with wetlands: Support the development of a global wetlands observation system by contributing to pilot projects in Africa, Latin America and South-East Asia;
- **EC6.** For Members with mountainous regions: Contribute to the development of the Global Network for Observation and information in Mountain Environments (GEO-GNOME) through pilot projects in the mountainous areas of the world. Support from the Italian Project NextData and synergy with the Mountain Research Initiative (MRI);
- **EC7.** Make available modelling and analysis tools that can be downloaded and used by the scientific community and stakeholders for assessing changes in ecosystem state, functions and services;
- **EC8.** Contribute ecosystem datasets to GEOSS DataCORE and support the development of an information website for the GEO Ecosystems Task.

## ENERGY

Close critical gaps in energy-related Earth observations and increase their use in all energy sectors in support of energy operations, as well as energy policy planning and implementation, to enable affordable energy with minimized environmental impact while moving towards a low-carbon footprint.



### Rationale for Target Rating

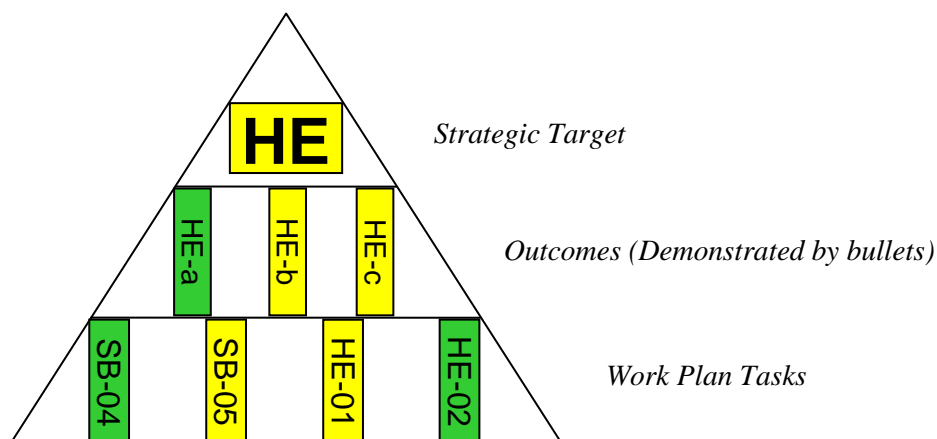
Earth observations and information are increasingly used for the resource assessment, monitoring and forecasting of renewable energy sources (including solar, wind, ocean, hydropower, and biomass) and geological resources (e.g. mineral, raw material). Non-renewable types of energies do not influence the proposed rating. In addition, this point of view is in coherence with the upcoming Sustainable Development Goals (SDG 7. Ensure access to affordable, reliable, sustainable, and modern energy for all). However, more applications and services are needed in the fields of ocean, hydro, nuclear, and fossil fuel energies. Awareness of stakeholders, including the private sector should be improved.

### Recommended Actions for GEO Members and Participating Organizations

- **EN1.** Provide data and technical/financial support for the expansion of the Global Renewable Energy Atlas from solar and wind energy to marine, geothermal, hydropower, and bio-Energy;
- **EN2.** For Members and Organizations active in renewable energy (e.g. China, Denmark, EC, Germany, South Africa, Spain, Japan, UK and USA):
  - i. Disseminate information about GEO energy tools and products;
  - ii. Support the development of new methodologies, tools and products for the mapping of renewable energy potential and impact assessment of energy exploitation.
- **EN3.** For Members and Organizations with sustainable mining as a priority (e.g. Australia, Brazil, Canada, South Africa, and USA):
  - i. Participate in the working group on “mining and environment” to help evaluate and mitigate the long-term impact of extensive coal mining on local soil, vegetation, water, and biodiversity;
  - ii. Support the organization of three workshops per year (in the Americas, Europe-Africa and Asia-Pacific regions). The working group currently includes representatives from China, France, Greece, India, Turkey and the UK.
- **EN4.** Improve result dissemination for different types of energies by developing services and providing easy access for all stakeholders;
- **EN5.** Improve links and partnerships with the private sector.

## HEALTH

Substantially expand the availability, use, and application of environmental information for public health decision-making in areas of health that include allergens, toxins, infectious diseases, food-borne diseases, and chronic diseases, particularly with regard to the impact of climate and ecosystem changes.



### Rationale for Target Rating

Activities on Malaria, Dengue, Rift valley fever (using environmental information for decision-making) are underway and likely to be achieved by 2015. Activities on pollutants monitoring (e.g. mercury and Persistent Organic Pollutants) are also advancing well. However several activities on water-borne diseases, including building and operationalizing a cholera early-warning system, are facing considerable funding gaps. Also there is little evidence that in-country capacity building is being done at sufficient level.

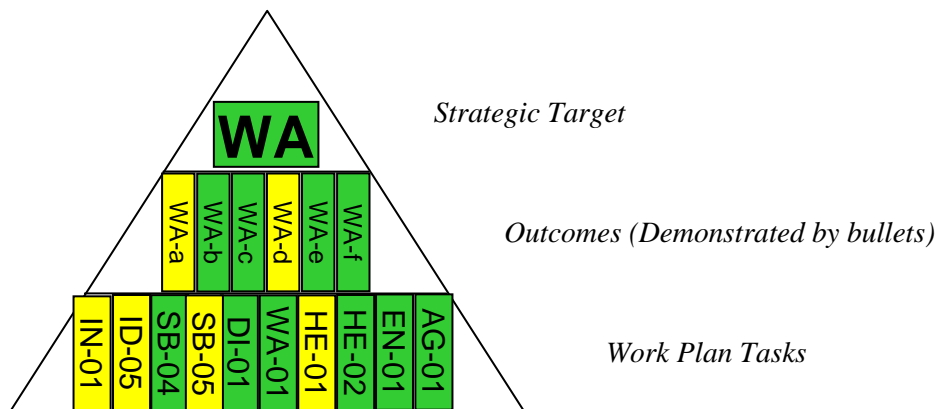
Additionally, lack of resources are impacting implementation and impairing the development of national coordination mechanisms. Societal benefits can only be realized when developed tools are adopted and used by national governments, especially in the developing regions of the world, which often also require building their capacity.

### Recommended Actions for GEO Members and Participating Organizations

- **HE1.** Expand national and/or international participation in GEO health-related activities; Support the implementation of Tasks that are key to the achievement of the Target: Tools and Information for Health Decision-making (HE-01), Tracking Pollutants (HE-02), Global Urban Observation and Information (SB-04), and Impact Assessment of Human Activities (SB-05);
- **HE2.** Provide national health data related to atmospheric levels of Persistent Organic Pollutants and mercury, as well as human exposure data, in a standardised format; especially for developing countries. Support the establishment and expansion of related observing networks and databases;
- **HE3.** Support in-country capacity building for the sustainable use of Earth information in health decision-making.

## WATER

Produce comprehensive sets of data and information products to support decision-making for efficient management of the world's water resources, based on coordinated, sustained observations of the water cycle on multiple scales.



### Rationale for Target Rating

The 2014 efforts for the Water Task focused on issues that needed to be addressed to accomplish the overall Strategic Target. In a number of cases advances have occurred – sufficient to merit the change in the overall assessment from yellow to green. In particular, the main contributor to the Target, WA-01, has been strengthened by new initiatives sponsored by the European Commission (e.g., Earth2Observe) and by commitments by Members and Participating Organizations to address recommendations in the GEOSS Water Strategy. Advances have occurred in the WA-e outcome (see Annex) and better representation of the breadth of the activity has come through the involvement of more Tasks in the accomplishment of the Water Target. For example, interactions with the Biodiversity Task on wetlands, the Health Tasks on water-borne diseases, the Agriculture Task through the Water-Energy-Food Nexus, the Energy Task through hydropower production and in indicators for monitoring the proposed Water Sustainable Development Goal have provided new opportunities and activities.

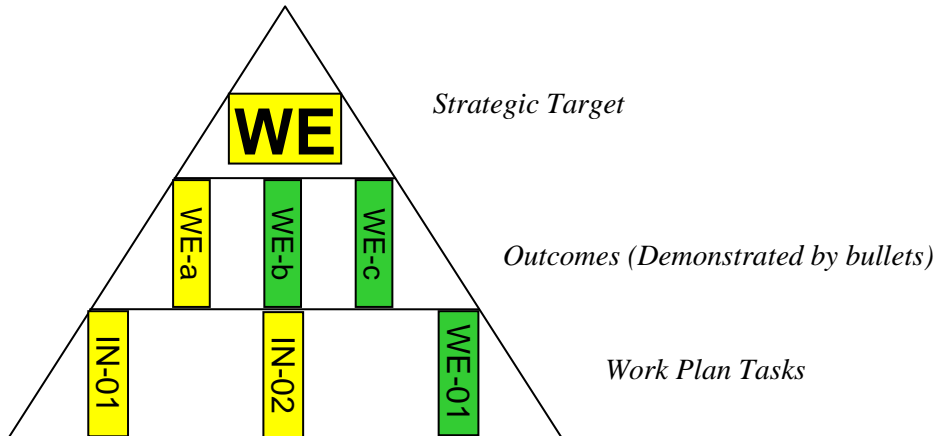
Although the overall assessment is green, there are still issues that need attention. One area still lacking progress involves strengthening observational networks for terrestrial hydrologic observations. This weakness in the support for in-situ networks affects many of the Societal Benefit Areas including Water. A coordinated approach at the GEO level is needed. Also more work is needed in the area of indicators of water availability and quality, and for an overall enhancement of the effectiveness of the Water activities

### Recommended Actions for GEO Members and Participating Organizations

- **WA1.** WMO in the framework of GEO should launch an initiative to strengthen the global in-situ observational networks for stream flow and groundwater data, and improved dissemination of these basic data;
- **WA2.** To improve coverage over data-poor regions, GEO Members from Africa, Asia, and South America should review the status of their in-country soil moisture monitoring and provide data and contacts for the soil moisture data archive;
- **WA3.** Although advances have been made, there are many needs and opportunities identified in the GEOSS Water Strategy related to data and information service activities that need to be contributed or funded. GEO Members and Participating Organizations are encouraged to address these challenges;
- **WA4.** GEO should develop a plan for fully supporting an integrated monitoring programme for the Sustainable Development Goals.

## WEATHER

Close critical gaps in meteorological and related ocean observations, and enhance observational and information capabilities for the protection of life and property, especially with regard to high-impact events, and in the developing world.



### Rationale for Target Rating

The Weather Task (WE-01) is a key contributor to this Target. Its main Component (Global Multi-Model Prediction System for High-Impact Weather) advances sufficiently well while the second Component (Easy Access to, and Use of, High-impact Weather Information) does not due to a lack of resources (there is not sufficient time to change this by 2015). Activities under Infrastructure Tasks (IN-01 “Earth Observing Systems” and IN-02 “Earth Data Sets”) also directly contribute to the Weather Target and underpinning Outcomes.

### Recommended Actions for GEO Members and Participating Organizations

- **WE1.** Support the enhancement and maintenance of the TIGGE (THORPEX Interactive Global Grand Ensemble) and TIGGE LAM archives - user-friendly databases of global and regional ensemble weather forecasts, tools and products;
- **WE2.** Identify resources for the post-2014 era (completion of the THORPEX programme and Europe-funded GEOWOW project) to support the new “Polar Prediction”, “High Impact Weather” and “Sub-seasonal to Seasonal” projects of the WMO World Weather Research Programme;
- See also “Recommended Actions” under the Architecture Strategic Target



## Annex

Strategic Target	Strategic Target Outcome ("Demonstrated by" bullet)	"Outcome" color	Analysis	Recommended Actions (as described under the Pyramid Diagrams; see previous pages)
Architecture	AR-a Deployment, population, and enablement of sustained operations and maintenance of a user-friendly and user-accessible GEOSS Common Infrastructure (GCI), including the core Components and functions that link the various resources of GEOSS.	G	There has been a major effort since the last Plenary to increase the visibility and registration of EO resources that are provided to GEOSS, and in particular to the GEOSS Data CORE. Direct contact with the data providers and assistance in turning their pledges into accessible GEOSS Data CORE resources, has increased this pool of resources from 8,700 in 2012 to over 1.2 million in 2013. This remarkable success could not have been possible without direct one-to-one contact with the data providers. This effort was sustained by the European Commission but as more effort is now needed to improve data access, it is critical that the GEOSS Secretariat takes on this responsibility of working directly with the data providers, and that dedicated resources are provided to the Secretariat to do this essential work. With respect to the evolution of the GEOSS architecture, dedicated workshops held in 2013 have explored new opportunities for including models, sensors, and new partnerships. The Architecture Interoperability Pilots, now in their 6th edition, provide a flexible agile mechanisms for developing and testing new components that can be incorporated in the future in the operational GCI.	AR1. Sustain the operations and evolution of the GEOSS Common Infrastructure (GCI), and assess continuity of commitments from GCI providers beyond 2015 (GCI providers include: ESA for the GEOSS Portal, Italy (CNR) for the Discovery and Access Broker, and the USA (USGS/George Mason University) and IEEE for the Registries). Shift focus from discovery to valorisation of the resources available through the GCI, working closely with Societal Benefit Areas and related Tasks to make data access/use easier, and demonstrate the value of the GCI
	AR-b Coordinated planning and sustained operation of national, regional and global observing and information systems within an interoperability framework.	Y	There is good progress for space-based observing systems, in particular the Climate Monitoring from Space initiative. For in-situ networks the situation is more challenging both in terms of coordination and sustainability. There is still considerable work to do to improve coordination of observing systems at national, regional, and global levels. Closer relationships with the in-situ data provider communities need to be developed in collaboration with the SBAs, and with new activities being proposed in the UN GGIM initiative.	AR2. Increase efforts to coordinate the provision, and improve the integration, of space-based and in-situ data at global, regional, and national levels; ensuring operations of underpinning observing systems so that gaps in availability and access are minimized. In particular, in-situ coordination should be encouraged building on the European Copernicus space/in-situ coordination efforts
	AR-c Continual improvement in observations and information available to users through the transition of research outcomes and systems into operational use, and through an optimal mix of space-based, airborne and in-situ observing platforms.	Y	More work needs to be done to achieve this Target, particularly in relation to in-situ observing platform and information resources. There is an increasingly dynamic landscape of initiatives that support the development of digital platforms and research cyber-infrastructures worldwide with similar aims as those of GEOSS. It should be a matter or priority for the GEO Members to ensure that interoperability arrangements are put in place to develop synergies across these investments. New sources of data are also becoming increasingly available from citizens and sensor networks. Attention should be given to the many research projects in this area identifying those that can be turned into sustainable long term operational systems.	AR3. Ensure that initiatives aimed at developing research data infrastructures (e.g. e-infrastructures in Europe and Australia, cyber-infrastructures in the USA, Digital China) are made interoperable and accessible from GEOSS  AR4. Seek opportunities to enhance GEOSS with new data sources (e.g. sensor networks and citizens-contributed information), working with the research community to deliver prototypes to be transitioned to operations post-2015
	AR-d Increased efficiency in the operation of observational systems through convergence among global, regional and national facilities.	G	For space-based observing systems, good progress is illustrated by the development of the CEOS Virtual Constellations, in particular recent achievements for Sea-Surface Temperature and Land Surface Imaging. In Europe some integration of national networks is developing in the framework of INSPIRE and Copernicus (GMES) but continued effort is needed to achieve this target.	AR3. Ensure that initiatives aimed at developing research data infrastructures (e.g. e-infrastructures in Europe and Australia, cyber-infrastructures in the USA, Digital China) are made interoperable and accessible from GEOSS
	AR-e Comprehensive gap analysis and gap filling, integrated across all Societal Benefit Areas, including issues pertaining to operational redundancy and succession planning (especially with respect to space missions) for systems and products.	Y	Some gap analyses for space-based systems have been done for climate and weather observations. More work needs to be done to achieve this Target. In particular in order to influence future space missions, all requirements should expressed well in advance. This activity should be accompanied by an outreach exercise in order to be sure that potential data providers are fully aware about new or consolidated user requirements.	AR5. More collaboration between Infrastructure providers and Societal Benefit Area actors (and Communities of Practice) is needed to develop a comprehensive gap analysis. Encourage the development of Essential Variables, check availability against existing datasets, and prioritize gap-filling on the basis of Societal Benefit Area requirements

Strategic Target	Strategic Target Outcome ("Demonstrated by" bullet)	"Outcome" color	Analysis	Recommended Actions (as described under the Pyramid Diagrams; see previous pages)
<b>Data Management</b>	<p>DM-a Increased use of observations through advances in all aspects of life-cycle data management, integration, and data recovery and conversion.</p>	Y	<p>The G8 Meeting in 2013 has made a strong statement in support of Open Data initiatives addressing both public sector information and research data and outcomes. Opening up data for reuse needs to be underpinned by data management plans that consider the full life-cycle of data from acquisition, to maintenance, updating, and long term preservation. There is therefore a strong need for GEO Members and Participating Organisation to share their data management best practices, and develop shared principles based on such practices.</p>	<p>DM1. Contribute to the work of the GEOSS Data Management Principles Task Force so that a broad consensus is reached by the GEO-XI Plenary</p>
	<p>DM-b Open, reliable, timely, consistent, and free access to a core set of essential environmental observations and information products, supported by adequate metadata, by users across all GEOSS Societal Benefit Areas in accordance with GEOSS Data Sharing Principles.</p>	G	<p>Increased effort was made this year in increasing the visibility and registration of EO resources that are provided in accordance with the GEOSS Data Sharing Principles. Direct contact with the data providers and assistance in turning their pledges into accessible GEOSS Data CORE resources, has increased this pool of resources from 8,700 in 2012 to over 1.2 million in 2013. Many of the Essential Climate Variables are now supported by accessible GEOSS Data CORE resources. More effort is now needed to support the essential variables of other communities, and fill the existing gaps, particularly in relation to socio-economic data.</p>	<p>DM2. Awareness and use of both, the GEOSS Common Infrastructure (GCI) and the GEOSS Data CORE, are still low in the user community. More effort is needed to bring data users from the Societal Benefit Areas (the demand side) together with data providers via the GCI, and Data CORE. Data providers should also be encouraged to further improve the quality of the data sets made accessible through GEOSS, and to respond to related prioritized user requests</p> <p>DM5. Ensure adequate representation on the Data Sharing Working Group from the Middle East, South America, and Asia-Pacific regions</p>
	<p>DM-c Removal of important data management deficiencies.</p>	Y	<p>This "demonstrated by" is redundant given that DM-a above already covers activities needed to remove important data management deficiencies. On the other hand, there is no "demonstrated by" outcome to guide activities leading to the harmonisation of key global datasets. It would be appropriate to consider a revision of this bullet.</p>	<p>DM1. Contribute to the work of the GEOSS Data Management Principles Task Force so that a broad consensus is reached by the GEO-XI Plenary</p> <p>DM3. Work towards harmonization of key global datasets contributing to Societal Benefit Area Essential Variables in collaboration with existing initiatives in GEOSS, and new activities proposed in the framework of Global Geospatial Information Management (UN GGIM)</p>
	<p>DM-d Enhanced information extraction from historical, current and future source data.</p>	Y	<p>There has been considerable improvement in the availability of resources made accessible to users of the GCI, particularly in respect to the GEOSS Data CORE: More effort is now needed in making available historical data sets needed for longitudinal analysis as well as models and model outputs necessary for forecasting and future scenario assessment.</p>	<p>DM4. Encourage data providers to provide access through the GEOSS Common Infrastructure to (i) historical datasets for longitudinal analysis, and (ii) outcomes of modelling and forecasting activities for future scenario analysis</p>

Strategic Target	Strategic Target Outcome ("Demonstrated by" bullet)	"Outcome" color	Analysis	Recommended Actions (as described under the Pyramid Diagrams; see previous pages)
<b>Capacity Building</b>	CB-a Networking activities that specifically build individual, institutional and infrastructure capacity.	G	More national capacity building activities need to be contributed to GEO	CB1. Participate and contribute to national, regional, and international capacity building activities  CB2. Actively support capacity building efforts directed at the introduction of the GEOSS Discovery and Access Broker (DAB) approach – to increase the number of datasets available through GEOSS and facilitate access to capacity building funding  CB3. Provide capacity building resources, material and information to populate the Global Earth Observation Capacity Building (GEOCAB) Portal and CEOS Inventory (that will be incorporated into GEOCAB)  CB4. Raise awareness of the use of the GEOSS Data-CORE nationally and regionally
	CB-b Leveraging resources for Earth observation capacity building efforts.	G	National/international experience on resource mobilization should be shared	CB1. Participate and contribute to national, regional, and international capacity building activities  CB2. Actively support capacity building efforts directed at the introduction of the GEOSS Discovery and Access Broker (DAB) approach – to increase the number of datasets available through GEOSS and facilitate access to capacity building funding  CB3. Provide capacity building resources, material and information to populate the Global Earth Observation Capacity Building (GEOCAB) Portal and CEOS Inventory (that will be incorporated into GEOCAB)
	CB-c Increased use of Earth observation in policy and decision making.	G	Ongoing	CB2. Actively support capacity building efforts directed at the introduction of the GEOSS Discovery and Access Broker (DAB) approach – to increase the number of datasets available through GEOSS and facilitate access to capacity building funding  CB3. Provide capacity building resources, material and information to populate the Global Earth Observation Capacity Building (GEOCAB) Portal and CEOS Inventory (that will be incorporated into GEOCAB)  CB4. Raise awareness of the use of the GEOSS Data-CORE nationally and regionally
	CB-d Enhanced participation of developing countries in GEO and GEOSS.	G	Connections with existing national/regional capacity development initiatives need to be established	CB1. Participate and contribute to national, regional, and international capacity building activities  CB3. Provide capacity building resources, material and information to populate the Global Earth Observation Capacity Building (GEOCAB) Portal and CEOS Inventory (that will be incorporated into GEOCAB)  CB4. Raise awareness of the use of the GEOSS Data-CORE nationally and regionally  CB5. Stimulate the uptake of the GEO Data Sharing Principles at national, regional and international levels

Strategic Target	Strategic Target Outcome ("Demonstrated by" bullet)	"Outcome" color	Analysis	Recommended Actions (as described under the Pyramid Diagrams; see previous pages)
Science & Technology	ST-a Improved and new instrumentation and observation system design for in-situ, airborne, and space-based observation, benefiting from advances in science and technology.	G	ST-a is being partially addressed through activities in IN-01 and IN-02	See AR2 and AR4 above under Architecture
	ST-b Increased accessibility of global sets of scientific data necessary for improved Earth System modelling in the different GEO Societal Benefit Areas.	Y	National/international contributions still needed on data management (including processing, inter-calibration and validation, quality assurance, harmonization, archiving, integration, assimilation, modelling, long-term preservation, digitization, and visualization)	ST1. Support the implementation of the GEO Science & Technology Roadmap and encourage new contributions to Work Plan activities from Asia and Africa  ST2. Establish links with national and regional activities on Future Earth and the broader Sustainable Development Goal (SDG) agenda  ST3. Inform the Science & Technology Task (ID-03) of any national, regional and international GEO and/or GEOSS related scientific meetings or sessions
	ST-c Increased accessibility of data and improved coordination and maintenance of observational systems through GEOSS are realized by the research community.	G	ST-c was changed to green because of the indirect links within Tasks such as those producing the Virtual Constellations, the GEO BON, and other observing systems. The Board believes that the activities listed by other Tasks are likely to be completed either in their entirety, or in sufficient number to point to an increased use of Earth observations data through GEOSS by the research community	ST1. Support the implementation of the GEO Science & Technology Roadmap and encourage new contributions to Work Plan activities from Asia and Africa  ST2. Establish links with national and regional activities on Future Earth and the broader Sustainable Development Goal (SDG) agenda  ST3. Inform the Science & Technology Task (ID-03) of any national, regional and international GEO and/or GEOSS related scientific meetings or session
Strategic Target	Strategic Target Outcome ("Demonstrated by" bullet)	"Outcome" color	Analysis	Recommended Actions (as described under the Pyramid Diagrams; see previous pages)
User Engagement	UE-a Establishment of an agreed core set of essential environmental, geophysical, geological, and socio-economic variables needed to provide data, metadata and products in support of all GEOSS Societal Benefit Areas.	G	UE-a has been partially met with the delivery of the Critical Earth Observations Priorities document released in 2010 ( <a href="http://sbageotask.larc.nasa.gov/US-09-01a_SummaryBrochure.pdf">http://sbageotask.larc.nasa.gov/US-09-01a_SummaryBrochure.pdf</a> ). UE-a is also being partially addressed through activities in IN-04 and SB-05	None at this stage
	UE-b Involvement of users in: reviewing and assessing requirements for Earth observation data, products and services; creating appropriate mechanisms for coordinating user requirements; utilizing data/information delivery systems; and capturing user feedback on an ongoing basis across Societal Benefit Areas.	G	UE-b was changed to green given the addition of the three ID tasks, and their user communities. Tasks ID-01, -02, and -03 were added in recognition of their extensive user focus on the data sharing, capacity building, and science and technology communities. These three communities represent large user groups in addition to the ones identified by the Infrastructure and Societal Benefit tasks.	UE2. Support at least one User Engagement Session per year (linked to one or more Work Plan Tasks) – to capture the work and needs of the users in a specific region  UE3. Encourage national or regional user engagement sessions collocated with relevant conferences to capture contributions from developing countries and feedbacks on user needs
	UE-c Increased use of geo-spatial data in all Societal Benefit Areas and in particular in developing countries.	Y	Engagement of developing countries remains a challenge; see also Capacity Building	UE1. Provide national and organizational user perspectives to illustrate the richness of the cross-cutting user engagement  UE4. Results from those meetings should be included into the larger user engagement information and disseminated as appropriate

Strategic Target	Strategic Target Outcome ("Demonstrated by" bullet)	"Outcome" color	Analysis	Recommended Actions (as described under the Pyramid Diagrams; see previous pages)
Agriculture	AG-a Increased use of Earth observing capabilities and supporting applications systems to produce timely, objective, reliable, and transparent agricultural and forest statistics and information at the national and regional level.	G	The task is on the right track and the accomplishment of the task results to the accomplishment of the target. Monthly global crops outlooks were delivered to the AMIS Market Monitor during 1 year with positive feedbacks from the users. A dialogue with user is foreseen to foster and consolidate the system. The network of contributing experts and agencies is well establish and present gaps are well identified. <a href="http://geoglam-crop-monitor.org/">http://geoglam-crop-monitor.org/</a>	AG1. Support coordination of GEOGLAM activities by (i) appointing national contacts, and (ii) providing financial and technical support for the reinforcement of GEOGLAM coordination office; iii) Developing information flow and procedure to increase traceability and transparency.
	AG-b Improved agricultural risk assessment and operational weather/climate forecast systems for early warning and food security.	G	GEOGLAM initiated a restricted group willing to extend the CROP MONITOR activities focus on AMIS (G20+7 main producers and exporters) to Countries at risks in the rest of the world. This involved FAO GIEWS and WFP and technical way forwards will be discuss in Addis Ababa (October 2014). Reporting to AMIS included in 2014 some notice and highlights on the development of El Nino (coordinated by USGS FEWSNET)	AG1. Support coordination of GEOGLAM activities by (i) appointing national contacts, and (ii) providing financial and technical support for the reinforcement of GEOGLAM coordination office AG2. Identify key agencies/institutions to (i) complete the national/international network for agricultural resource management, food security (ii) host regional targeted workshops related to GEOGLAM activities AG7. Contribute to the new GEO initiative on Land Cover for Africa to develop land use/land cover data for the African continent at a 30-meter resolution
	AG-c Effective early warning of famine leading to more timely mobilization of an international response in food aid.	Y	This a very ultimate outcome of GEOGLAM (which only contribute to this overarching goal) Underway, thanks to similar initiatives involving all the FS dimensions , in particular the IPC (integrate Food Security phase classification) , a multiple agency initiative involving UN FAO WFP, USAID FEWSNET, EC JRC, NGO's (ACF, Save the Children, Oxfam)and UNICEF <a href="http://www.ipcinfo.org/">http://www.ipcinfo.org/</a>	AG1. Support coordination of GEOGLAM activities by (i) appointing national contacts, and (ii) providing financial and technical support for the establishment of a regional coordination office for food security within GEOGLAM AG2. Identify key agencies/institutions to (i) complete the national/international network for agricultural resource management, food security, and (ii) host regional targeted workshops related to GEOGLAM activities AG7. Contribute to the new GEO initiative on Land Cover for Africa to develop land use/land cover data for the African continent at a 30-meter resolution
	AG-d Expanded monitoring of agricultural land use change, through periodic regional and global assessments.	G	Some countries such as Brazil, Australia and Argentina are continuously updating their agricultural crop masks. The SIGMA project, funded by the European commission, will also deliver up to date regional ad global agricultural land use masks. The production of dynamic crop masks is also foreseen in ESA Sentinel2Agri project. The availability and interoperability of Landsat 8 and Sentinel 2 satellite systems will deliver such operational product. But the real uptake by operational system may take longer and is not granted in most complex agricultural landscapes.	AG3. Provide commercial data as in-kind contribution to support availability of satellite data for food security related issues (in particular VHR) AG4. Conduct crop mask updates and coordinate in-country to ensure that these updates are shared and discoverable through the GEOSS Common Infrastructure AG5. Support the maintenance of, and make datasets available through, the GEO Global Land Cover Information Portal; Communicate data requirements for Land Cover and Land Use to the Land Cover Task Team (SB-02) AG6. For Members and Organizations advanced in Land Cover Land Use (LCLU) monitoring (e.g. Australia, Brazil, Germany, France, Russia, and CEOS): Provide technical and financial support for LCLU methodologies and the organisation of related capacity building activities (3 workshops per year mainly in developing countries) AG7. Contribute to the new GEO initiative on Land Cover for Africa to develop land use/land cover data for the African continent at a 30-meter resolution
	AG-e Development of quantitative measurements of global and regional desertification.	Y	The RAPP (Rangeland and Pasture Productivity) initiative lead by Australia (CSIRO) gained momentum with a second global Workshop (Paris July 2013) with involvement of IRLI, FAO, IASA FEWSNET etc . There might be opportunity to link to regional desertification monitoring activities. However the global perspective need to be focused between covering global meat and dairy production and focusing only on rangeland.	AG8. i) Propose contributions related to /rangeland/ pasture management: ii) Liaise with key stakeholder /users and identify the best perspective / focus for this activity (where Earth observations/information fill an information gap) which is probably the natural rangeland ecosystems.

	<p>AG-f Increased capacity building through Targeted workshops and joint multi-institution research teams.</p>	G	<p>SIGMA brings new opportunities for targeted regional capacity development workshops</p>	<p>AG6. For Members and Organizations advanced in Land Cover Land Use (LCLU) monitoring (e.g. Australia, Brazil, Germany, France, Russia, and CEOS): Provide technical and financial support for LCLU methodologies and the organization of related capacity building activities (3 workshops per year mainly in developing countries) AG7. Contribute to the new GEO initiative on Land Cover for Africa to develop land use/land cover data for the African continent at a 30-meter resolution</p>
	<p>AG-g Improved collaboration and coordination on the use and applications of Earth observations for fisheries, aquaculture, forestry and land cover mapping.</p>	G	<p>Underway in multiple Societal Benefit Areas (Agriculture, Ecosystems, Climate)  But no evident to demonstrate concrete operational outcomes for GEOGLAM main targets</p>	<p>AG5. Support the maintenance of, and make datasets available through, the GEO Global Land Cover Information Portal; Communicate data requirements for Land Cover and Land Use to the Land Cover Task Team (SB-02) AG6. For Members and Organizations advanced in Land Cover Land Use (LCLU) monitoring (e.g. Australia, Brazil, Germany, France, Russia, and CEOS): Provide technical and financial support for LCLU methodologies and the organisation of related capacity building activities (3 workshops per year mainly in developing countries) AG7. Contribute to the new GEO initiative on Land Cover for Africa to develop land use/land cover data for the African continent at a 30-meter resolution  See also Actions EC1, EC2, EC3, and EC5 under Ecosystems and CL8 under Climate</p>

Strategic Target	Strategic Target Outcome ("Demonstrated by" bullet)	"Outcome" color	Analysis	Recommended Actions (as described under the Pyramid Diagrams; see previous pages)
Biodiversity	<p>BI-a Increased routine collection of long term in-situ and remotely sensed biodiversity observations.</p>	Y	<p>A number of countries have initiated discussions on and/or development of National/Regional Biodiversity Observation Networks (BONs) with the aim of increasing 'routine collection of long term in-situ and remotely sensed biodiversity observations' for decision-making. An expansion of these activities is required. For in-situ monitoring in particular, this is unlikely to be achieved without funding for capacity building and facilitation activities.</p>	<p>BI1. Support development of national or regional Biodiversity Observation Networks (BONs; these will help countries meet their decision-making and reporting requirements, e.g. under the CBD and other MEAs) (...) BI2. Host workshops and other activities that support the development of "BON-in-a-Box" (BiaB) by defining requirements and engaging stakeholders BI3. Engage with GEO BON partners to facilitate development of the Global Wetland Observing System (GWOS) BI4. Once available, adopt the Essential Biodiversity Variables (EBVs) for the monitoring of biodiversity change, by both in-situ and remote sensing means BI5. Participate in development of the biodiversity field site network (for Genes, Species and Ecosystems), which will enhance coordination of existing field site activities and improve capacity BI8. Support global coordination activities through the GEO BON office (...)</p>
Biodiversity	<p>BI-b Access through GEOSS to a large panel of biodiversity observations, including satellite, aerial and in-situ.</p>	G	<p>The availability of biodiversity information through GEOSS as contributed by various GEO POs and GEO BON/EU BON partners, has increased. The RS and biodiversity communities are continuing their dialogue and a number of initiatives have been launched to advance the use of RS for biodiversity and conservation. More work is required and expected in the coming years.</p>	<p>BI1. Support development of national or regional Biodiversity Observation Networks (BONs; these will help countries meet their decision-making and reporting requirements, e.g. under the CBD and other MEAs) (...) BI3. Engage with GEO BON partners to facilitate development of the Global Wetland Observing System (GWOS) BI4. Once available, adopt the Essential Biodiversity Variables (EBVs) for the monitoring of biodiversity change, by both in-situ and remote sensing means BI5. Participate in development of the biodiversity field site network (for Genes, Species and Ecosystems), which will enhance coordination of existing field site activities and improve capacity BI6. Support full and open access to data and information relevant to biodiversity (...) BI7. Support maintenance of, and make datasets available through, the GEO Global Land Cover Information Portal; Communicate data requirements for Land Cover Land Use to the Land Cover Task Team (SB-02)</p>

<b>Biodiversity</b>	<p>BI-c Increased information sharing on biodiversity conservation and sustainable use of biodiversity resources.</p>	G	<p>A number of products developed and being developed by GEO BON and its partners aim at increasing information on the state of biodiversity. A number of new product development initiatives has started in 2014 with expected delivery by August 2015. Availability of this kind of information through GEOSS as contributed by GEO BON/EU BON partners and GEO POs, continues to increase.</p>	<p>BI1. Support development of national or regional Biodiversity Observation Networks (BONs; these will help countries meet their decision-making and reporting requirements, e.g. under the CBD and other MEAs) (...) BI2. Host workshops and other activities that support the development of "BON-in-a-Box" (BiaB) by defining requirements and engaging stakeholders BI3. Engage with GEO BON partners to facilitate development of the Global Wetland Observing System (GWOS) BI5. Participate in development of the biodiversity field site network (for Genes, Species and Ecosystems), which will enhance coordination of existing field site activities and improve capacity BI6. Support full and open access to data and information relevant to biodiversity (...) BI7. Support maintenance of, and make datasets available through, the GEO Global Land Cover Information Portal; Communicate data requirements for Land Cover Land Use to the Land Cover Task Team (SB-02) BI8. Support global coordination activities through the GEO BON office (...)</p>
	<p>BI-d Implementation of a mechanism that enables users to interact with the development of biodiversity observations systems and request services.</p>	Y	<p>There has been no change since 2013. While this has been done for freshwater, marine and terrestrial realms are lagging. Some activities have been put in place to try rectify this (e.g. EBVs, BON-in-a-Box), but their success by 2015 is uncertain. Funding is required for development of these two initiatives, together with user engagement and needs analysis. Other mechanisms do exist and GEO BON (BI-01) is engaging with the UN CBD (Convention on Biological Diversity) and Ramsar in addressing user needs, though this is not a formal mechanism.</p>	<p>BI1. Support development of national or regional Biodiversity Observation Networks (BONs; these will help countries meet their decision-making and reporting requirements, e.g. under the CBD and other MEAs) (...) BI2. Host workshops and other activities that support the development of "BON-in-a-Box" (BiaB) by defining requirements and engaging stakeholders BI3. Engage with GEO BON partners to facilitate development of the Global Wetland Observing System (GWOS) BI4. Once available, adopt the Essential Biodiversity Variables (EBVs) for the monitoring of biodiversity change, by both in-situ and remote sensing means BI5. Participate in development of the biodiversity field site network (for Genes, Species and Ecosystems), which will enhance coordination of existing field site activities and improve capacity BI8. Support global coordination activities through the GEO BON office (...)</p>
	<p>BI-e Increased availability of biodiversity information necessary to respond to and support related topics (ecosystems, health, climate, etc.).</p>	G	<p>See BI-b above.</p>	<p>BI1. Support development of national or regional Biodiversity Observation Networks (BONs; these will help countries meet their decision-making and reporting requirements, e.g. under the CBD and other MEAs) (...) BI3. Engage with GEO BON partners to facilitate development of the Global Wetland Observing System (GWOS) BI4. Once available, adopt the Essential Biodiversity Variables (EBVs) for the monitoring of biodiversity change, by both in-situ and remote sensing means BI5. Participate in development of the biodiversity field site network (for Genes, Species and Ecosystems), which will enhance coordination of existing field site activities and improve capacity BI6. Support full and open access to data and information relevant to biodiversity (...) BI7. Support maintenance of, and make datasets available through, the GEO Global Land Cover Information Portal; Communicate data requirements for Land Cover Land Use to the Land Cover Task Team (SB-02) BI8. Support global coordination activities through the GEO BON office (...)</p>
	<p>BI-f Increased information to reduce the cost and support the management of biodiversity issues.</p>	Y	<p>There has been no change in progress towards this bullet. To what extent this outcome is met by default if outcome BI-c ('increased information sharing on biodiversity conservation and sustainable use of biodiversity resources'), which is on track, is met, is uncertain (perhaps this should be green?). It is difficult to know to what extent information is taken up and used by those making decisions on the use of biodiversity resources. The bottom line, however, is that the information is increasing.</p>	<p>BI1. Support development of national or regional Biodiversity Observation Networks (BONs; these will help countries meet their decision-making and reporting requirements, e.g. under the CBD and other MEAs) (...) BI2. Host workshops and other activities that support the development of "BON-in-a-Box" (BiaB) by defining requirements and engaging stakeholders BI3. Engage with GEO BON partners to facilitate development of the Global Wetland Observing System (GWOS) BI4. Once available, adopt the Essential Biodiversity Variables (EBVs) for the monitoring of biodiversity change, by both in-situ and remote sensing means BI5. Participate in development of the biodiversity field site network (for Genes, Species and Ecosystems), which will enhance coordination of existing field site activities and improve capacity BI6. Support full and open access to data and information relevant to biodiversity (...) BI7. Support maintenance of, and make datasets available through, the GEO Global Land Cover Information Portal; Communicate data requirements for Land Cover Land Use to the Land Cover Task Team (SB-02) BI8. Support global coordination activities through the GEO BON office (...)</p>



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Climate	CL-a Improved scientific understanding, modelling and prediction of climate.	G	There are many ongoing and growing activities resulting in improvement of models and more robust predictions. Better links between the climate observation community and the climate modelling community have accelerated the progress. However, in order to be able to better address needs of users at national and local levels further reduction of uncertainties and higher spatial resolution information is needed. Model data are not readily available through GEOSS. There is a need for improved access to existing model data portals in GEOSS. Many already exist: (NOMADS, ESGF, WCRP, etc.) and could be advanced by Member nations.	CL3. Advance architectures for climate monitoring using guidelines outlined in "A Strategy Towards an Architecture for Climate Monitoring from Space" (Joint CEOS, CGMS, WMO, Published 2013). CL4. For members that generate or archive numerical models (including AOGCM climate models), advance improved access to models and end-user applications, and in a form that can be used in adaptation decisions (e.g., ESGF, NOMADS); and advance the development of Earth System Models and associated reanalyses CL5. Develop "Practical Guidance" of climate information for use at all levels of expertise (e.g. policy/decision makers, scientists, educators, citizen scientists) CL6. Support the development of Climate and Earth System Models and associated downscaling techniques (e.g. Coordinated Regional Climate Downscaling Experiment, CORDEX), and of seamless weather-climate predictions from sub-seasonal to decadal time-scales CL11. Improve coordination between GEO and GFCS; Build linkages at national level between activities implemented under both frameworks
	CL-b Accessibility of all the observational data needed for climate monitoring and services in support of adaptation to climate variability and change.	Y	A number of relevant datasets are available, however, they are often difficult to access for reasons of national data policies or lack of adequate retrieval mechanisms. There is a growing need for information at finer spatial and temporal scales to address adaptation to climate variability and change. There are a number of activities addressing climate services, but many are not connected to GEOSS.	CL2. Participate and contribute to the GCOS Improvement and Assessment cycle CL7. For Members and Organizations that own climate or carbon-related data: Align data policies with the GEOSS Data Sharing Principles; make the data accessible through the GEOSS Portal. (...) CL11. Improve coordination between GEO and GFCS; Build linkages at national level between activities implemented under both frameworks
	CL-c Development and facilitation of a comprehensive (atmosphere, ocean, land) treaty global carbon observation and analysis system in support of monitoring based decision-making and related environmental obligations.	Y	The development of a global carbon observation and analysis system is underway. Before 2015 we should be able to have i) identified the key elements and players to be involved, ii) coordinated the most important observing systems, and iii) defined the requirements for building such a system. The first reliable policy relevant information will also be released. Thanks to the above efforts, we are ready to establish an operational global monitoring system during the next GEO Work Plan, if there will be the needed political, infrastructural and financial support by governments.  A key issue is the lack of continuity and sustainability of many of the past and current monitoring networks. A key gap is the lack of coverage especially in less developed regions, like Africa. The Global Forest Observation Initiative (GFOI) has identified and prioritized research and development needs for all countries to implement national forest monitoring systems, but resources to address these needs are lacking. While support is available for developing countries to develop the systems they need to deliver operational national forest monitoring systems providing estimates of forest carbon stocks and greenhouse gas emissions, most developing countries do not have a sustainable mechanism in place for obtaining satellite data from international providers and additional resources and technical expertise is required to develop appropriate systems.	CL8. Support the development and maintenance of carbon monitoring networks and systems (e.g. for carbon pools and fluxes both in vegetation and soil, as well as in the oceans) especially in less developed regions (e.g. Africa, South-East Asia) and less studied seas CL9. The European Commission, as well as other GEO Members, is encouraged to continue supporting the GEO Carbon Office and its activities (e.g. coordination of the global carbon community, dissemination of scientific results to appropriate national authorities) CL10. Contribute activities supporting the Research and Development Implementation Plan of the Global Forest Observation Initiative (GFOI). Support the delivery of forest carbon data to developing countries through the GFOI CL12. Promote participation of national institutions in GEO Work Plan Task CL-02 "Global Carbon Observation and Analysis"  A wide internationally-coordinated Global Land Cover mapping framework (including Earth observation data supply, processing chain and associated standardized or harmonized rules) still needs to be defined. Coordination between BI-01 and CL-02 is needed.
	CL-d Availability of all Essential Climate Variables needed by the WCRP, the IPCC and the UNFCCC.	Y	Essential Climate Variable (ECV) requirements for space-based Climate Data Records (CDR) are well specified, but further development is needed for in-situ CDRs. CDRs are being produced for all ECVs, although not satisfying GCOS criteria for all of them, and strengthened coordination and contributions are needed. The development of an architecture for climate monitoring would improve both observational requirements and fitness-for-purpose of applications and "services" and provide a link between the two	CL1. Continue to implement the recommended actions of the GCOS Implementation Plan (2010, GCOS-138)  CL2. Participate and contribute to the GCOS Improvement and Assessment cycle

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Disasters	DI-a Improved use of observations and related information to inform policies, decisions and actions associated with disaster preparedness and mitigation.	Y	Despite increased evidence of utilization of EO data for disaster preparedness and mitigation additional actions/intervention are required by the GEO community to make the use of observations more systematic over all area of the World and for all tyoe of disasters.	DI1. For Members and Organizations that own data, software systems and products relevant to disaster risk reduction (including calibration/validation data and ancillary data): Increase the level of contribution to and participation in the Disasters Work Plan Task (DI-01)
	DI-b More effective access to observations and related information to facilitate warning, response and recovery to disasters.	Y	Observations and related informations are more accessible during the response phase of major disasters. However actions/intervention are required to make the access to observations more effective during the warning and recovery phase.	DI3. Support the Geohazards Supersites and National Laboratories initiative by providing easy access to 3 types of data: (i) satellite (SAR and optical) data; (ii) Global Navigation Satellite System (GNSS) data; and (iii) Seismic data
	DI-c Increased communication and coordination between national, regional and global communities in support of disaster risk reduction, including clarification of roles and responsibilities and improved resources management.	Y	A regional strategy is still needed to engage participation at community level and to improve communication and and coordination between national, regional and global communities.	DI2. Contribute very-high-resolution and high-resolution satellite data (in the range of 0.5m-10m spatial resolution) to the development of a Global Human Settlement Layer (GHSL). The GHSL plays a key role in assessing exposure and vulnerability to disasters risk and supporting crisis management operations
	DI-d Improved national response to natural and man-made disasters through delivery of space-based data, resulting from strengthened International Charter on "Space and Major Disasters."	G	Much progress has been done to extend the access of the Charter to all GEO member countries, Effort to train local disaster project manager to improve the interface with the Charter must continue.	DI4. Maintain efforts in support of a universal access to the International Charter Space and Major Disasters
	DI-e Support to the successful implementation of the Hyogo Framework for Action 2005-2015.	Y	A better link with the stakeholder of the Hyogo framework is required to help building the resilience of nations and communities to disasters.	DI5. Support the implementation of the Hyogo Framework and the upcoming post-2015 DRR (Disaster Risk Reduction) framework with concrete activities and pilot projects involving national and local users

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Ecosystems	EC-a Implementation of a global standardised ecosystem classification system and map as a basis for worldwide inventory, assessment and monitoring.	G	Done for conterminous United States, for South America and for Africa. Ongoing for other regions	EC7. Make available modelling and analysis tools that can be downloaded and used by the scientific community and stakeholders for assessing changes in ecosystem state, functions and services EC8. Contribute datasets to GEOSS DataCORE and support the development of an information website for the GEO Ecosystems Task
	EC-b Implementation of a global, standardized inventory of major ecosystems and the protected areas within them.	Y	Progressing but not yet completed.	EC2. Provide technical and financial support for in-water observations in synergy with related satellite observations (e.g. through the ChloroGIN network) EC3. For Members with coastal zones (e.g. Southern Asia and Africa): Participate in coastal ecosystem management activities EC4. For Members with arid and semi-arid areas: Participate in the development of a Global Dryland Observation Network (in collaboration with UNCCD) EC5. For Members with wetlands: Support the development of a Global Wetlands Observation System by contributing to pilot projects in Africa, Latin America and South-East Asia EC6. For Members with mountainous regions: Contribute to the development of the Global Network for Observation and information in Mountain Environments (GEO-GNOME) through pilot projects in mountain areas of the world
	EC-c Increased operational monitoring of major ecosystems on land on an annual basis, including properties such as land cover type; species composition; vegetation structure, height and age; net ecosystem productivity; and biomass and carbon estimates of vegetation and soils based on remote sensing and sampled in-situ observations using internationally agreed standards.	G	Started activity on mountain ecosystems, transitional coastal waters, Arctic ecosystems, drylands, forests. Started the implementation of models and projections. Interaction with the Water "Cold Regions" Task is ongoing.	EC4. For Members with arid and semi-arid areas: Participate in the development of a Global Dryland Observation Network (in collaboration with UNCCD) EC6. For Members with mountainous regions: Contribute to the development of the Global Network for Observation and information in Mountain Environments (GEO-GNOME) through pilot projects in mountain areas of the world EC8. Contribute datasets to GEOSS DataCORE and support the development of an information website for the GEO Ecosystems Task See also CL8 under Climate
	EC-d Increased operational monitoring of major marine and coastal ecosystems on an annual basis including properties such as extent, water temperature, salinity, pH and pCO <sub>2</sub> , phytoplankton species composition and productivity and marine resource stocks, based on remote sensing and sampled in-situ observations using internationally agreed standards.	Y	Collaboration with Blue Planet has been modest. Most participants in EC-01 work on terrestrial ecosystems.	EC1. Support the Blue Planet initiative for the coordination of research activities, organization of workshops, and development and maintenance of the website (specific funding for Blue Planet coordination ceased in March 2013) EC2. Provide technical and financial support for in-water observations in synergy with related satellite observations (e.g. through the ChloroGIN network) EC3. For Members with coastal zones (e.g. Southern Asia and Africa): Participate in coastal ecosystem management activities EC5. For Members with wetlands: Support the development of a Global Wetlands Observation System by contributing to pilot projects in Africa, Latin America and South-East Asia
	EC-e Increased knowledge of environmental flow requirements of river baseflow and peak flow, as well as human requirements for irrigation and power plant cooling water and domestic usage.	Y	Collaboration with the Water Task has been modest. Few participants in EC-01 work on rivers.	EC2. Provide technical and financial support for in-water observations in synergy with related satellite observations (e.g. through the ChloroGIN network) EC3. For Members with coastal zones (e.g. Southern Asia and Africa): Participate in coastal ecosystem management activities EC5. For Members with wetlands: Support the development of a Global Wetlands Observation System by contributing to pilot projects in Africa, Latin America and South-East Asia EC6. For Members with mountainous regions: Contribute to the development of the Global Network for Observation and information in Mountain Environments (GEO-GNOME) through pilot projects in mountain areas of the world

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Energy	EN-a Significant increase in use of Earth observations by all sectors for improved: <ul style="list-style-type: none"> <li>o Environmental, economic and societal impact assessments of energy exploration, extraction, conversion, transportation and consumption.</li> </ul>	G	The launch of the Global Atlas for solar and wind energy (beginning of 2013) has greatly improved the use of the data sets available through this atlas. The set of activities from International Renewable Energy Agency (IRENA) are all working contributing to this. Mineral resources are also explored.	EN1. Provide data and technical/financial support for the expansion of the Global Renewable Energy Atlas from Solar and Wind Energy to Marine, Geothermal, Bioenergy and Hydropower EN2. For Members and Organizations active in renewable energy (e.g. China, Denmark, EC, Germany, South Africa, Spain, Japan, UK and USA): <ul style="list-style-type: none"> <li>o Disseminate information about GEO energy tools and products</li> <li>o Support the development of new methodologies, tools and products for the mapping of renewable energy potential and impact assessment of energy exploitation</li> </ul> EN3. For Members and Organizations with sustainable mining as a priority (e.g. Australia, Brazil, Canada, South Africa, and USA): <ul style="list-style-type: none"> <li>o Participate in the working group on "mining and environment" to help evaluate and mitigate the long-term impact of extensive coal mining on local soil, vegetation, water, and biodiversity</li> <li>o Support the organization of three workshops per year (in Americas, Europe-Africa and Asia-Pacific regions). The working group currently includes representatives from China, France, Greece, India, Turkey and the UK</li> </ul> EN4. Improve the dissemination of results for the different types of energies by developing services and providing easy access to all stakeholders EN5. Improve links and partnerships with the private sector
	EN-b Significant increase in use of Earth observations by all sectors for improved: <ul style="list-style-type: none"> <li>o Prediction of potential hazards to the energy infrastructure.</li> </ul>	G	Transmission and Distribution Operator (TSO and DSO) are already using weather predictions for surveying the potential hazards' impacts	EN2. For Members and Organizations active in renewable energy (e.g. China, Denmark, EC, Germany, South Africa, Spain, Japan, UK and USA): <ul style="list-style-type: none"> <li>o Disseminate information about GEO energy tools and products</li> <li>o Support the development of new methodologies, tools and products for the mapping of renewable energy potential and impact assessment of energy exploitation</li> </ul> EN3. For Members and Organizations with sustainable mining as a priority (e.g. Australia, Brazil, Canada, South Africa, and USA): <ul style="list-style-type: none"> <li>o Participate in the working group on "mining and environment" to help evaluate and mitigate the long-term impact of extensive coal mining on local soil, vegetation, water, and biodiversity</li> <li>o Support the organization of three workshops per year (in Americas, Europe-Africa and Asia-Pacific regions). The working group currently includes representatives from China, France, Greece, India, Turkey and the UK</li> </ul>
	EN-c Significant increase in use of Earth observations by all sectors for improved: <ul style="list-style-type: none"> <li>o Prediction of the production of intermittent sources of energy.</li> </ul>	G	Cost-WIRE (COST-Weather Intelligence for Renewable Energies) project is working to improve the existing prediction of intermittent sources of energy. TSO and DSO have also their own tools for that.	EN2. For Members and Organizations active in renewable energy (e.g. China, Denmark, EC, Germany, South Africa, Spain, Japan, UK and USA): <ul style="list-style-type: none"> <li>o Disseminate information about GEO energy tools and products</li> <li>o Support the development of new methodologies, tools and products for the mapping of renewable energy potential and impact assessment of energy exploitation</li> </ul> EN3. For Members and Organizations with sustainable mining as a priority (e.g. Australia, Brazil, Canada, South Africa, and USA): <ul style="list-style-type: none"> <li>o Participate in the working group on "mining and environment" to help evaluate and mitigate the long-term impact of extensive coal mining on local soil, vegetation, water, and biodiversity</li> <li>o Support the organization of three workshops per year (in Americas, Europe-Africa and Asia-Pacific regions). The working group currently includes representatives from China, France, Greece, India, Turkey and the UK</li> </ul>
	EN-d Significant increase in use of Earth observations by all sectors for improved: <ul style="list-style-type: none"> <li>o Mapping of renewable energy potential.</li> </ul>	G	The launch of the Global Atlas for solar and wind energy (beginning of 2013) has greatly improved the use of the data sets available through this atlas. The set of activities from IRENA are all working contributing to this. WA is in the process of providing a map to EN on Hydropower capacity	EN1. Provide data and technical/financial support for the expansion of the Global Renewable Energy Atlas from Solar and Wind Energy to Marine, Geothermal, Bioenergy and Hydropower; EN4. Improve the dissemination of results for the different types of energies by developing services and providing easy access to all stakeholders EN5. Improve links and partnerships with the private sector

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Health	HE-a Access to improved environmental information and tools to support the global community of human health and environment experts.	G	The Spatial Data Infrastructure (SDI) for the Global Mercury Observation System was implemented and a test-bed was done against the OGC Web Testing Facility, which fully passed. Data have been archived and metadata associated. The SDI was registered in GEOSS. The first phase of the Global Monitoring Plan (GMP) for POPs (Persistent Organic Pollutants) was successfully implemented and transferred into the GMP information system (www.pops-gmp-org). The GMP information is registered in GEOSS.	HE1. Expand national and/or international participation in GEO health-related activities HE2. Provide national health data related to atmospheric levels of Persistent Organic Pollutants and mercury, as well as human exposure data, in a standardised format; especially for developing countries. Support the establishment and expansion of related observing networks and databases HE3. Support in-country capacity building for the sustainable use of Earth information in health decision-making  Complete metadata, archive new data including those on human organs, tissues and cells coming from international participants/projects. Register the resource in GEOSS. A full access to data should be enabled in the next step.
	HE-b Increased use of environmental information and tools to support decision making in epidemics and/or disease management and planning for well-being. The effectiveness of these tools is demonstrated in at least 3 specific areas on different continents.	Y	Most of the planned targets have been delivered and therefore likely to be achieved. Early decision making for malaria, dengue and Rift Valley Fever in India, France, Senegal and Dakar using climate and satellite data. The use of information is related to the adoption of the Governance and Data Policy document. The Data Policy document is under its final review. Tools to view and download data are provided to end-users. No demonstration has been launched. For the purpose of the second phase of the GMP of POPs, electronic data collection software was developed and given to the parties of the Stockholm Convention in order to standardize the data formats. It will be used in all UN regions. Strategic target in health and environment has limited funding restricting it to limited geographic area and health issues.	HE1. Expand national and/or international participation in GEO health-related activities HE3. Support in-country capacity building for the sustainable use of Earth information in health decision-making  Several activities under water borne diseases including building and operationalizing cholera early warning system need funding support. Demonstrate the effectiveness of implemented tools in at least 3 specific areas on different continents. Promote application of the GMP data collection tool for collection of POPs data for the purpose of the second phase of GMP in 2014 in all UN regions.
	HE-c Applying Outcomes from other Societal Benefit Areas to improve health and well-being.	Y	The task to map climate-related vulnerability of water and sanitation access and diarrheal disease is completed and was a core contribution to the WHO/WMO Global Atlas on Climate and Health. The Global Leptospirosis Environmental Action Network is operational and on track. International summer schools are being organized to support a capacity building for the GMP for POPs. Strategic target in health and environment has limited funding restricting it to limited geographic area and health issues.	HE1. Expand national and/or international participation in GEO health-related activities HE3. Support in-country capacity building for the sustainable use of Earth information in health decision-making  Develop project databases of existing global air monitoring and human exposure monitoring programmes and link them to the GMP tool. Link human exposure data available in the GMP database to the WHO food and agriculture databases. Support the implementation of the task's activities in wider geographic area.

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Water	WA-a An operationalized and sustained global network of in-situ observation sites.	Y	The global networks for most water-cycle variables have had a net reduction rather than a net growth in the past 5 years. The progress of the related IN-01 activities is considered satisfactory and progress has been made to the achievement of this Outcome. The in-situ soil moisture data archive continues to expand and experience is being gained in using these data for calibration of the SMOS data sets. Developing consistent in-situ data sets is very labour intensive and the availability of resources has been controlling the rate of progress.	WA1. WMO in the framework of GEO should launch an initiative to strengthen the global in-situ observational networks for stream flow and groundwater data, and improved dissemination of these basic data WA2. To improve coverage over data-poor regions, GEO Members from Africa, Asia, and South America should review the status of their in-country soil moisture monitoring and provide data and contacts for the soil moisture data archive
	WA-b Increased availability of information products and services for monitoring changes in the water cycle, including clouds and precipitation, appropriate for both research and integrated water resource management.	G	Drought activities at individual institutions have progressed well but coordination of these efforts has been constrained by a lack of funding	WA3. Although advances have been made, there are many needs and opportunities identified in the GEOSS Water Strategy related to data and information service activities that need to be contributed or funded. GEO Members and Participating Organizations are encouraged to address these challenges
	WA-c Increased availability of data and information, including quantity and quality of both surface and groundwater, to support a water cycle decision making system.	G	The German government has taken on the responsibility of maintaining the GEMS water data archive. Although there is no common reporting platform for Persistent Organic Pollutants in surface waters, the Global Monitoring Plan database and visualization portal can be used for these purposes.	WA1. WMO in the framework of GEO should launch an initiative to strengthen the global in-situ observational networks for stream flow and groundwater data, and improved dissemination of these basic data WA2. To improve coverage over data-poor regions, GEO Members from Africa, Asia, and South America should review the status of their in-country soil moisture monitoring and provide data and contacts for the soil moisture data archive WA3. Although advances have been made, there are many needs and opportunities identified in the GEOSS Water Strategy related to data and information service activities that need to be contributed or funded. GEO Members and Participating Organizations are encouraged to address these challenges WA4. GEO should develop a plan for fully supporting an integrated monitoring programme for the Sustainable Development Goals
	WA-d Routine, reliable production of "watershed" and human health indicators from satellite data, surface and subsurface data, and data assimilation capabilities.	Y	Several indicators of watershed and human health have been developed by Conservation International.	Develop a project to identify how to use water information along with other Earth information to produce indicators that will be useful for independently assessing how well Sustainable Development Goals are being met
	WA-e Development of integrated data products	G	Integrated data products are now being vigorously pursued in most areas including subsurface flows through a recently funded EC project. The GEOSS Water Strategy identified a number of variables including ET as an Essential Water Variable.	The needs and opportunities identified in the GEOSS Water Strategy are being reviewed and a number of actions have been identified
	WA-f Regional data systems and information systems in developing countries	G	Regional developments of the Water Cycle Integrator information system are proceeding well in Asia and Africa and a new SERVIR node is being planned for Asia. There is a need for further activity and a strategy in Latin and Caribbean areas.	WA3. Although advances have been made, there are many needs and opportunities identified in the GEOSS Water Strategy related to data and information service activities that need to be contributed or funded. GEO Members and Participating Organizations are encouraged to address these challenges

Strategic Target	Strategic Target Outcome ("Demonstrated by" bullet)	"Outcome" color	Analysis	Recommended Actions (as described under the Pyramid Diagrams; see previous pages)
Weather	WE-a Identification and addressing of critical gaps in observational networks that reflect, in particular, the needs of developing countries, the need for continuity in space-based and in-situ observations, and the potential benefits of an interactive observing system to support user needs.	Y	Progress towards this Outcome is considered satisfactory (through WMO leadership and work under IN-01). However coordination and efforts to address the needs of developing countries are still needed	WE1. Support the enhancement and maintenance of the TIGGE (THORPEX Interactive Global Grand Ensemble) and TIGGE LAM archives - user-friendly databases of global and regional ensemble weather forecasts, tools and products; WE2. Identify resources for the post-2014 era (completion of the THORPEX programme and Europe-funded GEOWOW project) to support the new "Polar Prediction", "High Impact Weather" and "Sub-seasonal to Seasonal" projects of the WMO World Weather Research Programme;
	WE-b Improvements in the range and quality of services for high impact weather forecasting due to the design, future development, and operation of global observing, data assimilation, numerical modelling, and user application techniques.	G	The GEOWOW project ended in Aug 2014. The Weather module was about carrying out research in the development of ensemble weather forecast products and then testing and trialing these within the framework of the WMO Severe Weather Forecast Demonstration Projects (SWFDPs). Prototype products were developed.  The GEOWOW project provided some much needed resources to carry this out.	WE1. Support the enhancement and maintenance of the TIGGE (THORPEX Interactive Global Grand Ensemble) and TIGGE LAM archives - user-friendly databases of global and regional ensemble weather forecasts, tools and products; WE2. Identify resources for the post-2014 era (completion of the THORPEX programme and Europe-funded GEOWOW project) to support the new "Polar Prediction", "High Impact Weather" and "Sub-seasonal to Seasonal" projects of the WMO World Weather Research Programme;
	WE-c More accurate, reliable and relevant weather analyses, forecasts, advisories and warnings of severe and other high impact hydrometeorological events enabled by enhanced observational capabilities.	G	The GEOWOW project ended in Aug 2014. The Weather module was about carrying out research in the development of ensemble weather forecast products and then testing and trialing these within the framework of the WMO Severe Weather Forecast Demonstration Projects (SWFDPs). Prototype products were developed.  The GEOWOW project provided some much needed resources to carry this out.	WE1. Support the enhancement and maintenance of the TIGGE (THORPEX Interactive Global Grand Ensemble) and TIGGE LAM archives - user-friendly databases of global and regional ensemble weather forecasts, tools and products; WE2. Identify resources for the post-2014 era (completion of the THORPEX programme and Europe-funded GEOWOW project) to support the new "Polar Prediction", "High Impact Weather" and "Sub-seasonal to Seasonal" projects of the WMO World Weather Research Programme;

## PART II

### **GEO 2012-2015 Work Plan Implementation Report**

#### **Task Assessment**

The present report describes how the implementation of the GEO 2012-2015 Work Plan has advanced since the GEO-X Plenary. It features key outputs and activities and provides a summary of the progress made in each cross-cutting and Societal Benefit Area (SBA) of GEOSS.

Consistent with the Work Plan structure, the report is organized around Tasks to underline key lines of implementation and support the monitoring & evaluation of GEOSS implementation. Moreover the report proposes an assessment (summary table) featuring: (i) An “Overview” of progress and policy linkages at the Task level (*left column*); (ii) “Highlights” of GEO Members’ and Participating Organizations’ achievements (*middle column*); and (iii) “Actions needed from GEO Members and Participating Organizations” (*right column*).

To help the reader more easily evaluate overall progress, the table has been color-coded. Readers interested in details of specific Tasks are referred to the [Task Component Sheets](#) and the [Task presentations](#) delivered during the 2014 GEO Work Plan Symposium (28-30 April, Geneva, Switzerland).

The 2014 GEO Work Plan Symposium (convening about 100 participants from 36 GEO Members and Participating Organizations) represented a key opportunity to highlight progress, exchange information, and foster coordination across the whole Work Plan. The main focus was on accelerating GEOSS implementation towards the 2015 Strategic Targets whilst preparing for the next GEO decade.



GEO 2012-2015 WORK PLAN		IMPLEMENTATION REPORT	SUMMARY TABLE
<b>G</b>	Green: Expected to be achieved. Some actions/intervention may be required		
<b>Y</b>	Yellow: At risk of not being achieved without additional actions/intervention (see bolded actions in particular)		
<b>R</b>	Red: Not expected to be achieved without significant actions/intervention (see bolded actions in particular)		
INFRASTRUCTURE			
<u>IN-01 Earth Observing Systems</u>			
Y	Overview	Highlights	Actions Needed from GEO Members and POs
	<p>The promotion and coordination of surface-based and space-based observing systems to provide long-term continuous observations of the Earth System are making progress. However, activities for the expansion and coordination of in-situ networks require additional support from GEO Members and Participating Organizations. Also more work is needed to identify and fill critical gaps in observational networks, in particular in developing countries.</p> <p><i>Evidence of Use/ Policy Linkages</i></p> <ul style="list-style-type: none"> <li>Reanalysis products (combining modeling, space and in-situ) support IPCC reports and provide critical climatology information</li> <li>ECV database is a key tool to evaluate progress of the Climate Monitoring Architecture and assess gaps in measurements</li> <li>In-Situ recommendations used in Copernicus regulation in Europe</li> </ul>	<ul style="list-style-type: none"> <li>In-situ needs for Copernicus services identified and “Recommended Solutions” for provision of in-situ data developed. Ongoing consultation between European and international in-situ providers on opening access</li> <li>Essential Climate Variable (ECV) database populated (213 data records from 11 agencies gradually expanded to include in-situ data; see www.ecv-inventory.com) – to assess gaps in climate architecture</li> <li>Monthly precipitation datasets covering over 100 years (1900-2010) – to enable climate change detection</li> <li>US Global Precipitation Mission (GPM) and European Sentinel-1A successfully launched on 27 Feb and 3 April resp.</li> <li>CBERS-4 launch scheduled for 2014; Set-up and upgrade of CBERS ground stations underway (Spain, Gabon, South Africa); Gabon antenna installation starting in Sept. 2014 along with high-speed fiber optic network</li> <li>Action plan underway for realization of the GGOS-2020 International Terrestrial Reference Frame; 36 sites involved in GGOS network evolution</li> <li>Work underway to protect the radio frequency band used by Sentinel satellites (5.4 GHz; issue raised at GEO-X); WMO Preliminary Position Paper for 15<sup>th</sup> World Radiocommunication Conference (WRC-15) updated</li> </ul>	<p><i>Additional Resources and/or Contributions</i></p> <ul style="list-style-type: none"> <li><b>Contribute to the development of a global framework for in-situ management building upon the Copernicus in-situ coordination (GISC) initiative</b></li> <li>Support the expansion of the International Terrestrial Reference Frame (ITRF) through education and partnership development (e.g. in Africa)</li> <li>Support the protection of the 5.4 GHz band used by Sentinel satellites from potential frequency allocation to Radio Local Area Networks (RLANs)</li> <li>Support the protection of other Earth observation frequency bands that are of common GEO/WMO concern or interest</li> </ul>
<u>IN-02 Earth Data Sets</u>			
Y	Overview	Highlights	Actions Needed from GEO Members and POs
	<p>Life-cycle data management (e.g. processing, validation, quality control, modelling, visualization) is progressing on a number of fronts. GEOSS Data Management Principles are being developed and global/regional datasets are getting more diverse and reliable. However, there is a need for GEO Members and Participating Organizations to contribute more data management activities to ensure synergies, improve coordination and optimize the use of resources.</p> <p><i>Evidence of Use/ Policy Linkages</i></p> <ul style="list-style-type: none"> <li>Global mineral mapping from ASTER imagery</li> <li>Applications based on land terrain</li> <li>Disaster risk reduction</li> </ul>	<ul style="list-style-type: none"> <li>GEOSS Data Management Principles underway (Task Force created and operational); Draft Principles to be submitted to GEO-XI in Gabon</li> <li>High-resolution (5m) global Digital Elevation Model (DEM) 3D-map under development. Lower-resolution free-of-charge version (30m) in preparation</li> <li>Higher-resolution (30m) global elevation data released for Africa (SRTM)</li> <li>Numerous global datasets under development, including OneGeology and Global Human Settlement and Roadmap</li> <li>New version of Global Map (1km-500m resolution) released - providing basic geospatial information through international cooperation among National Mapping Organizations</li> <li>First-ever continental maps of Earth surface mineralogy released. Maps for Australia registered in the GEOSS Common Infrastructure. Further work initiated for parts of South America and China</li> <li>Global soil information system in progress; collaboration with European Marine Observation and Data Network (EMODNET) to enhance access to European seas’ data</li> <li>Earth System Spatial Grid (ESSG) developed to support GEOSS data cloud management, sharing and access, integrated analysis and applications</li> </ul>	<p><i>Additional Resources and/or Contributions</i></p> <ul style="list-style-type: none"> <li><b>Contribute socio-economic data (e.g. population maps) to the GEOSS DataCORE</b></li> <li><b>Expand national/international contributions related to data management</b> (including processing, inter-calibration and validation, quality assurance, harmonization, archiving, integration, assimilation, modelling, long-term preservation, digitization, and visualization)</li> <li>Further linkages with the UN Global Geospatial Information Management (GGIM) initiative</li> </ul>

<b><u>IN-03 GEOSS Common Infrastructure (GCI)</u></b>			
	<b>Overview</b>	<b>Highlights</b>	<b>Actions Needed from GEO Members and POs</b>
<b>G</b>	<p>Work is ongoing to support the sustained operation, maintenance and enhancement of the GEOSS Common Infrastructure (GCI) – including GEOSS Portal and Broker. Emphasis is given to the usability of the Portal and to data access (in particular Data-CORE). Support and funding mainly come from GCI component providers and international projects such as GEOWOW and Architecture Implementation Pilots (AIPs)</p> <p><i>Evidence of Use/ Policy Linkages</i></p> <ul style="list-style-type: none"> <li>Large data catalogs configured to enable direct download of individual files/images</li> <li>Providers make extensive use of the GEOSS Portal (incl. South Africa (SAEON), Brazil (INPE), CEOS, EEA, UNEP, WMO (WIS))</li> </ul>	<ul style="list-style-type: none"> <li>New version of GEOSS Web Portal launched and presented during GEO-X Plenary (usability improved based on extensive user input)</li> <li>Improvement of GCI components continuous and planned for release by GEO-XI Plenary</li> <li>Number of resources discoverable via the GEOSS Common Infrastructure (GCI) around 71 million, and growing</li> <li>DataCORE pledges gradually registered and made accessible</li> <li>Search results from the GEOSS Portal now providing description of resources, links to resources (e.g. Web pages providing access)</li> <li>GEOSS Community Portals Guidelines being established</li> <li>Analysis of interoperability between WMO WIS and GEOSS Common Infrastructure in progress - to allow for a two-way discovery of resources</li> <li>Refined GEOSS resources registration process developed through the Component and Service Registry (CSR) and Discovery and Access Broker (DAB)</li> </ul>	<p><i>Additional Resources and/or Contributions</i></p> <ul style="list-style-type: none"> <li>Encourage providers to make datasets discoverable and accessible through standard interfaces, and flag them wherever possible as GEOSS Data-CORE</li> </ul> <p><i>User Engagement / Outreach</i></p> <ul style="list-style-type: none"> <li>Encourage GEO communities (e.g. data providers, scientists, decision makers) to: <ul style="list-style-type: none"> <li>Identify requirements and needs for the GCI</li> <li>Organize GCI testing and provide feedback to developers</li> <li>Showcase the benefits of making data available through the GCI</li> </ul> </li> </ul>
<b><u>IN-04 GEOSS Communication Networks</u></b>			
	<b>Overview</b>	<b>Highlights</b>	<b>Actions Needed from GEO Members and POs</b>
<b>G</b>	<p>The collection and distribution of Earth data is making progress in most Societal Benefit Areas: Collection through the launch of several projects aimed at encouraging citizens to contribute data and distribution through GEONETCast latest developments (and recent progress from the GEOSS Portal).</p> <p><i>Evidence of Use/ Policy Linkages</i></p> <ul style="list-style-type: none"> <li>UV index, fire detection maps produced by Brazil (INPE) with GEONETCast data</li> <li>GEONETCast data applied to crop production and forest modeling (EU Agricab project)</li> </ul>	<ul style="list-style-type: none"> <li>Several EU projects underway to accelerate the integration of citizen-sensing in GEOSS encourage citizens to collect and contribute data e.g. COBWEB: Citizen Observatory Web; CitiSense: Air Quality Management; CitiCrops: Monitoring water colour; WeSenseIt: Water Monitoring, flood prediction</li> <li>Search capability for GEOSS data on GEONETCast channels under development; Connectivity with GEOSS broker in progress</li> <li>GEONETCast approved for operational use by the International Charter 'Space and Major Disasters'. GEONETCast can be chosen as an alternative delivery mechanism for the reception of high-volume, high-resolution satellite data and value-added products to support disaster mitigation</li> <li>User Fora organized in Americas and Africa to improve GEONETCast services</li> <li>Preparation for routine Landsat broadcast to African countries underway; Support for projects in Africa ongoing (e.g. AMESD, MESA, AGRICAB, and EAMNET)</li> <li>Contact established with Global Forest Observation Initiative (GFOI) and GEOGLAM</li> </ul>	<p><i>Additional Resources and/or Contributions</i></p> <ul style="list-style-type: none"> <li>Provide resources to fund installations for GEONETCast receiving stations</li> <li>Expand national/international contributions to citizen-sensing and mobile access to data</li> </ul> <p><i>Technical</i></p> <ul style="list-style-type: none"> <li>Enhance the integration of the satellite data distribution system 'MeteoInform-Mitra' into GEONETCast</li> <li>Continue development of coverage over the Pacific Islands region</li> </ul> <p><i>Capacity Development / User Engagement</i></p> <ul style="list-style-type: none"> <li>Make GEONETCast part of end-to-end projects design, especially if projects (i) take place in or target a developing country; (ii) intend to build long-term capacity; and (iii) plan to deliver data operationally to a wide user community</li> </ul>
<b><u>IN-05 GEOSS Design and Interoperability</u></b>			
	<b>Overview</b>	<b>Highlights</b>	<b>Actions Needed from GEO Members and POs</b>
<b>G</b>	<p>Activities to improve interoperability within GEOSS are underway. Key contributions include the Architecture &amp; Implementation Pilots (AIP) and Standards &amp; Interoperability Forum (SIF). Active participation from the community is needed</p> <p><i>Evidence of Use/ Policy Linkages</i></p> <ul style="list-style-type: none"> <li>Global exchange of in-situ water observations using WaterML (with WMO Hydro)</li> <li>Demonstration for West African States of Global Atlas for Solar and Wind Energy</li> <li>Flood crop loss assessment based on remote sensing</li> <li>Global drought monitoring based on vegetation indices</li> </ul>	<ul style="list-style-type: none"> <li>New Architecture Implementation Pilot (AIP-7) launched to (i) increase use of GEOSS resources by end-users; and (ii) focus on benefits and usability for developing countries</li> <li>"Apps" under development; they should be easy-to-use &amp; interactive, and address specific user problems in quasi-real-time</li> <li>Guidance paper on Community Portals in progress to promote community contributions to GEOSS and enable integration of specialized community services (e.g. helper applications, data processing, sensor webs, model webs)</li> <li>Tutorials for GEOSS users/providers released (help in understanding how to publish, register, discover, access, and use GEOSS resources)</li> </ul>	<ul style="list-style-type: none"> <li>Participate in the Architecture Implementation Pilot (AIP, <a href="http://ogcnetwork.net/AIP">ogcnetwork.net/AIP</a>)</li> </ul>

<b>INSTITUTIONS &amp; DEVELOPMENT</b>		
<b>ID-01 Advancing GEOSS Data Sharing Principles</b>		
<b>Overview</b>	<b>Highlights</b>	<b>Actions Needed from GEO Members and POs</b>
<p>Overall, the implementation of the GEOSS Data Sharing Action Plan is making progress. The Data Sharing Working Group (DSWG) has developed an activity plan for 2014-2015 to ensure that all Actions are addressed. Additional resources are needed to ensure adequate levels of (i) participation by developing countries in Working Group activities; and (ii) outreach to data users and providers, especially in developing countries</p> <p><i>Evidence of Use/ Policy Linkages</i></p> <ul style="list-style-type: none"> <li>• Open data announcements made by GEO Members and Participating Organizations during GEO-X and Geneva Ministerial Summit (e.g. by EC, France, Japan, Sweden, CEOS, ECMWF)</li> </ul>	<ul style="list-style-type: none"> <li>• Revision of GEOSS Data Sharing Principles underway – to be submitted to GEO-XI Plenary</li> <li>• Post-2015 Data Sharing Strategies prepared for consideration by Group working on next 10-year Implementation Plan</li> <li>• Over 51 million resources with full and open access; all easily discoverable through the new GEOSS Portal (thanks to a DataCORE icon). A ranking mechanism makes DataCORE data top of the list</li> <li>• More than 40 organizations, initiatives and projects contacted to consolidate and expand the GEOSS Data-CORE. Ongoing coordination with Architecture Implementation Pilot (AIP-7)</li> <li>• Survey in preparation to track use of DataCORE data</li> <li>• New guidelines document prepared for GEOSS data providers: "How to place tags in the Metadata for GEOSS Data-CORE"</li> <li>• Broad representation from more than 30 GEO Members and Participating Organizations on Data Sharing Working Group</li> </ul>	<ul style="list-style-type: none"> <li>• Work with the Data Sharing Working Group and the GEO Secretariat to make all resources currently pledged to the GEOSS Data-CORE discoverable in GEOSS with improved metadata, documentation, and quality information</li> <li>• Establish national coordinating mechanisms to promote and monitor engagement with the implementation of the GEOSS Data Sharing Principles and provide feedback to GEO</li> </ul> <p><i>Additional Resources/ Contributions</i></p> <ul style="list-style-type: none"> <li>• <b>Pledge further data to Data-CORE i.e. datasets with full and open access and preferably resolution and coverage that meet user needs</b></li> <li>• <b>Engage with socio-economic information producers (e.g. OECD, UN, national statistics agencies)</b></li> <li>• <b>Encourage additional contributions to the Data Sharing Working Group activities, in particular from developing countries</b></li> <li>• <b>Ensure adequate representation from the Middle East, South America, and Asia-Pacific regions</b></li> </ul> <p><i>Capacity Development/ Outreach</i></p> <ul style="list-style-type: none"> <li>• Raise awareness of the GEOSS Data-CORE nationally/regionally</li> <li>• Identify successful data sharing approaches to promote the benefits of full and open access and sensitize data providers</li> </ul>
<b>ID-02 Developing Institutional and Individual Capacity</b>		
<b>Overview</b>	<b>Highlights</b>	<b>Actions Needed from GEO Members and POs</b>
<p>Coordination of capacity-building activities across the globe and disciplines is improving – thanks to dedicated projects. Strong support from GEO Members and Participating Organizations is required to identify and eventually build on ongoing efforts</p> <p><i>Evidence of Use/ Policy Linkages</i></p> <ul style="list-style-type: none"> <li>• US National Strategy for Civil Earth Observations</li> <li>• Belgian Earth Observation Platform</li> <li>• South Africa Earth Observation Strategy</li> </ul>	<ul style="list-style-type: none"> <li>• New GEOCAB (Global Earth Observation Capacity Building) Portal about to be launched (<a href="http://geonetcab.mdweb-project.org/">http://geonetcab.mdweb-project.org/</a>) – to better coordinate existing capacity building efforts and inform future planning</li> <li>• Improvement of coordination among capacity-building networks through the GEOSS portal; numerous items registered, e.g. GEONETCast Toolbox; INPE Data Catalog</li> <li>• Increased availability of tools and training opportunities focusing on Societal Benefit Areas (e.g. EnviroGRIDS, <a href="http://portal.envirogrids.net">http://portal.envirogrids.net</a>)</li> <li>• Access to data and information improved e.g. through AfroMaison Broker (portal enabling geospatial data discovery in Africa); CIMHET (virtual centres for severe weather prediction in South America); SANS A EODC (catalogue linked to South African EOS portal)</li> <li>• Capacity building underway in Tropical Forest Monitoring using TerraAmazon system</li> <li>• Launch of new versions of open source software (TerraLib, TerraView, SPRING, TerraAmazon, TerraMa2, and TerraHidro) for monitoring, analysis and alert; Update of related homepages, training material, tutorial and documentations in English, French, Portuguese, and Spanish</li> <li>• Numerous projects underway (e.g. EOPOWER, IASON, SIGMA, SERVIR) or recently completed (e.g. AgriCab, GEONetCab, DevCoCast, EnerGEO, SEOCA, OBSERVE and BalkanGEONET)</li> <li>• Strong support from CEOS Working Group on Capacity Building &amp; Data Democracy</li> <li>• African Sub-regional Monitoring System identified as potential contribution to GEOGLAM; Related datasets to be registered in GEOSS (Southern-Africa Sub-Regional Workshop, May 2014, Pretoria, South Africa)</li> <li>• AfriGEOSS Implementation Plan under preparation, scheduled for submission to GEO-XI in Gabon</li> </ul>	<ul style="list-style-type: none"> <li>• Contribute national capacity building activities to GEO</li> <li>• Provide capacity building material and information to populate the EOCAB Portal and CEOS Inventory</li> <li>• Establish connections with existing national/regional capacity development initiatives</li> <li>• Develop tutorials targeting both Societal Benefit Areas and the use of the GEOSS portal</li> </ul>

<b>ID-03 Science and Technology in GEOSS</b>		
<b>Overview</b>	<b>Highlights</b>	<b>Actions Needed from GEO Members and POs</b>
Y	<p>The engagement of Science and Technology (S&amp;T) communities in GEOSS is building momentum. However, raising GEO visibility remains a challenge. Only a handful of individuals are active and committed to realizing the deliverables of this Task</p> <p><i>Evidence of Use/ Policy Linkages</i></p> <ul style="list-style-type: none"> <li>• User Registration Registry populated by Communities of Practice and external users</li> <li>• Use of EGIDA methodology in research projects and outreach activities</li> <li>• GEOSS S&amp;T Meeting Portal: About 200 visits per day</li> <li>• GEOSS S&amp;T Stakeholder Workshops: Linkages with international agendas e.g. UN Sustainable Development Goals, Future Earth</li> </ul>	<ul style="list-style-type: none"> <li>• Concept of a GEOSS Information System and Knowledge Base under discussion</li> <li>• GEOSS S&amp;T Meeting Portal launched to provide information on GEO and GEOSS-related events at major science and technology meetings</li> <li>• 3<sup>rd</sup> GEOSS Science &amp; Technology Stakeholder Workshop in planning (1<sup>st</sup> quarter 2015) to address the role of GEO and Earth observations/information in achieving the Sustainable Development Goals</li> </ul> <p><i>Additional Resources / Contributions</i></p> <ul style="list-style-type: none"> <li>• Support the implementation of the GEO Science &amp; Technology Roadmap and encourage new contributions to Task activities e.g. from Asia and Africa</li> <li>• Establish links with national/regional activities on Future Earth and the broader Sustainable Development Goal (SDG) agenda</li> </ul>
<b>ID-04 Building a User-Driven GEOSS</b>		
<b>Overview</b>	<b>Highlights</b>	<b>Actions Needed from GEO Members and POs</b>
G	<p>The collection of user feedbacks on products, data access and delivery is becoming more efficient. However more work is needed to truly integrate user perspectives in GEOSS development and efficiently demonstrate added-value to decision-makers</p> <p><i>Evidence of Use/ Policy Linkages</i></p> <p>G-20 interest in GEO GLAM, UNCBD interest in GEO BON, multi-national interest in GFOI; all point to meeting user needs for GEOSS capability</p>	<p><i>User Engagement</i></p> <ul style="list-style-type: none"> <li>• Disseminate results of relevant GEOSS workshops</li> <li>• Highlight national/organizational user perspectives</li> <li>• Encourage national/regional user engagement sessions collocated with relevant conferences to capture contributions from developing countries and feedbacks on user needs</li> </ul>
<b>ID-05 Catalyzing Resources for GEOSS Implementation</b>		
<b>Overview</b>	<b>Highlights</b>	<b>Actions Needed from GEO Members and POs</b>
Y	<p>Progress on resource mobilization for GEOSS in the areas of capacity building (individual, institutional, infrastructure) and Research and Development (R&amp;D) is picking up. Activities mainly build on individual international projects (e.g. EOPOWER, IASON). Resource mobilization is a crucial deliverable of GEO that requires strong support from Members and Participating Organizations</p> <p><i>Evidence of Use/ Policy Linkages</i></p> <ul style="list-style-type: none"> <li>• Future Earth (10-year Research Programme)</li> <li>• Development agendas, e.g. UN Sustainable Development Goals (SDGs)</li> </ul>	<ul style="list-style-type: none"> <li>• Promotion and dissemination of Earth observations and information in regions (via EOPOWER, IASON and other projects)</li> <li>• Small task force established on “Mobilizing Resources for Water” (pilot); Webinar series organized on water-cycle monitoring</li> <li>• Increased cooperation with funding agencies; Advice on use of remote sensing provided to World Bank Water Partnership Program; Contribution made to Belmont Forum Collaborative Research Actions Workshop: e-Infrastructures and Data Management</li> <li>• Draft plan underway for a comparative study on international research funding</li> <li>• Ministerial showcase video “Cold Regions through a Modern Explorer’s Eyes” awarded</li> </ul> <p><i>Additional Resources / Contributions</i></p> <ul style="list-style-type: none"> <li>• <b>Build upon the European FP7 example to mobilize funds for GEOSS implementation</b></li> <li>• Facilitate communication with national funding agencies; help identify/engage relevant units and individuals</li> <li>• Establish high-level relationships with the Belmont Forum</li> <li>• Help increase cooperation with IGFA (International Group of Funding Agencies) and UNESCO</li> <li>• Encourage contributions from Asian and African countries to the comparative study on international research funding</li> </ul>

INFORMATION FOR SOCIETAL BENEFITS			
<u>SB-01 Oceans and Society: Blue Planet</u>			
Y	Overview	Highlights	Actions Needed from GEO Members and POs
Y	<p>The Blue Planet initiative is building momentum with new projects and activities developing. Coordination of observing, modeling, and disseminating systems is also growing through regular interactions among ocean communities. Support is strongly needed for ocean observing networks whose continuity is essential to the development of applications and key information for society</p> <p><i>Evidence of Use/ Policy Linkages</i></p> <ul style="list-style-type: none"> <li>• Ocean forecasting (GODAE Ocean View) applied for instance to naval operations, seasonal prediction, search &amp; rescue, oil spill response</li> <li>• ChloroGIN website usage doubled in 2013-2014 (e.g. over 7'000 pages downloaded in March 2014). ChloroGIN is an international network to assess the state of marine, coastal and inland-water ecosystems</li> <li>• EU, Canada and US Research Alliance on the Atlantic Ocean</li> </ul>	<ul style="list-style-type: none"> <li>• Mobile app under development – for identifying plankton and producing crowd-sourcing data on species distribution (proposal made to the Architecture Implementation Pilot; AIP-7)</li> <li>• EU, Canada and US Research Alliance under development to increase knowledge of the Atlantic Ocean. Blue Planet recognized as a viable platform on which international cooperation could be based</li> <li>• Blue Planet White Paper (<a href="http://www.oceansandsociety.org/files/whitepaper.pdf">http://www.oceansandsociety.org/files/whitepaper.pdf</a>), Book, and Website released (<a href="http://www.oceansandsociety.org">www.oceansandsociety.org</a>)</li> <li>• Collaboration with GEOBON (Task BI-01) underway for identification of Essential Ocean Variables for biology &amp; ecosystems</li> <li>• Collaboration with Coastal and Water Quality communities (Tasks WA-01 and HE-01) ongoing to address large-lake issues and implement a service pilot for coastal water quality monitoring</li> <li>• Efforts ongoing to disseminate information to under-served communities (with Task IN-04)</li> <li>• Periodic workshops held on societal applications in fisheries and aquaculture</li> <li>• Scholars trained and regional pilot projects initiated as part of POGO joint capacity building activities</li> <li>• Side Event held at GEO-X Plenary with high-level representation from the European Commission and Intergovernmental Oceanographic Commission (IOC)</li> <li>• Blue Planet Symposium in planning (May/June 2015 in Australia)</li> </ul>	<p><i>Additional Resources and/or Contributions</i></p> <ul style="list-style-type: none"> <li>• <b>Support POGO for the establishment of a Blue Planet Secretariat</b></li> <li>• <b>Consider (i) seconding personnel to facilitate coordination and/or (ii) funding required activities (e.g. ChloroGIN or SAFARI - Societal Applications in Fisheries &amp; Aquaculture using Remotely Sensed Imagery)</b></li> <li>• Support observing systems that are not funded or facing decline in support (e.g. tropical moored arrays)</li> <li>• Contribute ship time to service existing systems or instruments/sensors to complete/enhance existing systems (e.g. OceanSITES)</li> </ul>
<u>SB-02 Global Land Cover</u>			
G	Overview	Highlights	Actions Needed from GEO Members and POs
G	<p>Progress continues towards a suite of global land-cover datasets, based on improved and validated land-cover scenes. Major contributions relate to China, USA, GOCF-GOLD, ESA, and EC. More work is needed to efficiently coordinate activities and communicate related societal benefits</p> <p><i>Evidence of Use/ Policy Linkages</i></p> <ul style="list-style-type: none"> <li>• UN-REDD (Reducing Emissions from Deforestation and Forest Degradation)</li> </ul>	<ul style="list-style-type: none"> <li>• International network created where GEO members can express needs for land-cover products and contribute national/international land-cover efforts</li> <li>• Global land cover products delivered for 2000, 2005, 2010</li> <li>• Precise mapping (30m) of global open water released after validation for 2000 and 2010 Geo-wiki crowdsourcing tool and Cropland Capture game under constant development</li> <li>• Concept for a collaborative Global Land Cover Information Service System being explored</li> <li>• Independent validation database for global land cover products in preparation; Direct contribution to Biodiversity, Ecosystem, Agriculture, and Forest activities</li> <li>• Connection of major Global Land Cover websites/portals underway (China NGCC, GOCF-GOLD LC, EEA Eye on Earth) to facilitate data sharing and accuracy assessment of land-cover products</li> <li>• Working group on Land Cover for Africa created to lead the development of a 30m resolution map for Africa (contribution to AfriGEOSS initiative)</li> <li>• Training courses and regional network meetings held in China, Europe, and USA</li> </ul>	<p><i>Additional Resources and/or Contributions</i></p> <ul style="list-style-type: none"> <li>• Expand national/international participation in land cover activities</li> <li>• Organize workshops connecting producers, users, and application developers</li> </ul> <p><i>Technical</i></p> <ul style="list-style-type: none"> <li>• Support data processing and information extraction/classification activities</li> <li>• Conduct/support validation activities of global land cover products</li> <li>• Initiate capacity development activities; support South-South cooperation</li> </ul>

<b><u>SB-03 Global Forest Observation</u></b>			
	<b>Overview</b>	<b>Highlights</b>	<b>Actions Needed from GEO Members and POs</b>
<b>G</b>	<p>The Global Forest Observation Initiative (GFOI) continues to develop in support of emissions/removals national reporting to UNFCCC REDD+ process. GFOI activities have been organised under 4 elements: Space Data, Methods and Guidance, Capacity Building, and Research &amp; Development (R&amp;D)</p> <p><i>Evidence of Use/ Policy Linkages</i></p> <ul style="list-style-type: none"> <li>• GFOI data stored and processed through FAO Space Data Management System</li> <li>• Methods &amp; Guidance Document used by FAO, UN-REDD and World Bank</li> <li>• Data supply to GEO demonstrator countries increasing year-on-year</li> <li>• UN-REDD (Reducing Emissions from Deforestation and Forest Degradation)</li> <li>• UNFCCC</li> </ul>	<ul style="list-style-type: none"> <li>• Methods and Guidance Document for “estimating emissions/removals of greenhouse gases in forests” distributed and used since January; First trial in Ghana underway; Taken up by SilvaCarbon Program; Document underlies all GFOI activities: Space Data, R&amp;D, Capacity Building</li> <li>• Regional capacity building activities developing: 1<sup>st</sup> workshops planned for SE Asia (Jan 2014), Africa (June 2014), and S-America (2015); Close cooperation with FAO and UN-REDD+</li> <li>• Strategy to coordinate space data acquisition and meet GFOI needs developed and approved by CEOS (commits CEOS agencies and involves systematic and sustained wall-to-wall acquisitions of forested areas)</li> <li>• Activities in the GEO Forest Carbon Tracking National Demonstrators ongoing (e.g. data processing)</li> <li>• R&amp;D plans in preparation for addressing e.g. degradation, forest types, sensor interoperability, uncertainty and accuracy metrics, data-model integration; 1<sup>st</sup> R&amp;D Workshops held (June 2014, Woods Hole, USA; and Oct 2014, Wageningen, Netherlands)</li> <li>• Links established with UN-REDD and World Bank (Forest Carbon Partnership Facility) and REDD+ safeguards (agriculture, ecosystems, land use)</li> </ul>	<p><i>Additional Resources and/or Contributions</i></p> <ul style="list-style-type: none"> <li>• Plan contributions to GFOI implementation for the period 2014-2015, and to the GFOI Office</li> <li>• As a country, consider using the Methods &amp; Guidance Document for capacity development</li> <li>• Seek funding support for essential R&amp;D</li> <li>• Foster collaboration with relevant organisations e.g. UNFCCC, FAO, World Bank, IPCC</li> </ul> <p><i>Technical</i></p> <ul style="list-style-type: none"> <li>• Ensure continuity in space data and product development for the Forest Carbon Tracking National Demonstrator countries</li> </ul>
<b><u>SB-04 Global Urban Observation and Information</u></b>			
	<b>Overview</b>	<b>Highlights</b>	<b>Actions Needed from GEO Members and POs</b>
<b>G</b>	<p>Coordination of activities for urban monitoring, forecasting, and assessment is growing, with new projects and products contributed and connected to GEOSS. Impediments to further progress essentially relate to a lack of funding for coordination activities</p> <p><i>Evidence of Use/ Policy Linkages</i></p> <p>The World Bank (Sustainable Development Unit) is using the radiance VIIRS products to rate the success and longevity of electrification projects in India, Vietnam and Indonesia</p>	<ul style="list-style-type: none"> <li>• Global Urban Supersites Initiative underway to estimate urban extent and assess risks associated with natural disasters, air/water qualities, and health hazards; 8 megacities selected (Los Angeles, Atlanta, Mexico City, Athens, Istanbul, Sao Paulo, Beijing, Hong Kong); Website incl. data repository launched (<a href="http://www.indstate.edu/cuec/UrbanSupersites/home.html">www.indstate.edu/cuec/UrbanSupersites/home.html</a>)</li> <li>• Temporal variations of light detections used to assess electric-power grid performance; Global radiance VIIRS images released (nightly, monthly, annual; see <a href="http://ngdc.noaa.gov/eog/viirs.html">ngdc.noaa.gov/eog/viirs.html</a>)</li> <li>• Global Urban Area Map (AGURAM) in preparation; 3734 cities of more than 0.1 million people mapped using ASTER (15m)</li> <li>• Time-series analysis (1975-2010) produced, describing the spatio-temporal development of 26 mega-cities; Global Urban Footprint derived from SAR data of the TanDEM-X mission (50 m)</li> <li>• Maps of global urban extent under development using ENVISAT or Sentinel-1 SAR data (30m)</li> <li>• Fine-scale human-settlement map of Europe for 2012 in preparation (from 2.5m resolution Spot data); Set up of the Global Human Settlement Layer (GHSL) database underway</li> <li>• USGS National Land Cover Database (NLCD) 2011 products released, incl. impervious surface changes between 2001-2006, and 2006-2011</li> <li>• Proposal for a Global Urban Remote Sensing Laboratory (GURSLab) under review (tool for on-line processing, visualizing, and sharing of urban data)</li> <li>• Textbook on “Global Urban Monitoring and Assessment through Earth Observation” published; <a href="http://www.crcpress.com/product/isbn/9781466564497">www.crcpress.com/product/isbn/9781466564497</a></li> <li>• Workshop held on Global Urban Observation and Monitoring from Space, Athens, Greece, March 31-April 1, 2014; 3<sup>rd</sup> Urban Task Symposium organized in conjunction with EORSA 2014, Changsha, China, June 11-14, 2014; 1st Global Human Settlement Workshop in preparation, Ispra, Italy, October 21-23, 2014</li> </ul>	<p><i>Additional Resources and/or Contributions</i></p> <ul style="list-style-type: none"> <li>• Connect national/international urban activities to Task SB-04</li> <li>• Dedicate national/regional funds to urban product generation, and technological development (imagery mining, data fusion, interpretation)</li> <li>• Identify/initiate international project calls and funding options for joint GEO urban activities</li> <li>• Support the organization of a GEO Urban Task Workshops</li> <li>• Help develop ties with users/stakeholders such as the World Bank, UN Habitat</li> </ul>

<b><u>SB-05 Impact Assessment of Human Activities</u></b>			
	<b>Overview</b>	<b>Highlights</b>	<b>Actions Needed from GEO Members and POs</b>
<b>Y</b>	<p>Good progress is underway on the development of tools/services for impact monitoring and prediction in the energy and mining sectors. However, new contributions are needed to sustain GEO impact activities. Also mutually-beneficial relationships need to be developed with the private sector</p> <p><i>Evidence of Use/ Policy Linkages</i></p> <ul style="list-style-type: none"> <li>European Innovation Partnership (EIP) on Raw Materials</li> <li>Flagship initiative "Resource Efficient Europe"</li> <li>Africa Mining Vision 2050</li> </ul>	<ul style="list-style-type: none"> <li>Decision-support tool delivered on energy policy (the EnerGEO portal enables planners and governments to forecast and monitor the environmental impact of changes in the energy mix); It was registered in the GEOSS Common Infrastructure and successfully tested regarding cataloguing web services for wind, solar applications and integrated assessments (<a href="http://energeo.researchstudio.at/energeo/catalog/main/home.page">http://energeo.researchstudio.at/energeo/catalog/main/home.page</a>)</li> <li>New Platform of Integrated Assessment (PIA) delivered (aims at assessing environmental and health impacts over the next 50 years; viewer.webservice-energy.org/energeo_pia/index.htm)</li> <li>Pilots underway to (i) link ozone and mercury emissions from fossil fuels to atmospheric levels of air pollutants; and (ii) monitor water turbidity and mercury content in French Guyana (Spot imagery) for illegal mining tracking</li> <li>Integrated products developed to monitor environmental/societal footprint of mining activities (3 demonstration sites: Czech Republic (lignite open pit), South Africa (coal fields) and Kyrgyzstan (gold mine))</li> <li>Stakeholder workshops organized: (i) At mining-site level with mining company, regulators and civil society; (ii) At institutional level with representatives from extractive industry (Euromines, ETP-SMR), European Commission (ENV, RTD, ENTR), EEA, NGOs</li> <li>e-training facilities for impact monitoring of mineral resource exploitation under development (ImpactMin project)</li> <li>Working group on coal and environment under development as part of the Energy Community of Practice</li> </ul>	<p><i>Additional Resources and/or Contributions</i></p> <ul style="list-style-type: none"> <li><b>Contribute new impact activities – all major projects came to an end in 2013</b> (e.g. EnerGEO, EO-Miners, ImpactMin)</li> <li>Provide incentives to industry and associations (e.g. EuroMines) to better engage in GEO activities and share data on the impact of their activities (e.g. socio-economic data)</li> </ul> <p><i>Technical</i></p> <ul style="list-style-type: none"> <li>Develop space-borne hyperspectral sensors that enable assessments of mining contaminants and effluent releases at global/regional scale</li> <li>Explore the potential of Unmanned Aerial Vehicles (UAVs) and citizen-sensing for in-situ data collection</li> </ul> <p><i>User Engagement /Outreach</i></p> <ul style="list-style-type: none"> <li>Promote Earth observation-based integrated tools in user-oriented conferences/ events</li> </ul>
<b><u>AG-01 Global Agricultural Monitoring and Early Warning System</u></b>			
	<b>Overview</b>	<b>Highlights</b>	<b>Actions Needed from GEO Members and Pos</b>
<b>G</b>	<p>Global capabilities in crop monitoring, food-supply prediction and agriculture risk-assessment are increasing significantly. Progress mainly relates to two international initiatives: GEOGLAM and GEO-JECAM. Whereas overall progress is encouraging, initiatives still require strong support from GEO Members and Participating Organizations</p> <p><i>Evidence of Use/ Policy Linkages</i></p> <p>G20 – In 2011, Ministers of Agriculture decided to create GEOGLAM to reduce crop price volatility</p>	<ul style="list-style-type: none"> <li>New tool developed (GEOGLAM Crop Monitor Assessment Interface) – to enable comparison of national data (global, regional and national), by crop type and accounting for crop calendars</li> <li>International monitoring projects making progress on countries at risk: (i) FAO GIEWS (Global Information &amp; Early Warning System); (ii) US FEWSNET (Famine Early Warning System); (iii) EC MARS Food Security Bulletins; and (iv) China CropWatch Drought &amp; Food security activities</li> <li>Global crop assessments delivered for N- and S-Hemisphere (wheat, maize, soybeans and rice crops); Consensus of about 30 main producers; Contribution to AMIS (G-20 Agricultural Market Information System) Monthly Operational Report</li> <li>2 new projects launched: ESA-funded Sentinel-2 for Agriculture, and Gates Foundation-funded STARS (remote sensing applied to small holders in Africa and Asia)</li> <li>Second version of Global Cropland Map (wiki-based) in preparation</li> <li>JECAM (Joint Experiment on Crop Assessment and Monitoring) expanded to South Africa, Russia and Ukraine (about 40 sites in total spanning 5 continents); provides the science foundation of GEOGLAM; 2014 JECAM Science Workshop held (Ottawa, Canada, 21-23 July 2014)</li> <li>Continued exchange with CEOS (GEOGLAM Adhoc Group) to ensure that data needs are met (for more rapid access to SAR data and data exchange between JECAM partners)</li> <li>National projects for capacity development ongoing (in Argentina, Pakistan, Ukraine, and South Africa)</li> </ul>	<p><i>Additional Resources and/or Contributions</i></p> <ul style="list-style-type: none"> <li>Expand national participation in, and funding for, GEOGLAM implementation</li> <li>Support capacity building initiatives in countries at risk (focus on Africa, South Asia, Black Sea)</li> <li>Contribute to African JECAM sites development and workshops</li> <li>Provide resources for the GEOGLAM Project Office</li> </ul> <p><i>Data Management &amp; Sharing</i></p> <ul style="list-style-type: none"> <li>Secure African additional rain gauge data for food insecure regions</li> <li>Give high priority to Landsat 8 agricultural acquisitions</li> <li>Commit near-real-time access to Sentinel 2 data for agricultural regions</li> <li>Give high priority to a possible Landsat 8 Sentinel 2 orbit optimization to reduce global coverage intervals and optimize in-season imagery</li> <li>Provide access to El-Niño forecasts to enable monitoring intensification over potentially affected regions (countries at risk)</li> <li>Help document the link between short-term weather anomalies (e.g. frost, flash-floods) and crop/vegetation anomalies</li> </ul>

<b>BI-01 Global Biodiversity Observation (GEO BON)</b>			
	Overview	Highlights	Actions Needed from GEO Members and POs
<b>G</b>	<p>The GEO Biodiversity Observation Network (GEO BON) is evolving towards an integrated network that collects, manages, shares and analyzes observations. However there are limitations to GEO BON progress mainly related to a lack of sustained funding</p> <p><i>Evidence of Use/ Policy Linkages</i></p> <ul style="list-style-type: none"> <li>• Convention on Biological Diversity (CBD) Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA)</li> <li>• Convention on Wetlands (Ramsar)</li> </ul>	<ul style="list-style-type: none"> <li>• Call for Proposals launched to support Essential Biodiversity Variables tools, standards and monitoring guidelines; 24 proposals submitted, 5 projects selected and already underway from Australia, Colombia, Netherlands, USA, UNEP</li> <li>• Essential Biodiversity Variables (EBVs) used as a core concept for organizing biodiversity monitoring; At the center of the EU BON project (European Biodiversity Observation Network; 30 partners from 18 countries)</li> <li>• Two new GEO BON initiatives launched: Global Network of Ecosystem Observatories and Marine Biodiversity Observation Network</li> <li>• Sourcebook on biodiversity monitoring in tropical forests in preparation - to foster the use of remote sensing data and field information in the context of UN Conventions</li> <li>• BON-in-a-Box (BiaB) handbook under development – to assist governments and organizations in setting up Biodiversity Observation Networks</li> <li>• Citizen-sensing introduced as a component of the Global Wetland Observation System (GWOS); Used to verify wetland extent (in partnership with HSBC/EarthWatch program)</li> <li>• 8-page leaflet on "Developing National Species Monitoring for the Aichi Targets" produced for SBSTTA-17</li> <li>• New GEO BON strategic plan developed, major update of GEO BON website in progress</li> <li>• GEO BON office hosted by Germany (from 2014; hosted by South Africa from 2009 to 2013)</li> </ul>	<p><i>Additional Resources and/or Contributions</i></p> <ul style="list-style-type: none"> <li>• Expand national/international participation in, and funding for, GEO BON</li> <li>• Host/sponsor regional workshops to create/strengthen biodiversity networks</li> <li>• Develop national/regional Biodiversity Observation Networks</li> </ul>
<b>CL-01 Climate Information for Adaptation</b>			
	Overview	Highlights	Actions Needed from GEO Members and POs
<b>Y</b>	<p>Efforts are underway to develop and use climate information for adaptation. The climate record is extending (through reanalysis, reprocessing, reconstruction) thereby helping to better detect climate variability and change. Also research on polar dynamics, monsoons and tropical cyclones is advancing, offering new prospects for seasonal prediction. Activities for the development and integration of climate products/services into adaptation processes are ongoing, however they require further coordination. Also more work is needed to foster the use of climate information by policy- and decision-makers at all levels</p> <p><i>Evidence of Use/ Policy Linkages</i></p> <ul style="list-style-type: none"> <li>• UNFCCC Subsidiary Body for Scientific and Technological Advice (SBSTA)</li> <li>• IPCC</li> </ul>	<ul style="list-style-type: none"> <li>• New ECWMF reanalysis project (ERA-CLIM2) to start in Jan 2015 – to develop a new coupled atmosphere-land-ocean reanalysis system and improve the climate record</li> <li>• Ocean reanalysis datasets produced for past 53 years (incl. biogeochemical data)</li> <li>• Continental-scale variability of surface temperature reconstructed over last 2000 years. Datasets archived at US NOAA NCDC. Climate field reconstructions of temperature and precipitation underway. Global-scale detailed synthesis to be released in 2016</li> <li>• "Polar prediction" and "Sub-seasonal to seasonal prediction" projects underway; Database of sub-seasonal forecasts established at ECMWF; Projects aim to improve forecast skills, quantify uncertainties and develop societal applications; Collaboration of weather and climate communities strengthening</li> <li>• Status Report on Global Observing Systems for Climate under preparation – for submission to GCOS sponsors and UNFCCC Parties in 2015</li> <li>• Several GCOS Cooperation Mechanism (GCM) projects completed – making more climate observations available</li> <li>• Portal (GOSIC) to access climate observations and Essential Climate Variables (ECVs) under continuous development</li> <li>• Architecture of the EC Copernicus Climate Change Service developed. Discussion ongoing to possibly authorize ECMWF operate the Service from Nov 2014</li> <li>• Earth System Grid Federation GEOSS node under implementation (data/information archiving and dissemination mechanism)</li> <li>• GFCS Climate Services Adaptation Programme under implementation in Africa – to develop services for food security, health, and disaster risk reduction in Malawi and Tanzania</li> </ul>	<p><i>Additional Resources and/or Contributions</i></p> <ul style="list-style-type: none"> <li>• <b>Expand national/international participation in the present Task; in particular with regard to climate information production, use, and access</b></li> <li>• Disseminate/develop climate adaptation guidance products</li> <li>• Build on the capability of the European Clearinghouse and US climate.gov, and on synergies with the WMO Global Framework for Climate Services</li> <li>• Develop a coordinated user-requirement platform for models, data, and knowledge through GEOSS</li> <li>• Promote seamless weather-climate prediction and regional climate science efforts (e.g. CORDEX)</li> </ul> <p><i>Infrastructure</i></p> <ul style="list-style-type: none"> <li>• Reverse the deteriorating trend of some in-situ networks and help fill gaps in relevant regions (cf. GCOS recommendations)</li> <li>• Advance Infrastructure and Middleware Applications/Services to archive, disseminate, analyze and visualize climate datasets (models, in-situ, satellite), e.g. via the Earth System Grid Federation (ESGF) and its obs4MIPs component</li> <li>• Coordinate with US (NSF) EarthCube project</li> </ul>



<b><u>CL-02 Global Carbon Observation and Analysis</u></b>			
	<b>Overview</b>	<b>Highlights</b>	<b>Actions Needed from GEO Members and POs</b>
<b>G</b>	<p>The development of a comprehensive global carbon observation and analysis system (integrated across the atmosphere, land and ocean domains) is underway, with support from a number of international/national projects and programs. More work is needed to translate observations and products into policy relevant information</p> <p><i>Evidence of Use/ Policy Linkages</i></p> <ul style="list-style-type: none"> <li>• UNFCCC</li> <li>• IPCC</li> <li>• Carbon information is central to the design of mitigation policies and adaptation measures with major implications on cost-management</li> </ul>	<ul style="list-style-type: none"> <li>• Global Carbon Budget assessed for 2013 (77 contributors from 14 countries and 46 organizations; presented at UNFCCC COP; globalcarbonproject.org)</li> <li>• Global Carbon Atlas released as a platform to explore and visualize updated data on carbon fluxes resulting from human activities and natural processes (globalcarbonatlas.org)</li> <li>• Numerous carbon datasets released, potentially available through the GEOSS Portal as DataCORE resources (full and open access)</li> <li>• GEOCARBON Portal in operation to enable free exchange of carbon data and products (geocarbon.net)</li> <li>• Concept for an Integrated Global Greenhouse Gas Information System (IGIS) developed – to inform policy and strategies on GHG emissions</li> <li>• CEOS Strategy for Carbon Observations from Space completed</li> <li>• ESA satellite mission BIOMASS under preparation ( will provide unprecedented measurements of forest biomass to assess terrestrial carbon stocks and fluxes from 2020 onwards)</li> </ul>	<p><i>Additional Resources and/or Contributions</i></p> <ul style="list-style-type: none"> <li>• Connect national/international carbon activities to Task CL-02; provide contact information</li> <li>• Contribute carbon datasets to GEOSS on the basis of full and open access (GEOSS DataCORE)</li> <li>• Design and follow a long-term funding strategy for maintaining carbon observing/monitoring networks (in-situ &amp; space), beyond the funding period of research projects</li> </ul> <p><i>Outreach</i></p> <ul style="list-style-type: none"> <li>• Make national/international entities aware of available carbon information and of the need to sustain carbon measurements</li> </ul>
<b><u>DI-01 Informing Risk Management and Disaster Reduction</u></b>			
	<b>Overview</b>	<b>Highlights</b>	<b>Actions Needed from GEO Members and Pos</b>
<b>G</b>	<p>Efforts are underway to provide timely information relevant to the full cycle of disaster management (mitigation, preparedness, warning, response and recovery). Bridges are getting built across disaster communities and progress on overall disaster risk management is significant. However more work and coordination are needed to develop multi-hazard end-to-end approaches and make Earth observations and information effectively reach decision-makers and the public</p> <p><i>Evidence of Use/ Policy Linkages</i></p> <ul style="list-style-type: none"> <li>• Hyogo Framework for Action 2005-2015</li> <li>• UNISDR Post-2015 Framework for Disaster Risk Reduction</li> </ul>	<ul style="list-style-type: none"> <li>• GEO Geohazards Supersites initiative evolving towards providing easy and free-of-charge access to satellite and ground-based datasets; 3 sites accepted by CEOS as Permanent Supersites: Marmara Sea/North Anatolian Fault Zone, Mt. Etna, Mt. Vesuvius volcanoes (space imagery committed by ASI, CNES, CSA, DLR, ESA, JAXA, NASA)</li> <li>• Satellite-based Advanced Fire Information System (AFIS) developed to provide near-real-time fire information to users across the globe</li> <li>• Initiative underway to increase the role of CEOS space agencies in all phases of Disaster Risk Management (DRM); Global Satellite Observation Strategy completed and three pilot projects ongoing on Floods, Volcanoes and Earthquakes</li> <li>• Recovery Observatory in planning to organize data and plan coordinated acquisitions for (i) Built-area damage assessment, and (ii) Reconstruction planning &amp; monitoring</li> <li>• “GEOSS Architecture for Disasters” developed to facilitate interoperability interactions between data providers and disaster response personnel; this relates to (i) Distributed and virtual cloud-based functional nodes; (ii) Methods to access local data to validate processing, including crowd-sourcing; and (iii) Social media distribution of products for discovery and sharing</li> <li>• Working Group on Disasters strengthened within CEOS with space agencies from Australia, China, and South Africa joining</li> </ul>	<p><i>Additional Resources and/or Contributions</i></p> <ul style="list-style-type: none"> <li>• Help engage a broader set of stakeholders and practitioners working on Disaster Risk Management (e.g. operational and field users); Identify and help establish contact with end-user groups (e.g. local disaster managers)</li> <li>• Facilitate access to in-situ data and infrastructure (repositories, processing, distribution) in particular for developing countries</li> </ul>

<b>EC-01 Global Ecosystem Monitoring</b>			
	Overview	Highlights	Actions Needed from GEO Members and POs
<b>Y</b>	<p>Efforts to assess the state and trends of world ecosystems are gathering momentum. Linkages with GEO BON, Blue Planet, Cold Regions are gradually developing. Mountain activities are evolving into a major GEO initiative that requires support from Members and Organizations</p> <p><i>Evidence of Use/ Policy Linkages</i></p> <ul style="list-style-type: none"> <li>UNESCO World Heritage Programme</li> <li>Alpine Convention</li> <li>Carpathian Convention</li> <li>Convention on Wetlands (Ramsar)</li> </ul>	<ul style="list-style-type: none"> <li>Initiative for a GEO Global Network for Observations and Information in Mountain Environments (GEO-GNOME) under implementation - to monitor and predict the state and change of mountains</li> <li>GEO-GNOME website/portal developed and linked to the GEOSS Portal – providing lists of (i) Datasets available on mountain environment and change; (ii) Climate model outputs suited for mountain environment (incl. downscaling); and (iii) Mountain protected-areas involved in GEO-GNOME and willing to share data and vision</li> <li>NextData project ongoing – to help assess the impact of climate variability on mountain ecosystems (population dynamics of selected species, Alpine lake ecosystems, changes in resource-consumer relationships); Focus on the Alps, Apennines and Himalaya-Karakorum (nextdataport.it)</li> <li>High-resolution ecosystem map of Africa developed (provides a baseline for impact monitoring)</li> <li>World Heritage Sites, Biosphere Reserves and Geoparks set up for preserving key ecosystems</li> <li>2<sup>nd</sup> Environmental and Ecological Global Datasets and Analysis Report released by the Chinese Global Remote Sensing Monitoring on Ecosystem and Environment Program – support for urban, agriculture, and water areas</li> <li>Free-access real-time platform for marine conservation under development (integrating and monitoring Earth observation and human pressure data; SEAWETRA)</li> <li>Archive for global change data and tools under development through ABCC program (Australia, Brazil, Canada, China); Focus on dry regions, cold regions, forests, grasslands, and atmosphere (aerosol). ABCC expanded its research partnership to Germany, Malaysia, ISDE, and OGC</li> <li>Proposal for a GEO Global Dry-land Observation Network under discussion – to provide global information on arid and semi-arid ecosystems</li> <li>Contact established with the Belmont Forum about a possible Collaborative Research Action on Mountains as Sentinels of Change (scoping workshop held in June 2014, decision to be made in Oct 2014)</li> <li>Linkages with Cold Regions (WA-01) and Oceans (SB-01) activities explored</li> </ul>	<p><i>Additional Resources and/or Contributions</i></p> <ul style="list-style-type: none"> <li><b>Identify entities carrying out monitoring activities for key ecosystems (e.g. moist/dry forests, wetlands, drylands, tropical ecosystems, cold regions)</b></li> <li>Support national efforts on environmental network building, data validation and report dissemination under the GEO umbrella</li> <li><b>Support the development of GEO-GNOME</b> (GEO Global Network for Observations and Information in Mountain Environments) through contributions of projects and/or coordination resources</li> <li>Support the development of a network of protected areas and identify related monitoring activities and available data</li> <li>Support ecosystem mapping activities</li> <li>Help strengthen links with UNESCO-HIST, the European Climate Research Alliance (ECRA), EU initiatives (eg, LifeWatch) and international programs such asILTER</li> </ul>
<b>EN-01 Energy and Geo-Resources Management</b>			
	Overview	Highlights	Actions Needed from GEO Members and Pos
<b>G</b>	<p>Tools and information for the resource assessment, monitoring and forecasting of energy sources (including solar, wind, ocean, hydropower, and biomass) and geological resources (e.g. mineral, raw material) are developing. However, applications and services need to be developed in the fields of ocean, hydro, nuclear, and fossil fuel energies. Also, outreach work is needed to ensure that users are confident in using Earth observations and information for energy applications</p> <p><i>Evidence of Use/ Policy Linkages</i></p> <ul style="list-style-type: none"> <li>More than 45'000 users/year of GEO solar/wind products</li> <li>IRENA (International Renewable Energy Agency) Work Programme</li> </ul>	<ul style="list-style-type: none"> <li>Web-service Energy Community Portal launched – providing a catalogue of data and tools (OGC Compliant; webservice-energy.org)</li> <li>Expansion of Global Atlas for Solar and Wind Energy to all renewable energies underway: Geo-thermal Energy (2014) and Marine Energy (2015); the Atlas is the largest-ever initiative to assess renewable energy potential on a global scale</li> <li>Long-term Solar Energy Atlas launched</li> <li>BioEnergy Atlas for South Africa released (first outcome of BioEnergy Atlas for Africa effort); most Atlas datasets are tagged for inclusion in the GEOSS Data-CORE (full and open access)</li> <li>10 downstream services developed and demonstrated (e.g. related to solar, wind and biomass, electricity grid management, and building engineering); ready to interface with the private sector (ENDORSE project)</li> <li>Several European projects ongoing on Climate Forecasting Tools for Renewable Energy Resource Mapping (e.g. CLIM-RUN; EUPORIAS; SPECS)</li> <li>Discussion with the private sector (Earth observation and energy) ongoing to launch a GEOSS University Professorship in Renewable Energies</li> <li>Solar training for professionals held in Sophia Antipolis (France) 22-24 Jan 2014 (32 participants from UE, Africa and Middle-East)</li> </ul>	<p><i>Additional Resources and/or Contributions</i></p> <ul style="list-style-type: none"> <li><b>Develop Earth observation based applications and services in the fields of ocean, hydro, nuclear, and fossil fuel energies</b></li> <li>Provide incentives to energy industry (hydro, nuclear, fossil) to collaborate and share data</li> </ul> <p><i>User Engagement</i></p> <ul style="list-style-type: none"> <li>Make energy users aware of benefits of Earth observation based tools and services</li> </ul>

<b><u>HE-01 Tools and Information for Health Decision Making</u></b>			
Y	<b>Overview</b>	<b>Highlights</b>	<b>Actions Needed from GEO Members and Pos</b>
Y	<p>The Health &amp; Environment Community of Practice is working to advance activities in five main areas (airborne diseases and air quality, water-borne diseases, vector-borne diseases, urban health forecasting, and infectious disease emergence/spread). Although individual projects are making progress, the Community of Practice is seeking to develop a “bigger picture” for the Health Societal Benefit Area, trying to connect priority areas, and identify resources and people who are able to contribute to the Task</p> <p><i>Evidence of Use/ Policy Linkages</i></p> <p>Post-2015 development agendas, e.g. UN Sustainable Development Goals (SDGs)</p>	<ul style="list-style-type: none"> <li>• Globally integrated Cholera Early Warning System under implementation – based on regional pilots in areas such as Uganda, Bangladesh, Puget Sound, Chesapeake Bay</li> <li>• Regional hazards outlooks in preparation for food security across Africa</li> <li>• Requirements for geospatial standards relevant to health and environment under development; EO2HEAVEN (Earth Observation and Environmental Modelling for the Mitigation of Health Risks) results disseminated to the OGC Domain Working Group on Health</li> <li>• Malaria map-room operational – to help anticipate time and conditions suitable for malaria transmission (e.g. average temperature between 18°C and 32°C and relative humidity greater than 60%)</li> <li>• Meningitis map-room in operation to provide information tools for epidemic meningitis (e.g. observed distribution maps during 1841-1999 and predicted probability maps)</li> <li>• Information clearinghouse for tick-borne diseases in preparation</li> <li>• New water-health partnership (WHO-UNHABITAT-UNEP) in progress – supported by Switzerland (project secretariat at WHO); GEO recognized as a partner for providing Earth observations and information in monitoring achievement of the Water Sustainable Development Goal (see WA-01)</li> </ul>	<p><i>Management</i></p> <ul style="list-style-type: none"> <li>• <b>Ensure active participation from Leads and Contributors and provision of information</b></li> </ul> <p><i>Additional Resources and/or Contributions</i></p> <ul style="list-style-type: none"> <li>• Expand national/international participation in GEO health activities</li> <li>• Exchange knowledge on health related models – uncertainties, assumptions, degree of validation</li> <li>• Represent GEO whenever negotiating aspects of the Global Framework for Climate Services (GFCS), Sustainable Development Goals (SDGs)</li> <li>• Show that attainment of Sustainable Development Goals (SDGs) cannot be achieved without Earth observation and information</li> <li>• Encourage WHO to become a Participating Organization of GEO</li> </ul>
<b><u>HE-02 Tracking Pollutants</u></b>			
G	<b>Overview</b>	<b>Highlights</b>	<b>Actions Needed from GEO Members and Pos</b>
G	<p>The implementations of a global observation system for mercury and global monitoring plan for Persistent Organic Pollutants are making progress. However, activities to monitor pollutants and their compounds in air, water, soil, vegetation and biota remain limited. Efforts could be extended to additional pollutants, pending on further contributions by GEO Members and Participating Organizations</p> <p><i>Evidence of Use/ Policy Linkages</i></p> <ul style="list-style-type: none"> <li>• Minamata Convention on Mercury</li> <li>• Stockholm Convention on Persistent Organic Pollutants (POPs)</li> </ul>	<ul style="list-style-type: none"> <li>• Ground-based observing system for mercury in operation</li> <li>• Infrastructure collecting near real-time mercury data from ground-based sites; Quality Assurance/Quality Control system implemented; Historical datasets and metadata completed</li> <li>• GMOS web portal (gmos.eu) up and running – providing information about project development, capacity building, support to policy, major findings, publications, and press releases</li> <li>• Collection of Persistent Organic Pollutants (POP) data ongoing in all UN regions – for ambient air, human milk/blood, and water</li> <li>• Data collection and processing underway through the POP data warehouse (www.pops-gmp.org), including e.g. (i) Standardization of the collected data; (ii) Manual or electronic data entry; (iii) Data validation procedures (factual and political); and (iv) Data presentation interface; and (v) Link to existing databases</li> <li>• Regional Global Monitoring Plan Reports in preparation for 2015 endorsement by UN Regions</li> </ul>	<p><i>Additional Resources and/or Contributions</i></p> <ul style="list-style-type: none"> <li>• Expand national/international participation in pollutant monitoring activities</li> <li>• Share experience on the use of regional/global transport models (a major challenge is to evaluate pollutant transport)</li> <li>• Support full and open access to biomonitoring data (human milk and blood)</li> </ul> <p><i>Technical</i></p> <ul style="list-style-type: none"> <li>• Develop more advanced sensors for Mercury and POPs to make observing systems less human dependent</li> <li>• Develop datasets on human exposure to mercury, and links between mercury in ambient air and human health</li> </ul>

<b><u>WA-01 Integrated Water Information (incl. Floods and Droughts)</u></b>			
	<b>Overview</b>	<b>Highlights</b>	<b>Actions Needed from GEO Members and POs</b>
<b>G</b>	<p>Water activities mainly rely on the work of the GEO Water Community of Practice and regional capacity building initiatives (Asia, Africa, and Latin America &amp; Caribbean). Work on Cold Regions (Cryosphere) is making good progress through numerous contributions from ongoing projects and systems</p> <p><i>Evidence of Use/ Policy Linkages</i></p> <ul style="list-style-type: none"> <li>• 2 million TRMM files (4.5 Terabytes) distributed to ~2000 users/month</li> <li>• Indicator applications developed for UNESCO (WWAP)</li> <li>• Great Lakes Service adopted by International Joint Commission for Canada-US Basins</li> <li>• Transboundary basin management (Asian Water Cycle Initiative AWCI, and African Water Cycle Coordination Initiative AfWCCI)</li> <li>• UN Sustainable Development Goals</li> <li>• Belmont Forum's Call for Proposals on Arctic Observations</li> </ul>	<ul style="list-style-type: none"> <li>• New Water Initiative developing under the leadership of WHO, UNEP, and UNHABITAT - to address the Water Sustainable Development Goal (SDG) and integrate Earth observations into water monitoring processes post-2015</li> <li>• GEO Great Lakes project adopted as an operational service in the Great Lakes area (<a href="http://data.glos.us/geo-greatlakes/">http://data.glos.us/geo-greatlakes/</a>)</li> <li>• GEOWOW river-discharge project completed (<a href="http://www.geowow.eu">www.geowow.eu</a>) combining GRDC run-off data and TIGGE weather forecasts (Task WE-01); Use case to discover, access and visualize observed and predicted river discharge delivered</li> <li>• GEO Cold Regions initiative gathering momentum: 2-page rationale released for observations and information over polar and cold regions. Contributors include: Polar Data Catalogue (Canada), National snow and Ice Data Centre (USA), Norwegian Meteorological Institute, Sustaining Arctic Observing Networks (SAON), Svalbard Integrated Arctic Earth Observing System (SIOS), CryoClim, INTERACT, 3rd Pole Environment (TPE), Pan Eurasia Experiment (PEEX), WMO Global Cryosphere Watch, and Polar Space Task Group</li> <li>• New Arctic website launched to help non-remote-sensing scientists place polar change in context (<a href="http://staging.nsidc.org/soac">http://staging.nsidc.org/soac</a>)</li> <li>• CryoClim service for monitoring climate change in the cryosphere now operational and contributed to GEOSS (<a href="http://cryoclim.net/cryoclim/index.php">cryoclim.net/cryoclim/index.php</a>); CryoClim supports monitoring of e.g. sea ice (global); seasonal snow (global); glaciers (Norway); Free of charge web portal and service for searching, browsing and downloading</li> <li>• Completion of the "GEOSS Water Strategy: From Observations to Decisions"; Summary circulated at 2014 GEO Summit</li> <li>• Joint initiative (e.g. with ICSU Global Water System Project (GWSP), FAO) on the role of Earth observations in the Water-Energy-Food Nexus; Workshop held at FAO in March 2014; Proposal submitted to Future Earth in April 2014</li> <li>• 3 independent webinar series inaugurated, featuring ocean acidification, water quality, and capacity building for Latin America (GEOSS in the Americas/CIEHLYC); held in Spanish, and recorded/made available for later viewing</li> </ul>	<p><i>Additional Resources and/or Contributions</i></p> <ul style="list-style-type: none"> <li>• Make specific commitments to carry out actions in support of GEOSS Water Strategy recommendations</li> <li>• Strengthen in-situ data networks to support integrated product development and validation/calibration</li> <li>• Launch an initiative on "water use" – a critical missing variable at the global scale</li> <li>• Promote regional water initiatives in Asia, Africa, Latin America (e.g. AWCI, AfWCCI, CIEHLYC)</li> <li>• Promote GEO Cold Regions as a global coordination framework for related existing projects and programs. Encourage collaboration among existing initiatives (e.g. SAON, SIOS, CAFF, Pan-Eurasian Experiment (PEEX), INTERACT, World Glacier Monitoring Service (WGMS), WMO SPICE, WMO GCW Portal and Polar Space Task Group (PSTG))</li> <li>• Support the development of a GEO Cold Regions Community Portal to maximize the impact of systems contributed to GEOSS</li> </ul>
<b><u>WE-01 High-impact Weather Prediction and Information</u></b>			
	<b>Overview</b>	<b>Highlights</b>	<b>Actions Needed from GEO Members and Pos</b>
<b>G</b>	<p>Progress continues on the prediction of high-impact weather and related user-driven products for improved early warning. Current funding is ensured, however major hurdles could be faced in the post-2014 era when ongoing projects terminate</p> <p><i>Evidence of Use/ Policy Linkages</i></p> <ul style="list-style-type: none"> <li>• More than 100 routine users downloading and analyzing TIGGE forecast data</li> <li>• About 140 scientific papers published so far</li> </ul>	<ul style="list-style-type: none"> <li>• Prototype early-warning products developed for: (i) tropical cyclone track &amp; strike probability, and (ii) extreme weather (heavy rainfall, strong winds, very hot or cold); To be trialed through WMO Severe Weather Forecast Demonstration Projects</li> <li>• Global weather predictions (so-called TIGGE data) contributed by 10 leading weather forecasting centers (Australia (BOM), Brazil (CPTEC), Canada (CMC), China (CMA), France (MétéoFrance), Japan (JMA), Korea (KMA), UK (Met Office), USA (NCEP) and ECMWF)</li> <li>• TIGGE data made available for research after a 48-hour delay; regularly accessed by over 100 users (e.g. universities)</li> <li>• TIGGE data portals under enhancement to (i) improve access to time series data, and (ii) deliver data in different formats; Connection with GEOSS Portal in progress</li> <li>• New database of European (regional) weather forecasts developed and registered in the GEOSS Common Infrastructure (<a href="http://apps.ecmwf.int/datasets/data/tigge_lam/">apps.ecmwf.int/datasets/data/tigge_lam/</a>)</li> <li>• Interactive platform for the prediction and visualization of river discharge under development; Through joint GEO Water/Weather activities to improve river flood forecasting; Based on TIGGE forecast archive and GRDC observations</li> <li>• Sub-seasonal to seasonal prediction dataset in planning (global forecasts up to 60 days at lower temporal and spatial resolutions)</li> <li>• Strong support from European project GEOWOW (ended in Aug 2014)</li> </ul>	<p><i>Additional Resources and/or Contributions</i></p> <ul style="list-style-type: none"> <li>• Support the enhancement and maintenance of TIGGE (THORPEX Integrated Grand Global Ensemble) archive, portal, tools and products</li> <li>• Identify resources for the post-2014 era (end of THORPEX programme and GEOWOW project)</li> </ul>

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## 1 INFRASTRUCTURE

### 1.1 IN-01 Earth Observing Systems

CEOS continued improving data access and interoperability of its **Virtual Constellations (VCs)** supporting the delivery of the GEOSS space segment. CEOS placed a renewed emphasis on the VC outputs to focus priorities and optimize outcomes. Recent achievements include:

- **Ocean Surface Topography** – International consensus on measurement requirements; Recent missions SARAL (25-Feb-2013) and INSAT-3D (25-Jul-2013) now providing operational data;
- **Ocean Surface Vector Winds** – Rapidscat mission approval on International Space Station with deployment planned in late 2014;
- **Ocean Colour Radiometry** – Completion of IOCCG (International Ocean Colour Coordinating Group) Report #14 to define “In-Flight Calibration of Satellite Ocean Colour Sensors”;
- **Sea Surface Temperature** – 100% of GHRSSST (Group for High Resolution Sea Surface Temperature) products discoverable through CEOS International Directory Network;
- **Land Surface Imaging** – Launch of Sentinel-1A (3-Apr-2014) and ALOS-2 (24-May-2014) will provide critical C-Band and L-Band data, respectively; SMAP (NASA), CBERS-4 (INPE/China), KOMPSAT-3A (KARI) and VENUS (CNES) launches are planned for later 2014;
- **Precipitation** – New Precipitation Constellation data portal initiated with plans to integrate with the JAXA Water Portal; Global Precipitation Mission (GPM) data, launched 27-Feb-2014, publicly available;
- **Atmospheric Composition** – Progress on Total Ozone as an Essential Climate Variable and volcanic ash alert system; initial discussions for a GEO air quality constellation underway; launch of OCO-2 on 24-Feb-2014.

A new CGMS-CEOS working group on climate was created to pursue efforts towards the definition of a Climate Monitoring Architecture for space-based observations. This includes the development of an **Essential Climate Variable (ECV) Inventory** (including 200+ data records; see [ecv-inventory.com](http://ecv-inventory.com)) to assess gaps. The 1<sup>st</sup> meeting of the new working group was held in March 2014 and another is planned for late 2014. The new ECV Inventory is considering an expansion to include in-situ datasets.

AGEOS (Gabonese Agency for Space Studies and Observations) will establish **ground stations in central Africa** (23 countries) for CBERS, Landsat, SPOT and COSMO-SkyMed data. Antenna installation will start in September 2014 along with a high speed fiber-optic network. This network will support data processing for forests, coastal management, water and urbanization.

The European Environment Agency (EEA) finalized a catalogue of **in-situ needs for Copernicus** services and an inventory of in-situ issues faced by EU GEO projects. After consultation between the EU and international in-situ providers on opening access to in-situ for GMES/Copernicus data, the EEA finalized a document on “recommended solutions” for provision of in-situ data to Copernicus.

The GEO Implementation Boards and Space and Technology community are planning to provide input to the GEO Implementation Plan Working Group (IPWG) by exploring options as to how in-situ could be organized under the **next GEOSS Implementation Plan**, and how key issues could be addressed. The potential contribution of **new technologies** such as UAVs and Gliders are also being explored. A workshop is suggested for spring 2015 to look at new technologies.

A GEO Position Paper was introduced at the ITU Joint Task Group (21-31 July 2014) "on behalf of the Earth Observations community" on the need to **preserve the frequencies used by Earth**

**Observation systems** and networks, and in particular the frequencies used by the Sentinel-1 SAR and the Sentinel-3 altimeter. Simultaneously, a letter has been sent to GEO Principals to support their discussions with national telecom administrations.

## 1.2 IN-02 Earth Data Sets

Japan (JAXA) progressed towards a **global, coordinated and integrated Digital Elevation Model (DEM)**, facilitating interoperability among existing Digital Elevation Model data sets. JAXA started to process the precise global digital 3D map using some 3 million data images acquired by ALOS. The digital 3D-map to be compiled has the world's best precision of 5m spatial resolution (with 5m height accuracy) that enables to express land terrain all over the world. JAXA will commission the compiling work and service provision to NTT DATA Corporation.

In order to popularize the utilization of the **3D-map data**, JAXA will also prepare a global digital elevation model (DEM) with lower spatial resolution (about 30m) to be published as soon as it is ready. Its use will be **free of charge**. Work continued on creation of NASADEM, a global DEM incorporating newly processed SRTM raw radar data, ASTER GDEM, and other sources. The SRTM (Shuttle Radar Topography Mission) DEM dataset and Shuttle Radar Water Body Mask will be registered in the GEOSS Common Infrastructure in late 2014.

The US released **higher-resolution global elevation data** from SRTM (cf. Climate-Resilient International Development initiative announced at the UN Heads of State Climate Summit, New York, USA, 23 Sept). The SRTM mission was a collaboration of US NASA, US National Geospatial-intelligence Agency, and the German and Italian Space agencies. Full resolution 30m data was made available for **Africa** though a user-friendly interface on the US Geological Survey's Earth Explorer website. The next data release will be of Latin American and the Caribbean, and remaining coverage of the world will be provided in 2015.

Australia (CSIRO), with support from the ASTER Science Team, produced and released the **first-ever continental mineral maps**. The series of maps for Australia were registered in the GEOSS Common Infrastructure. Discussions are ongoing to identify an organization to support the creation of a mineral map on the global scale. Work has started on mineral maps for parts of **South America and China**.

Two white papers related to **life-cycle data management** were delivered: GEO Long Term Data Preservation Guidelines Issue 2.0 and Browse Data Guideline. Work advanced on the GEO **Quality Assurance (QA)** definition and the development of QA4EO implementation pilots and showcases (e.g. on Ozone; see new case-studies at qa4eo.org). The case-study repository needs to be expanded to address a larger segment of the science and data product provider community (i.e. level 1, atmosphere, terrestrial, and ocean).

**Global Map** data (national and regional version) were released for **110 countries and 8 regions** (see e.g. ISCGM website at iscgm.org/). These data correspond to 65% of the whole land area of the Earth. In addition, ISCGM released Global Map Version 2, Global Land Cover and Percent Tree Cover, and Global Elevation. Participating countries and regions are steadily increasing and now come to 167 countries and 16 regions. This corresponds to 96% of the whole land area of the Earth. ISCGM newly proposed a catalogue service of global map thematic layers and a web platform for urban hazard maps. Prototypes of these services are now released from ISCGM's website.

AGURAM, Japan (AIST) **global urban map** based on ASTER and MODIS data, will be soon completed and registered in the GEOSS Common Infrastructure. The AGURAM project will contribute to Task SB-04 through high-resolution products to supplement analyses of nighttime lights products from VIIRS.

Work progressed towards the development of a standard **global spatial reference frame for GEOSS** data positioning and analysis (Earth-system spatial-grid; ESSG). Best practices and guidance documents were prepared, as well as tools for cloud-based GEOSS data management, free access, and

easy application. Demonstrations of an ESSG-based data sharing service for **earthquake anomaly recognition** and monitoring are underway. Also workshops and training courses for scientists and decision makers across Societal Benefit Areas are under preparation. In particular, training is being provided to Asia-Pacific and African nations.

CEOS increased interoperability among data sets using the GEOSS Common Infrastructure (GCI). Moreover Space Agencies adopted recommendations to improve **“open” access to CEOS data** from the GCI. Related best practice and guidance documents are under preparation.

Feedbacks and comments to the initial Data Management Principles have been sent to the Data Management Principles Task Force. A dialogue has been initiated towards the best cooperation between **UN-GGIM** and GEO during the 4<sup>th</sup> Session of the United Nations Committee of Experts on Global Geospatial Information Management (New York, USA, 4-5 August 2014).

### 1.3 IN-03 GEOSS Common Infrastructure (GCI)

The GEOSS Common Infrastructure (GCI), which has the purpose to serve as a central hub for **searching, accessing and using data, information, tools and services**, continued to develop – including system monitoring, maintenance and administration of GCI-component application software and hardware platforms.

In 2014, the number of resources discoverable via the GCI increased **from 65 million to 71 million** based on registration of new Earth observation inventories (e.g. CEOS inventories). This relates to the introduction of the **Discovery and Access Broker (DAB)** from EuroGEOSS which allows real-time search of, and access to, multiple external catalogues and related resources.

Moreover new Earth observation data and products were registered in the GCI and flagged according to their nature (e.g. **full and open access**). Continuous efforts are undertaken to ensure registration and facilitate discovery and access to **Data-CORE** pledges made available by GEO Member countries and Participating Organizations. As of May 2014, 51 million potentially downloadable resources (products, files, granules, images) are tagged as GEOSS DataCORE in the GEOSS Common Infrastructure.

The **new version of the GEO Portal** (now **GEOSS Portal**), which constitutes the main entry point to discover and access GEOSS resources, was successfully demonstrated at GEO-X Plenary in Geneva. Focus is now on ensuring a suitable interfacing of the GCI with existing or new community specific portals with the goal to better serve GEOSS user needs. This is supported by the establishment of a set of “GEOSS Community Portals Guidelines” and through initial coordination with some communities (e.g. GEO-BON, SAON).

Other components of the GCI have also undergone evolutions and upgrades: the Component and Service Registry (CSR) has simplified its resource pledge and registration process; the **GEO Discovery and Access Broker (DAB)** search results ranking algorithm has been improved and some of the GEOSS Clearinghouse functions will be migrated into the DAB. The GCI requirements baseline has been reviewed and consolidated.

These improvements were in part supported by the GEOWOW project (<http://www.geowow.eu/>), which helped the GCI to evolve **from data discovery to data use and access**, and by Phases 5 and 6 of the Architecture Implementation Pilot (see Task IN-05). As for the GCI, the Implementation Pilot priority is to (i) develop innovative methods for harmonized access and use of heterogeneous data, services, and models; and (ii) foster sharing of knowledge across disciplines for integrated assessments.

CEOS continued to contribute satellite data assets to GEOSS through the CEOS WGISS Integrated Catalog (CWIC). CEOS International Directory Network (IDN) also provided a source for registered data collections from Space Agencies in CEOS. On-going tests were made to establish **interoperability** between the **WMO Information System (WIS)** and the GCI. GCI/DAB tested the



harvesting of WIS metadata from WIS/GISC/DWD and WIS/GISC/KMA tested the harvesting of GEOSS metadata from GCI-DAB. After fixing errors, an integrated test will be made for operational use.

#### 1.4 IN-04 GEOSS Communication Networks

##### *GEONETCast*

China (CMA), USA (NOAA) and EUMETSAT continued to operate and further develop GEONETCast – a **dissemination system**, which delivers GEOSS data to users **across a wide range disciplines**. GEONETCast provides **near-global geographic coverage** through data exchange between 3 regional Network Centers: EUMETSAT (EUMETCast, over Europe, Africa, and Americas), NOAA (GEONETCast Americas, over the Americas and Caribbean), and CMA (CMACast, over Asia and part of the Pacific).

In keeping with the goal of GEO to increase GEOSS Data-CORE, qualified **resources** in the GEONETCast Product Navigator had their metadata **flagged as GEOSS DataCORE**.

EUMETCast and GEONETCast-Americas evolved to support national disaster management activities. These systems have been approved for **operational use by the International Charter ‘Space and Major Disasters’**. In the event of an activation of the Charter, GEONETCast can be chosen by Charter Project Managers and Authorized Users as an alternative delivery mechanism for the **reception of high-volume, high-resolution satellite data** and value-added products to **support disaster mitigation**.

The EUMETCast-Europe service is transitioning to DVB-S2. A parallel service is operating until the end of 2014 to allow user to migrate before the old DVB-S service is switched off. The DVB-S2 standard will give a more flexible and affordable implementation and allow the service to grow without disrupting the existing services for users due to frequent configuration changes. The **new service provides users with high volume reception capabilities**, which will give access to a wide range of data and products from existing and future satellites.

EUMETSAT and CMA have established a **joint user management process** to handle user access for the data exchanged on each system. Two Asia-Pacific users (in Australia and Hong Kong) are receiving EUMETSAT satellite data through CMACast via this joint process.

A joint EUMETSAT-Turkish State Meteorological Service project saw **5 new EUMETCast stations** installed in the Central Asian countries of **Kazakhstan, Uzbekistan, Turkmenistan, Tajikistan and Kirgizstan** by mid-2014. Work progressed on the installation of GEONETCast-Americas receiving stations in **Barbados, Belize, and Haiti**. Funding for additional GEONETCast-Americas stations in **Mexico** is being mobilized.

The EU-funded capacity building project AGRICAB (with a mission to increase Africa’s capacity to use Earth observations for better agriculture and forest management) completed the **installations of EUMETCast-Africa stations** at the Sahara and Sahel Observatory (OSS) in **Tunisia** and at CURAT in **Ivory Coast**. EUMETSAT set up the first routine use of the EUMETCast training channel and started discussing a concept note to widen the Training Channel usage beyond meteorological community from AGRICAB project. Efforts will continue in the framework of the EU-funded SIGMA project, also contributing to GEOGLAM.

Preparations were made to upgrade 110 existing EUMETCast-Africa stations and to install about 50 new stations in in Africa, in the context of the EU-funded **Monitoring of Environment and Security in Africa** (MESA) project. Equipment in training centres will also be upgraded. Following this project, there will be about **400 GEONETCast stations in Africa**.

In order to support GEONETCast users in the Western Balkan and Eastern Europe and Caucasian, EUMETSAT organised a training courses in April 2014 and supported the transition of EUMETCast **stations** installed in the framework of the **Data Access for Western Balkan, Eastern European and**

**Caucasian countries** (DAWBEE) to DVB-S2. Activities for the Western Balkan NMHS were part of the WMO-led project "Building Resilience to Disasters in Western Balkans and Turkey", funded by the EU Instrument for Pre-Accession Assistance.

#### *GEOSS worldwide communication network of networks*

With regard to the broader objective of developing a **GEOSS worldwide communication network of networks**, new activities have been started in 2013/14 with an aim to enhance the GEOSS Common Infrastructure (GCI) with new data sources and mobile access capabilities. These activities complement each other also addressing the challenge of **citizen-sensing** integration into GEOSS. They include:

- The **MoblScience** initiative (IEEE), which is a system to gather Earth observation data from sensors and instruments into **mobile phones**, where it can be displayed, and then transferred into a public/private **cloud computing** system for processing, archiving and distribution. Interaction with the GCI is under study for both archiving and distribution purposes but also for allowing mobile access to other GEOSS data. MoblScience is a platform of **open source** software;
- The **Omniscientis** project, which allows for odour monitoring and information system based on citizen and technology innovative sensors;
- The **COBWEB** project, which aims at: (i) gathering **crowd-sourced environmental data** with an aim to aid decision making, (ii) introducing **quality measures** and reduce uncertainty, and (iii) providing tools to **fusion** crowd-sourced data with reference data;
- The **CITI-SENSE** project, which aims at the development of a sensor-based Citizens' Observatory Community for improving quality of life in cities;
- The **GEOSAF Farmsupport Mobile App** project, which aims at using mobile technologies in order to access crowd-sourcing data;
- The **eI4Africa** survey, which is to collect data on established and emerging e-Infrastructure applications in Africa;
- The **EuroAfrica GEO-related demonstrators** (FEAST, Erina4Africa, EuroAfrica-p8, eI4Africa, AGLARBRI, SomaliREN, Ekokonnct), which comprise lighthouse demonstrators establishing a Science Gateway (<http://sgw.africa-grid.org/>) supporting **key apps** in health, governance, and environmental monitoring.

Interoperability with the GCI components is being pursued. The main focus is on achieving **full and sustained integration of citizen-sensing**, as well as **mobile access to GEOSS data**, in the GCI.

### **1.5 IN-05 GEOSS Design and Interoperability**

Progress on GEOSS design and interoperability was achieved in three main areas: (i) Architecture Implementation Pilot (AIP); and (ii) Standards and Interoperability Forum (SIF).

#### *Architecture Implementation Pilot (AIP)*

Phase 7 of the Architecture Implementation Pilot (AIP-7) was launched in early 2014 to develop and deploy **easy-to-use online (Web and Mobile) apps** that demonstrate the value of standards-based access to Earth observation data and services registered with GEOSS. Target areas include: Flood and drought Monitoring, Food security and energy management, Environmental monitoring using Mobile Sensors, Citizen Observatories, Crowd Sourcing, Wind and Solar Energy Potential Estimator, Earth cover change detection, and Ocean observations and commercial fisheries.

A Call for Proposals was launched and **23 proposals** (representing 80 organizations) were received in response. This resulted in the formation of 14 AIP-7 Working Groups (e.g. Disaster Management & Agriculture, Land, Oceans, Health, Water, Data Sharing, System Design, Architecture, AppFramework, **Crowdsourcing**, Capacity Building, Tutorials (in coordination with the Standards and Interoperability Forum), and GCI Research).

AIP-7 (managed by the OGC) will deliver results for the GEO-XI Plenary in Gabon (demonstrations), and complete its activities in early 2015 (Engineering Reports). The demonstration (either as a smartphone app or as a web application) will showcase the **combination of societal benefit area (SBA) information to solve a particular end-user problem**. It will use local data, if available. One very compelling application will be selected and demonstrated ‘live on stage’.

#### *Standards and Interoperability Forum (SIF)*

The SIF continued to promote GEOSS **interoperability** principles, assist communities and providers with interoperability challenges between GEOSS resources, encourage broader use of existing standards, and support related education and outreach. The SIF published a series of **GEOSS Tutorials** assisting GEOSS users and providers in understanding how to publish, register, discover, access, and use GEOSS resources (see <http://wiki.ieee-earth.org/Documents>).

The SIF worked on two whitepapers on interoperability assessment: one on GEOSS registration alternatives, and one on **GEO Label** integration. The whitepapers will be delivered to the GEO Infrastructure Implementation Board for consideration of next steps.

## 2 INSTITUTIONS AND DEVELOPMENT

### 2.1 ID-01 Advancing GEOSS Data Sharing Principles

During the period of December 2013 to August 2014, the Data Sharing Working Group (DSWG) intensified its work to advance GEOSS Data Sharing Principles.

The DSWG drafted the **GEOSS Data Sharing Principles (DSPs) Post-2015** in order to better reflect the rising Open Data trend observed worldwide and the need to reinforce GEO's impact on promoting availability of data on a free, full and open basis. The new Principles elevate the status of GEOSS Data-CORE to the default standard of data sharing through GEOSS. They include as an exception the possibility of sharing data with restrictions. They broaden the application of free of charge data provision beyond the sole case of "research and education". The new DSPs have been approved by the Executive Committee members during their 31<sup>st</sup> meeting. They will be presented at the GEO-XI Plenary for consultation.

The DSWG revised its background white paper which reviews the definition of legal interoperability, the forms of legal protection of Earth observation data and the **legal mechanisms for sharing**. The white paper recommends a list of open access licenses and waivers, as well as restricted licenses, as practical tools for GEO contributors to share data as part of the GEOSS Data-CORE. This document has also been approved by the 31<sup>st</sup> Executive Committee and will be presented at the GEO-XI Plenary for consultation.

The DSWG, together with the GEO Secretariat and the European Commission, contacted all Members and Participating Organizations that had **pledged resources for the GEOSS Data-CORE**, but had not yet registered them in the Portal, nor developed interoperability arrangements with the Discovery and Access Broker (DAB). 41 institutions from 12 countries or Participating Organizations were contacted, and requested to either register their resources, or rescind their pledge in advance of Executive Committee-31. This exercise resulted in the following: 11 organizations honored their pledge, with 5 having registered their data; 1 organization rescinded its pledge, and 29 did not respond.

As of October 2014, more than 30 brokered data providers (capacities, systems, communities) published about 13 million first-level resources (mix of data collections, datasets and individual images) and over 70 million individual resources (e.g. satellite scenes, rain gauge records) that are discoverable and potentially accessible, among which **51 million individual resources are tagged as GEOSS Data-CORE**.

The number of resources in the GCI is expected to take another leap as the result of an interoperability agreement to discover and access the open resources in ESRI's ArcGIS On-line; conversely, **400,000 users globally of ESRI's GIS software will now have easier access to the resources in the GCI**.

The DSWG participated in the design of the current Architecture Implementation Pilot (AIP-7) and is conducting a test to check whether the GCI can find the current licensing metadata and make it available to GEOSS users. A call for data providers to assist the group in this effort was issued. Also within AIP-7, the list of use metrics information to be collected started to be reviewed with the dual aim of (i) understanding **how many users can access data through the GEOSS Data-CORE**, and (ii) tracking the re-use of data made available through the GEOSS Data-CORE.

The DSWG started a close collaboration with Infrastructure Implementation Board (IIB) in order to establish a **Data Management Principles** Task Force (DMP-TF) aiming to develop high-level principles, which should ensure the long-term preservation, distribution, and quality of GEOSS resources, and the GEOSS Data-CORE. The DMP-TF was established in May 2014 and has delivered draft principles for internal and external consultation.

Supported by the GEO Secretariat, the **Data Sharing page on the GEO website** ([earthobservations.org/dswg.php](http://earthobservations.org/dswg.php)) is being reorganized and updated frequently. With reference

documents, presentations, formal reports and other essential information, the page is now a knowledge base for GEO Data Sharing Principles and activities open to both GEO communities and external users.

In the previous ID-01 Task assessment report several actions were outlined: (i) **expand participation in Working Group activities** from Members and Participating Organizations, (ii) ensure desirable levels of participation by developing country representatives in Working Group activities and desirable levels of outreach to developing country data users and providers. In response, the DSWG sent a request of expansion to GEO Members and Participating Organizations through the GEO Secretariat. By now, seven nominations have been received, with four from developing countries and two from Participating Organizations. Since then, 5 of them have already participated in DSWG activities.

Members of the DSWG have been particularly involved this year in a series of **outreach** activities: (i) March 2014, side event of RDA plenary in Dublin and the Copernicus Big Data Workshop in Brussels, Belgium; (ii) June 2014, 8th GEO European Project Workshop in Athens, Greece; (iii) June 2014, ICSSSM'14 (The 11th International Conference on Service Systems and Service Management) in Beijing, China; (iv) August 2014, COSPAR Scientific Assembly in Moscow; (v) August 2014, OpenDataSSDC in Nairobi, Kenya; (vi) September 2014, IAC in Toronto, Canada; (vii) November 2014, SciDataCon 2014 in New Delhi, India. Three of these activities are held in developing countries and aim at data users and providers in developing countries.

The DSWG, with support from the DMP-TF, will host a **side-event at the GEO-XI Plenary** aiming at presenting the revised DSPs and draft Data Management Principles, and taking stock of perspectives by data users and managers from developing countries, especially those in Africa.

In summary, the implementation of the GEOSS Data Sharing Action Plan is making good progress. The DSWG is also monitoring whether additional challenges emerge in sharing or accessing data through GEOSS and identifying additional opportunities to further implement the GEOSS Data Sharing Principles.

However, the DSWG recognizes that **additional resources** are needed especially to help establish national coordinating mechanisms, to trigger capacity building activities related to the uptake of the GEOSS Data Sharing Principles, and to promote and monitor engagement with their implementation, and to provide feedback to GEO.

## 2.2 ID-02 Developing Institutional and Individual Capacity

### *GEOCAB: the new GEO Capacity Building Portal*

The Institutional Development Task has, through the contributions of EU/FP7 GEONETCab and now EOPOWER projects, developed a capacity building resource facility, the Global Earth Observations Capacity Building (GEOCAB) Portal ([geonetcab.mdweb-project.org/search/main.jsf](http://geonetcab.mdweb-project.org/search/main.jsf)).

Past and on-going projects are collecting information about Capacity Building resources (e.g. stakeholders' contacts, description of initiatives and activities, training material) on different geographical areas and about different topics. The GEOCAB Portal aims to capture capacity development material and make them easily accessible. The Portal will provide a capacity building resource inventory, enable the sharing of best practices, strengthen and facilitate networking and collaboration among Earth observations capacity building resources, thereby enhancing coordination between existing resources facilities, and achieving resource mobilization.

Joint efforts by CEOS and the EU/FP7 GeoNetCab, EOPOWER, and IASON projects have started to identify capacity development opportunities and material on Earth observation outside the GEO community. This information is made freely accessible through the GEOCAB Portal.

Contribution/registration of capacity building resources to the GEOCAB Portal has been requested. The resources can be in the form of tutorials, best practice toolkits, software, etc. Tutorials on how to contribute and how to register resources are available on the EOPOWER website at <http://www.eopower.eu>.

A Memorandum of Understanding is under preparation between South Africa (SANSA), Switzerland (UNIGE), HCP international, and the GEO secretariat to ensure long-term sustainability of the Portal. The Portal should be launched during the GEO-XI Plenary (13-14 Nov 2014, Libreville, Gabon).

#### *Side Events – (Re)Building a GEO Capacity Building community*

A Capacity Building side-event was held during the 2014 GEO Work Plan Symposium. The aim was to share information on capacity building programmes (especially from developing countries) and to explore options for coordination. Main issues were the capturing of initiatives and accessibility of development material (<http://earthobservations.org/cb.php>). This side event received very positive feedbacks. Efforts will continue to (re)build a strong capacity building/development network within GEO. The next Capacity Building event will be organized during the GEO-XI Plenary in Gabon.

#### *Ongoing projects with strong capacity building components*

Numerous activities entail strong capacity building components critical in addressing GEOSS Strategic Targets:

1. GEONETCast toolbox provides an open and flexible integrated solution to manage the EUMETCast-GEONETCast data stream, import of various image types and data products, and bring them together in a common GIS and RS environment for further processing ([itc.nl/Pub/WRS/WRS-GEONETCast/GEONETCast-toolbox.html](http://itc.nl/Pub/WRS/WRS-GEONETCast/GEONETCast-toolbox.html));
2. AfriGEOSS aims to provide the necessary framework for African countries and organizations (as well as international partners) to access and leverage on-going local and international bilateral and multilateral initiatives on Earth observation and information, thereby creating synergies and minimizing duplication for the benefit of the continent ([www.earthobservations.org/afrigeoass.php](http://www.earthobservations.org/afrigeoass.php));
3. ARCSSTE-E (African Regional Centre for Space Science and Technology Education in English) aims to develop the skills and knowledge of university educators, environmental research scientists in the four principal areas of Remote Sensing, Satellite Meteorology Applications, Satellite Communication and Basic Space and Atmospheric Science and Technology (<http://arcsstee.org>);
4. GEOapps+ is the commercial arm of the National Space Research & Development Agency (NASRDA) in Nigeria. The company promotes applications of space technology for sustainable development in Nigeria and Africa (<http://www.geoappsplus.com>);
5. RECTAS (Regional Centre for Training in Aerospace Surveys) provides theoretical and practical training in the field of Geoinformatics, in particular photogrammetry, remote sensing, cartography and geographic information systems and their applications in geophysical surveys, environmental studies, natural resources management, mapping, land administration (<http://www.rectas.org>);
6. INPE (National Institute for Space Research, Brazil) is engaged in training and education activities, especially in open geospatial technology applied to forest and land change monitoring, disasters, hydrology and satellite meteorology. A partnership with GEONETCast Americas is providing user training, data collection, processing, exchange and dissemination of 25 products over the internet (<http://www.inpe.br>);
7. POGO (Partnership for Observation of the Global Oceans) offers opportunities for training and education across oceanographic institutions and promote long-term cooperation for

- comprehensive global-ocean observations. These include a Visiting Fellowship programme on Oceanographic Observations (SCOR), a Visiting Professorship Programme, and a Centre of Excellence in Ocean Observations ([www.ocean-partners.org/training-and-education](http://www.ocean-partners.org/training-and-education));
8. SERVIR provides training, workshops, servers & cloud-computing, GIS tools, Earth observation applications, and map products related to agriculture, climate, disasters, ecosystems, water and weather ([www.servirglobal.net](http://www.servirglobal.net));
  9. GEONETCast-Americas provides infrastructure and training for low-cost reception of satellite products (<http://www.geonetcastamericas.noaa.gov/>);
  10. ARSET provides applied remote-sensing training for water and air quality practitioners (<http://water.gsfc.nasa.gov/>);
  11. DEVELOP provides training to young and transitioning professionals as well as end-users to apply Earth observation (<http://develop.larc.nasa.gov/>);
  12. FEWS Net provides information and training to decision makers on the use of agro-meteorological data to assess food security (<http://www.fews.net/>);
  13. AGRICAB compiled an initial inventory of open-source software and worked to facilitate data-exchange between free tools from INPE (TerraLib), the Earth observation community of 52North and VITO/European Commission (Joint Research Centre) (e.g. SPIRITS); see [www.agricab.info/Achievements/Documents/AGRICAB\\_WP22\\_Tools.pdf](http://www.agricab.info/Achievements/Documents/AGRICAB_WP22_Tools.pdf)
  14. GFOI (Global Forest Observation Initiative) produced methods and guidance on the integration of satellite and ground based data for forest monitoring and estimation of greenhouse gas fluxes, and is now preparing training material (already used by SilvaCarbon); see [gfoi.org/capacity-building](http://gfoi.org/capacity-building);
  15. SilvaCarbon is the US contribution to GFOI aimed at improving forest carbon monitoring. It has now expanded from South America to South-East Asia and Central Africa (<http://swp.gmu.edu/silvacarbon/node/30>);
  16. CODATA (Committee on Data for Science and Technology; (<http://www.codata.org>) organizes workshops on Open Data for Science and Sustainability in Developing Countries ([codata-pastd.org](http://codata-pastd.org)), training in Big Data Science, International Conferences on Data Sharing and Integration ([scidatacon2014.org](http://scidatacon2014.org)), and has a working group on “Early Career Data Professionals” ([codata.org/working-groups/early-career-data-professionals](http://codata.org/working-groups/early-career-data-professionals));
  17. EnerGEO built a knowledge portal to assess energy-related impacts. It also held summer schools to facilitate the dialogue between policy-makers and researchers, stimulate new thinking on energy planning, taking different development pathways into account. Follow up should be organized through EU activities contributing to AfriGEOSS and the Bioenergy Atlas for Africa ([energeo-project.eu](http://energeo-project.eu));
  18. “Bringing GEOSS Services Into Practice” Workshops aim at teaching how to configure, use and deploy open-source software to set up a spatial data infrastructure (SDI; <http://www.geossintopractice.org>). Trainees learn how to publish and share data using OGC/ISO standards and register services into GEOSS. Material (tutorial on iTunesStore and Google Play Books, virtual machine) can be downloaded from [unige.ch/outils/limesurvey2/index.php/survey/index/sid/973347/newtest/Y/lang/en](http://unige.ch/outils/limesurvey2/index.php/survey/index/sid/973347/newtest/Y/lang/en);
  19. EU FP7 EOPOWER aims to create conditions for sustainable economic development through increased use of Earth observation products and services for environmental applications (<http://www.eopower.eu/>);

20. EU FP7 IASON aims to establish a permanent and sustainable network of scientific and non-scientific institutions, stakeholders and private sector enterprises from the EU and developing countries located in the Mediterranean and the Black Sea regions ([iason-fp7.eu/index.php/en/](http://iason-fp7.eu/index.php/en/));
21. CEOS Working Group on Capacity Building & Data Democracy (WGCapD) and EOPOWER are pursuing the Capacity Building Inventory Project (compiles ongoing and planned capacity-building projects around the world). The collected information and material will populate the GEOCAB Portal and be made freely available to stakeholders to coordinate efforts and inform future planning;
22. CEOS Visualization Environment (COVE) provides a browser-based suite of tools for searching, analyzing and visualizing actual and potential global satellite sensor coverage. It is free and open and has been heavily utilized for data acquisition planning and coverage assessments for CEOS initiatives as well as many satellite calibration and validation activities. The tool includes over 240 missions and 647 mission-instrument combinations (<http://www.ceos-cove.org>);
23. GEOGLAM (Global Agricultural Monitoring Initiative) aims to reinforce the capacity to produce and disseminate relevant, timely and accurate forecasts of agricultural production at national, regional, and global scales. The capacity building component will provide technical and institutional training, training of trainers, methodological guidelines and tools, facilitated access to Earth observations, and expert advice and support ([earthobservations.org/geoglam\\_cb.php](http://earthobservations.org/geoglam_cb.php));
24. On Performance Indicators, a framework has been developed to qualitatively measure the progress of Capacity Building in the frame of GEO and GEOSS.

#### *Tools and open-source software*

The Earth observation community (<http://52north.org>) released free and open-source software to **process data received through satellite broadcast** (e.g. **GEONETCast**, ESA Data Dissemination System) or downloaded online. Related capacity building information, hands-on exercises and sample data are freely available through a portal registered in the GEOSS Common Infrastructure (<http://www.itc.nl/Pub/WRS/WRS-GEONETCast>).

Brazil (INPE) further developed TerraHidro, a distributed **hydrology modeling system** created to design Geographic Information Systems (GIS) applications for water flow in hydrographical basins. The latter will align with the DEM (Digital Elevation Model) project developed with CEOS WGCapD.

Training on the use of the open source software for **deforestation monitoring** “TerraAmazon” continued. An agreement was signed between Brazil (INPE) and the Development Bank of Latin America (CAF) to elaborate training material and video-classes.

### **2.3 ID-03 Science and Technology in GEOSS**

A **GEOSS Science and Technology (S&T) Service Suite** (GSTSS) has been developed, including the GEOSS S&T Portfolio, a Meeting Portal, an Outreach library, a forum for discussion of research on Earth observation systems, and a user feedback utility. The GSTSS is available at <http://www.gstss.org> and is partly based on deliverables of the EU-funded project EGIDA. The Meeting Portal allows coordination and documentation of GEO-related sessions and presentations at major international S&T meetings. Outreach material will be added to the Outreach Library of the GSTSS. The comprehensive user-feedback utility allows users of GEOSS and Earth observation data to evaluate services and datasets and provide comments and reviews.

The **GEOSS Portfolio for Science and Technology** has been populated and features “compelling examples” of GEO activities, projects, and Work Plan Tasks that demonstrate GEOSS benefits for



science and technology communities across Societal Benefit Areas (see [gstss.org/portfolio](http://gstss.org/portfolio)). The related website notes that the portfolio shows how products accessible through the GEOSS Common Infrastructure work for S&T communities.

Outreach activities include preparations for the 3rd GEOSS **Science and Technology Stakeholder Workshop**: Navigating Sustainability on a Changing Planet, March 22-24, 2015, Norfolk, USA; and the 4th GEOSS Science and Technology Stakeholder Workshop: Concepts, Technologies, Systems and Users of the Next GEOSS, March 24-26, 2015, Norfolk, USA.

## 2.4 ID-04 Building a User-Driven GEOSS

The **User Requirements Registry** (URR) was further developed as a component of the GEOSS Common Infrastructure (GCI). The URR is for the collection of user-related information. Its primary objectives are to enable users to guide GEOSS implementation, and establish and sustain an ongoing **dialogue with user communities** (feedbacks on experience). There are still technical issues that need to be addressed, however the URR is showing great potential. IEEE will be working closely with the URR developers to ensure smooth incorporation into the GCI.

CEOS and ESA produced a new version of the **Earth Observation Handbook**. This includes comprehensive information about various Earth observation activities and a **catalog of the world's satellites and missions**.

The **Earthzine** online publication (<http://www.earthzine.org/>) continued to grow and evolve. Primary objectives include (i) **transfer knowledge** to professionals as well as to the general public; (ii) increase interaction and engage relevant communities into GEOSS implementation; (iii) develop mechanisms for coordinating **user requirements, feedback and engagement** across all Societal Benefit Areas; and (iv) increase **awareness amongst policy and decision makers**, especially in **developing countries**, on the benefits from Earth observation and the need to support capacity building for Earth observation integration into decision making.

Numerous **outreach** activities were held in 2013 including: (i) 1-day user forum on "**Societal impacts and benefits of improved environmental and geospatial information**", Geospatial World Forum, Rotterdam, Netherlands, 15 May 2013; (ii) 2-day conference on "**Big Data**", Rome, Italy, 6-7 June; (iii) 2-day workshop devoted to GEO outreach to the wider Balkan area, Novi Sad, Serbia, 19-20 September, 2013.

## 2.5 ID-05 Catalyzing Resources for GEOSS Implementation

In **Southern Africa**, activities focused on **road shows** (communities of practice, students), elaboration of success stories, and establishment of local nodes for capacity building and resource mobilization. Activities in French-speaking Africa are dedicated to the organization of **training and promotion activities** in the different regions, which are divided in 3 categories related to the level of advancement in Earth observation. Dissemination activities in Africa also serve to promote **AfriGEOSS**.

In the Czech Republic, **dissemination activities** continued while they started in Slovakia. Focus was on national parks (science valorisation for environmental management) and education. In **Poland**, the website for Earth observation resources was established. Promotion activities were carried out, with **webinars, science festivals**, and the **space app camp** success story.

In **Turkey**, activities focused on the exploitation of the new satellite RASAT and the organization of a conference on Earth observation for the Asia and Pacific region. Dissemination and promotion were carried out in Turkey and will be expanded to other Turkish-speaking areas. The Permanent Networking Facility for the Balkans was enhanced and a Balkan Liaison Office will be established shortly.

In the **Black Sea** region, a number of activities were organized to promote the use of tools developed in the enviroGRIDS FP7 project, including the development of an **online platform**. Two **success stories** on the accession of Georgia and Armenia to GEO were published.

In **Latin America**, activities were organized that focused on **disaster and emergency management**. A database was established and **networking activities** were organized together with international/regional organizations active in disaster management. Several workshops on the use of space technology, open data and early warning for disaster reduction were organized.

With regard to **GEO engagement with the private sector**, activities were supported (promotion at Geospatial Middle East Forum, special day at Geospatial World Forum, and a workshop on the European perspective on engaging the private sector in GEO). Links were established and strengthened with a number of international organizations that are interested in Earth observation applications, such as disaster management, **food security** and water resources management.

GEO was well represented in an expert meeting on enhancement of the use of remote sensing in **water programmes and projects of the World Bank**. Active participation took place in several events to cooperate more closely with ICPDR (International Commission for the Protection of the Danube River) and BSCP (***Black Sea Contingency Plan***), and with UNEP (to improve access to Earth observation resources in Africa).

Two CARAVAN workshops were organized for the **promotion of Earth observation**, one in Rabat, Morocco and the other in Thessaloniki, Greece.

In the framework of the EOPOWER project, an **impact assessment methodology** was developed. The methodology includes a scheme for positioning the product or service (current economic model or environmental accounting), a number of non-technical indicators and an assessment of the business environment. **Marketing toolkits** on agriculture, water management, environmental management, **energy and mining, climate change**, disaster management and marine resources were updated and improved.

### 3 INFORMATION FOR SOCIETAL BENEFITS

#### 3.1 SB-01 Oceans and Society: Blue Planet

Blue Planet is collaborating with the European Commission (EC) and North America (Canada and the USA) in its efforts to promote a **transatlantic initiative in ocean observing**. Blue Planet has been recognized by the EC as a viable platform on which the **cooperation** could be based, and the EC and Blue Planet appeared together in a joint side event at the **GEO-X Plenary** (Geneva, 16 January 2014).

The Europe-funded FP7 project GEO-WOW has achieved progress in developing applications and **integrating ocean data streams** into the GEOSS Common Infrastructure. The main focus is on ocean assessments and ecosystem applications ([www.geowow.eu](http://www.geowow.eu)).

Progress continues on inter-comparison and validation of **ocean forecasting systems**, observing system evaluation, and coastal & shelf-seas forecast model coordination. Activities mainly relate to the **Global Ocean Data Assimilation Experiment (GODAE)** OceanView, JCOMM Operational Ocean Forecasting Systems (ETOOFS), POGO, and regional plans such as Copernicus MyOcean and SOOS (Southern Ocean Observation System). In the context of GODAE Ocean View, several teams have been established to coordinate activities with the meteorological and oceanic communities. Topics include Short to Medium Range Coupled Prediction, **Marine Ecosystem Prediction**, and Coastal and Shelf Seas.

A **Blue Planet white paper** has been developed that includes a mission statement, detailed structure, governance, added-value and resource mobilization for the initiative. A **steering committee** for Blue Planet has been formed with representation from the Component Leads, as well as from agencies and institutions with an interest in the success of the Blue Planet.

The committee's Terms of Reference are designed to: (i) Oversee and guide the evolution of the Blue Planet Task; (ii) Promote the Blue Planet in appropriate international scientific fora; (iii) Constitute the governance structure for the Task; (iv) Promote **societal applications** of ocean observations; (v) Facilitate **interconnections** between elements of Blue Planet; (vi) Aid **delivery of benefits to society** from Blue Planet; and (vii) Assist in **securing a resource base** for execution of the Blue Planet Task.

A Blue Planet Steering Committee Meeting was held on 30-31 July, 2014 (Geneva, Switzerland). Topics of discussion included: **governance** and the role of the Steering Committee; progress in each of the Blue Planet Components; and Blue Planet's broader **engagement** with the GEO community and other international programmes and organizations. The GEO "Oceans and Society: Blue Planet" **Book** was published ([cambridgescholars.com/oceans-and-society](http://cambridgescholars.com/oceans-and-society)).

Australia took the lead to organize a symposium for the Blue Planet in May 2015 (including provision of some funding). The Antares network (the Latin American node of ChloroGIN; [www.chlorogin.org](http://www.chlorogin.org)) was also successful in **mobilizing major funding** from the IAI (Inter-American Institute for Global Change Research).

In collaboration with the Nippon Foundation, POGO organized regional research projects funded at about \$30K per annum (usually coastal). At present, POGO has projects in **Latin America, India and Sri Lanka, SE Asia, and Africa**.

#### 3.2 SB-02 Global Land Cover

The GEO Global Land Cover team is working to improve **coordination of land cover activities around the globe**. It seeks to develop an international network where GEO Members can express their needs for land cover products and contribute mapping and monitoring efforts. Through its activities, the Land Cover team aims to meet the product needs of numerous stakeholders including environmental agencies, science (climate) communities, national mapping agencies, commercial users, and UN Conventions.

China (NASG), USA (Univ of Maryland, USGS), ISPRS, ESA, EC (JRC) and partners are advancing the production of **global land cover products at high-resolution** (both temporal and spatial: annual and **30m** resp). Precise mapping (30m) of global open water has been released after validation for 2000 and 2010. The complete Global Land Cover dataset will be released after extensive validation in late 2014.

The **ESA Climate Change Initiative** is progressing towards the production of data to support the monitoring of land cover as an **Essential Climate Variable (ECV)**. **First products**, produced under the leadership of Belgium (Univ Louvain), include: 3 global land cover maps (corresponding to the 2000, 2005 and 2010 epochs); 3 global land cover condition products (on NDVI, snow and burnt areas); surface time series for the whole MERIS archive (made of 7-day composites); and a SAR-based global water bodies product. The GOFC-GOLD Land Cover Office and Wageningen University participated actively in the validation of these land cover ECV products (see [www.esa-landcover-cci.org/](http://www.esa-landcover-cci.org/)).

**Landsat 8** is providing continuous and consistent data for land cover mapping worldwide. ESA has launched the first satellite of the Sentinel 1 series (C-band SAR) and is working on the **Sentinel 2** satellite mission (to be launched in 2015). Sentinel 2 will provide **10, 20 and 60m spatial resolution optical data** with 5-day global revisit time (2 satellites). It will also feature additional bands for detecting the “red edge” for leaf chlorophyll concentrations and thereby improve current global land cover products.

IIASA continued to develop the **Geo-Wiki** – a geospatial Wikipedia that uses a growing body of satellite imagery, Google Earth as a platform, and crowdsourcing as a mechanism for collecting and verifying data ([geo-wiki.org](http://geo-wiki.org)). To develop a solid map database, the Geo-Wiki project turned to gaming through “**Cropland Capture**” – a game built on a simple idea: players travel through satellite images of the Earth looking for arable land and collect points ([geo-wiki.org/games/croplandcapture](http://geo-wiki.org/games/croplandcapture)). Gamers help scientists not only find global crop cover, but also improve the available products and verify the maps. In addition to Cropland Capture, Geo-Wiki runs crowd-sourcing campaigns to help answer specific questions such as **land availability for biofuels, wilderness mapping and land grabbing**.

The concept and architecture of a collaborative and dynamic **Global Land Cover Information Service System (GLC-ISS)** is being explored (a concept paper has been developed). Such a web-based service system would be established by linking available global, regional and local land-cover resources and would contribute by providing online dynamic services (e.g. for validation).

GOFC-GOLD (Land Cover Office) in partnership with the USA (Boston University) and CEOS (WGCV land validation subgroup) is developing an **independent and updated validation database for global land cover products**. The database is based on multi-spectral, very high spatial resolution satellite images that are photo-interpreted. In addition, GOFC-GOLD is working on an online data portal to make available additional validation data produced by different partners (e.g. EC Joint Research Centre, ESA Climate Change Initiative). Additional datasets will be made available in the coming months/years ([www.gofcgold.wur.nl/sites/gofcgold\\_refdataportal.php](http://www.gofcgold.wur.nl/sites/gofcgold_refdataportal.php)).

Also, EEA is developing and testing a methodology to **augment existing global validation data** with continental, regional or national data. In a first pilot, EEA will contribute to the verification of the European parts of the Chinese 30m open water product in 2014-2015.

With regard to Africa, the EC (JRC) is advancing on the (i) capturing of land-cover conversions and ecosystem disturbances at 30m resolution; (ii) validation of test sites (checked with a network of African specialists); and (iii) definition and processing of **land cover standards and change** in the African region.

In parallel, the **working group on Land Cover for Africa** is developing in the framework of the **AfriGEOSS** initiative. The initial aim of the group is to contribute to the development of the **30m resolution map for Africa** bringing together users and providers from all the African Regions.

With regard to **capacity building**, several GOF-C-GOLD regional network meetings have been organized on data sharing and capacity development; Science Education through Earth Observation for High School projects. The **2nd GEO Land Cover meeting** will be held in Berlin, Germany as a side-meeting to the EARSeL-NASA Conference (March 2014). This workshop will aim to discuss progress with an emphasis on the development of the GEO Land Cover data portal and related contribution to the **GEOSS DataCORE**.

A special issue on Global Land Cover Mapping and Monitoring is under preparation for the ISPRS Journal ([journals.elsevier.com/isprs-journal-of-photogrammetry-and-remote-sensing/call-for-papers](http://journals.elsevier.com/isprs-journal-of-photogrammetry-and-remote-sensing/call-for-papers)). The special issue intends to shed light on progress, challenges, and **opportunities for mapping and monitoring global land cover** conditions at various scales, particularly at 30m resolution.

### 3.3 SB-03 Global Forest Observation

The activities of the Global Forest observations initiative (GFOI) are organised under **5 components**. These are the Space Data (led by CEOS, Australia and Norway), Methods and Guidance Document (led by Australia), Capacity Building (led by the USA), Research & Development (led by Norway) and the GFOI Office (supported by Norway and Australia).

#### *Space Data*

CEOS set up the Space data Coordination group (SDCG) to assist GFOI in the space data acquisition and provision. CEOS approved the Baseline Global Acquisition Strategy for the Global Forest Observations Initiative in March 2013. This **commits the CEOS agencies** to acquire core data annually for an expanding list of countries starting in 2013 and with global coverage by 2016 (see Table below). The data acquisition for 2013 was completed successfully.

This baseline strategy provides for **coordinated global data acquisition strategy** involving a number of core data streams that can be shared openly and acquired free-of-charge for GFOI purposes. This involves **systematic and sustained wall-to-wall acquisitions of forested areas**, globally repeated on timescales consistent with national reporting commitments and the requirements of national forest information systems - at least annual monitoring **in support of biennial reporting for developing countries under REDD+ provisions**.

This provides the default forest observations data **for all countries** without specific technical requirements, heritage or data preference (e.g. among Landsat, Sentinel 1 and 2 as they become available, and other potential sources such as CBERS-3 and -4 and RADARSAT).

The second element of SDCG, **Space data Services**, was agreed by CEOS in 2014. This covers Regional GFOI Space Data Workshops; Impartial National Space Data Needs Assessments; National Historical Coverage Reports; Ensured On-going Coverage; Satellite Data Discovery, Assembly & Delivery; and Cloud Storage, Processing, and Analysis of Satellite Data. These services will be available to countries as needed and an implementation plan for rolling out the Space Data Services was agreed. The third element of the SDCG, data for R&D, is under development.

#### *Methods and Guidance Documents*

The first **GFOI guidance document** was presented to GEO-X in 2014. Since then GFOI has been promoting the use of this document. Trial use of the document in Ghana together with its incorporation into capacity development is under way. Additional supporting material is also being produced with the first module published on the GFOI web site ([gfoi.org](http://gfoi.org)). The development of a second version by the beginning of 2016 based on feedback on its use and technical and scientific developments has started.

### *Capacity Building*

National capacity building activities have also continued to progress. Regional capacity building workshops have been organized in connection with the **US Silvacarbon** program. Workshops in **Central Africa and South-East Asia** have taken place in 2014, extending the programme from **South America** where technical collaboration and workshops continue. Some additional support and capacity building has also been provided under bilateral support provided by Australia and Norway. Information sharing with FAO and collaboration between GFOI and FAO capacity building programmes is continuing.

### *Research & Development (R&D)*

Work on the **R&D** component has continued with the production of a review of the R&D needs of countries in order to implement practical national forest monitoring and MRV systems. This was widely reviewed by experts and country representatives and the final document released. This, together with the Methods and Guidance Document will form the basis of an R&D plan to be finalised in 2014. A series of technical workshops on areas of R&D needed to allow the full implementation of National Forest Monitoring Systems has started with a 1<sup>st</sup> workshop in Woods Hole, USA, on sensor interoperability in June 2014, and a second on monitoring forest degradation in Wageningen, Netherlands in October 2014.

### *GFOI Office*

The main aim of the **Global Forest Observation Initiative Office** is to better coordinate the various activities of GFOI and to better coordinate GFOI with related activities undertaken by other organisations such as FAO and the World Bank.

Through the year, the Lead Team met 3 times and the Advisory committee met once to discuss the best way for GFOI to move forward. These meetings established that GFOI is best placed to support other organisations that are already working with countries such as FAO and **World Bank**, bilateral support arrangements and possibly NGOs. The GFOI office has also been strengthening links with **UNFCCC** and **IPCC**.

## **3.4 SB-04 Global Urban Observation and Information**

The Task Team led by the United States (Indiana State University, NASA, NOAA), China (Tsinghua University), European Commission (EC-JRC), Germany (DLR), and Italy (University of Pavia) is working towards the implementation of an **Urban Supersites initiative**. Eight mega-cities have been selected as Urban Supersites, namely Los Angeles, Atlanta, and Mexico City in North America; Athens, and Istanbul in Europe; Sao Paulo in South America; Beijing, and Hong Kong in Asia.

Activities include (i) reconstructions for assessing mega-cities development (e.g. **urban sprawl**); (ii) world-wide **inventories of human settlements** based on satellite data; and (iii) global urban morphological databases for urban monitoring/assessment and climate modeling.

In the future, surveys will be conducted to assess the magnitude and dynamics of the urban “heat island” effect, particularly in developing countries. Global standards and requirements for the acquisition and validation of products will also be developed. The website including a data repository for the Urban Supersite will further evolve (see Los Angeles prototype [indstate.edu/cuec/UrbanSupersites/home.html](http://indstate.edu/cuec/UrbanSupersites/home.html)).

Five Groups are generating Global Human Settlement Layers using satellite data:

- The European Commission (JRC) has contributed its whole image repository for information extraction (Global Human Settlement Layer (GHSL) project). This data (derived from fine-scale optical images) cover 100’s of millions of km<sup>2</sup> with resolution ranging from 0.5 to 100m;

- Sweden (KTH) and Italy (University of Pavia) have developed an “Urban Extractor” to map global urban extent at 30m resolution using ENVISAT or Sentinel-1 SAR data;
- Germany (DLR) has produced a time-series analysis (1975-2010) describing the spatio-temporal development of **26 mega-cities**, also setting up a global data base of binary settlements masks (Global Urban Footprint) derived from SAR data of the TanDEM-X mission (grid cell size: ~50x50 m);
- Japan (GEO Grid/AIST, University of Tokyo) has developed the ASTER Global Urban Area Map (AGURAM). 3734 cities of more than 0.1 million people urban area have been mapped using ASTER (15m). Gaps will be filled using PALSAR data;
- The US (NOAA National Geophysical Data Center) have produced global radiance calibrated VIIRS low light imaging products: 1) nightly, 2) monthly, and 3) annually. NGDC is still developing algorithms for producing research quality **night-time lights**, with background noise, fires, and aurora removed.

The US (NASA) are conducting an interdisciplinary science project combining satellite data and models to assess the **impacts of urbanization on the continental United States surface climate**. Two observation-based and two scenario-based maps are being developed to characterize distant-past (pre-urban), recent-past (2001), present (2010) and near-future (2020) land-cover and land-use including urbanized areas. Impacts on the US surface climate will be simulated using a NASA modeling test-bed that includes a suite of land surface models and a weather forecast model.

A collaborative project called “Global Urban Remote Sensing Laboratory (GURSLab)” is under development. This project aims at developing an **on-line processing** (urban areas extraction, basic image processing, and key metrics), **visualizing, and data sharing tool**.

This tool can select any urban region for processing and can **integrate satellite data of different sources, resolutions, and sensors with in situ field measurements**. It will provide globally distributed data (Earth observation and derived products) by developing requirements for global urban monitoring and assessment in terms of data products and expectations for data validation, archiving, update and sharing.

### 3.5 SB-05 Impact Assessment of Human Activities

Three Europe-funded FP7 projects contributing to the **impact assessment** of human activities have been completed in 2013: (i) **EnerGEO** (Monitoring and assessment of the environmental impact of energy use; [energeo-project.eu](http://energeo-project.eu)); (ii) **EO-MINERS** (Earth Observation for Monitoring and Observing Environmental and Societal Impacts of Mineral Resources Exploration and Exploitation; [eo-miners.eu](http://eo-miners.eu)); and (iii) **ImpactMin** (Impact monitoring of mineral resources exploitation; [impactmin.eu](http://impactmin.eu)).

Products delivered include two EnerGEO applications: One to support decision-makers and private companies in assessing the **environmental impact of offshore wind farms** in Northern Europe. A portfolio of maps enables users to produce a geo-localized life-cycle-assessment of offshore wind farms. The assessment takes into account water depth, distance to coast and harbors, and potential electricity production for the North Sea and the northern Atlantic Ocean.

The second application aims to provide information on **suitable location**, and the appropriate justification, for the **installation of solar power plants in Europe**. This takes into consideration irradiance, slope of the terrain, land use, distance to infrastructure, electricity grids and electricity consumers.

EnerGEO has also delivered a **Platform of Integrated Assessment** (PIA) aimed at assessing environmental and health impacts by computing and gathering key information on human activity for different energy scenarios over the next 50 years. The PIA focuses on annual assessments for 3 pollutants: Particulate Matter (PM2.5), **Ozone**, and Greenhouse Gases. The PIA can be accessed at [http://viewer.webservice-energy.org/energeo\\_pia/index.htm](http://viewer.webservice-energy.org/energeo_pia/index.htm).

The EnerGEO **Knowledge Geoportal** has been registered as a Community Catalogue in the GEOSS Registry ([geoportal.energeo-project.eu](http://geoportal.energeo-project.eu)). Via this portal, web services from the wind pilot, solar pilot, and **integrated assessment** can be accessed. EnerGEO results have been disseminated through the 3<sup>rd</sup> **Summer School** and Final Event of the project (TNO, Utrecht, Netherlands, 15-25 October 2013). The Summer School was dedicated to the “environmental impact assessment of a **transition to renewable energies**”. IIASA has advanced the organization of an E-training on GEOSS ([balkangeo.net/index.php?option=com\\_content&view=article&id=111&Itemid=89](http://balkangeo.net/index.php?option=com_content&view=article&id=111&Itemid=89)).

In geo-resource exploration and exploitation, EO-MINERS has developed a set of integrated products to assess and/or monitor the **environmental/societal footprint of mining activities** and associated risks over three demonstration sites: Czech Republic (Sokolov lignite open pit), South Africa (Mpumalanga coal fields) and Kyrgyzstan (Makmal gold mine and processing plant).

Products address various environmental issues e.g. **surface run-off and drainage contamination** by mining and ore processing, geotechnical hazards and ground instability, underground coal fires, contaminated water ingress, **mud-flow extension** associated with dam failure, surface water quality, forest health, and contamination by **dust transportation**.

Products have been introduced to local stakeholders (**mining representatives, local communities** and authorities) during on-site workshops to get feedback. All products and methods are available at the project web site ([www.eo-miners.eu](http://www.eo-miners.eu)). ImpactMin has also issued an e-training programme to facilitate the dissemination and use of the project's results. The e-training programme is available free of charge at <http://impactmin.geonardo.com/>.

With regard to **fossil fuels**, integrated assessment models have been developed to design and evaluate mitigation strategies for fossil fuels installations. A pilot is underway to link fossil-fuel particulate matter, **ozone and mercury emissions** to atmospheric levels of air pollutants.

A **working group on coal and environment** is under development as part of the Energy Community of Practice. Participants are experts from academia and the private sector and regional/international organizations. The first meeting of the working group was held on January 16<sup>th</sup> 2014 during the Ministerial Week in Geneva, Switzerland.



## AGRICULTURE

### Supporting sustainable agriculture and combating desertification

#### 3.6 AG-01 Global Agricultural Monitoring and Early Warning

The GEO **Global Agricultural Monitoring initiative (GEOGLAM)** is delivering on a number of fronts (<http://earthobservations.org/geoglam>). Since August 2013, it publishes on an operational basis, the monthly **Crop Monitor Bulletin** as part of the Agriculture **Market Information System (AMIS) Market Monitor** (see [www.amis-outlook.org/amis-monitoring](http://www.amis-outlook.org/amis-monitoring)). The Crop Monitor Bulletin is a multi-agency effort coordinated by the US (University of Maryland) with over 30 agencies participating. A new web interface was developed to share/collect crop condition information from the Crop Monitor partners and to allow comparison in time and allow annotation for areas of interest ([geoglam-crop-monitor.org/](http://geoglam-crop-monitor.org/)). This activity won the ESRI SAG (Special Achievement in GIS) award in July 2014.

Improvements to the Crop Monitor were also implemented to synthesize crop conditions. The new presentation includes 1 **crop condition map** synthesizing information for all 4 AMIS crops (wheat, maize, rice and soybeans), and pie-charts with sectors representing the main countries share of total AMIS production (5-year average), with colors according to crop conditions, and in case of bad conditions, symbols showing the reason (wet, dry, hot, cool, wind damage) behind these conditions.

**Two new projects** contributing to GEOGLAM were launched:

- (i) ESA-funded **Sentinel-2 for Agriculture**, coordinated by Belgium (Univ Catholique Louvain);
- (ii) Gates Foundation-funded **STARS**, coordinated by ITC and focused on the application of remote sensing in support of small holders in Africa and Asia.

The **CEOS Acquisition Strategy for GEOGLAM** was updated and refined by the Ad Hoc Team for GEOGLAM, and will be put forth to the CEOS Executive Committee in October 2014 (Tromsø, Norway). Numerous meetings were held on data coordination for GEOGLAM and data dissemination systems prototyping. These included 2 full days in Frascati in February (hosted by ESA), and a side meeting at the CEOS SIT Technical Meeting in Montpellier in September. The Ad Hoc Team's data coordination activities focused on GEOGLAM pilot studies, Asia-RiCE regions, and JECAM sites, with plans to expand data coverage to SIGMA countries as well, as implementation progresses.

The review process of the **GEOGLAM Implementation Plan** was initiated in July 2014. A 1<sup>st</sup> revised draft should be made available 2 weeks in advance of a dedicated meeting (Beijing, China, 20-22 Oct 2014), the same week as a meeting of the SIGMA European research project.

**Four strategic GEOGLAM meetings** were organized in 2014:

- JECAM (Joint Experiment on **Crop Assessment and Monitoring**, Ottawa, Canada, 21-23 July) to request wider access for JECAM partners to CEOS imagery acquired on JECAM sites, and to harmonize ways of reporting on in-situ measurements (best practices and standards for agricultural monitoring);
- RAPP (**Rangelands and Pasture Productivity**, Paris, France, 23-34 July) to agree on conditions for launching a global monitoring of rangelands;
- CEOS-GEOGLAM Co-Community meeting (Frascati, Italy, 27-28 February);
- US-GEOGLAM Workshop organized by USDA (August 5<sup>th</sup>).

Additional **international meetings** include:

- 5<sup>th</sup> Meeting of the **AMIS Global Food Market Information Group** (Mexico, May 2014) to present and discuss progress on the **Crop Monitoring tool** and its partnership with AMIS. The Crop Monitor received wide support from AMIS representatives;
- **Sentinel-2 for Science Workshop** (Frascati, Italy, May 2014) to prepare for agricultural monitoring applications of the ESA Sentinel2 high-resolution and high-repetition satellite.

## BIODIVERSITY

### Understanding, monitoring and conserving biodiversity

#### 3.7 BI-01 Global Biodiversity Observation (GEO BON)

GEO BON sent out a call for proposals to support the **development of Essential Biodiversity Variable (EBV)** based products and guidelines in April 2014. EBVs are key GEO BON products and there is an urgent need to operationalize the EBV concept through the development of **applicable tools**, data standards and monitoring guidelines.

This call of proposals was very well received by the global biodiversity community which submitted 24 proposals asking for 1.2 million Euro altogether. Following 3 selection rounds, **5 projects** were chosen to bring EBV development forward and contribute to GEO BONs goals. These are:

- Black Listing Invasive Species for Monitoring and Reporting (Monash University, Australia);
- Biodiversity Observing Network in a Box (Colombia's Humboldt Institute);
- Developing Guidelines for Standardised Global Butterfly Monitoring (UNEP-World Conservation Monitoring Center and Dutch Butterfly Conservation);
- Finalizing, Visualizing and Communicating Global Remote-sensing Supported Species EBVs and Change Indicators (Yale University, USA);
- Remote-sensing of Essential Biodiversity Variables (Twente University, Netherlands).

All 5 projects have now started and are making good progress. Four of the projects involve workshops at the GEO BON Secretariat in late 2014 and early 2015.

GEO BON and EU BON also organized a workshop on data standards, work flows, and pilot implementation for the further development of Essential Biodiversity Variables (EBVs). This joint workshop took place at the GEO BON Secretariat in Leipzig (Germany, 30 September - 2 October 2014). Preliminary data types and data sources were discussed to specify, develop, and **prototype first data flows, data standards, and workflows** for calculation of selected candidate EBVs. The outputs of the workshop will enable immediate follow-up for calculating the specified EBVs with available/existing data sets at various scales.

GEO BON further developed the concept of **BON-in-a-Box (BiaB)** and produced an internal white paper. BION in a Box is a **collection of tools, templates, and examples** that facilitate start-up and enhancement of national/regional Biodiversity Observing Networks and help meet national/regional reporting requirements (e.g. CBD, RAMSAR). One of the projects funded by GEO BON and submitted by Colombia's Humboldt Institute (see above), will set up a first framework for BiaB.

GEO BON finalized a **Handbook to assist governments and organizations** in setting up national Biodiversity Observation Networks (BONs). It is hoped to make available a printed/on-line version of the handbook by late 2014.

GEO BON collaborated with the GOF-C-GOLD Land Cover Project Office to develop a **sourcebook on biodiversity monitoring in tropical forests**. The objective is to provide the tropical forest biodiversity monitoring community with a living document (updated every year) that describes methods and standards for the use of remote sensing data and field information in the context of the United Nations Conventions (UNCBD, UNFCCC) and based on the Essential Biodiversity Variables. A recent meeting (London, UK) brought together dedicated remote sensing and tropical forest biodiversity experts.

A new **GEO BON initiative** was launched for a **Global Network of Ecosystem Observatories**. The initiative, led by the UK's Centre for Ecology and Hydrology and the International Long-Term Ecological Research Network (ILTER), will undertake long-term, co-located measurements at appropriate scales for linking drivers, states and impacts on natural capital ecosystems and ecosystem services. A work programme outline was established along with a task group to lead the development of this global network. Next steps are to produce a concept note, agree upon a site database approach (for linking existing databases to a single system), choose relevant EBVs, populate the site database and organize a workshop in 2015.

Another new GEO BON initiative was launched to build a **Marine Biodiversity Observation Network (BON)**. The latter will initially be supported by 3 projects funded by the USA (NASA, NOAA). Participants in these projects will „bootstrap“ the initiative by drafting terms of reference and exploring what other activities, globally, should be asked to join. Together, it is hoped that these activities will form the start of a global marine BON, essentially a federation of regional BONs.

In addition, GEO BON developed a **new strategic plan** and initiated a major update of its current website to make it more attractive and useful to end-users. The governance structure was revised to be composed of a new management and implementation committee and an advisory board (all groups met in June).

The **GEO BON Secretariat was also reshaped**. The GEO BON Steering Committee elected a new Chair (Henrique Pereira, iDiv, Germany), and a new vice-Chair (Mike Gill, Aboriginal Affairs and Northern Development Canada) in late 2013. Since then, the Secretariat moved from South Africa to Germany (Centre for Integrative Biodiversity Research (iDiv), Leipzig, providing funding and space) with Ariane Korn (administration), Christian Langer (web logistics) and Jörg Freyhof (Executive Director).

In 2014, GEO BON undertook many **outreach** activities in international meetings, including:

- EU BON Annual meeting, 30 March-3 April, Heraklion, Greece;
- Lake User Consultation Meeting jointly organized by Diversity II and GloboLakes projects, 19-20 May, Frascati, Italy;
- ESA SENTINEL-2 for Science Workshop, 20-21 May, Frascati, Italy;
- Remote Sensing for Conservation, 22-23 May, Zoological Society of London, UK;
- 8<sup>th</sup> GEO European Projects Workshop, 12-13 June 2014, Athens, Greece;
- Creative-B Conference, 25-26 September 2014, Brussels, Belgium.

In addition, GEO BON was well represented at the 12<sup>th</sup> meeting of the **Conference of the Parties to the Convention on Biological Diversity (COP)**, 6-17 October 2014 in Pyeongchang, Republic of Korea. GEO BON presented its activities in a booth and developed 4 new flyers and other dissemination materials dedicated to this event. GEO BON will also be part of the coming IUCN World Parks Congress in Nov 2014, Sydney, Australia.

## CLIMATE

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

#### 3.8 CL-01 Climate Information for Adaptation

##### *Global Climate Record*

A new project called ERA-CLIM2 will start in January 2015. The project will develop a **new coupled atmosphere-land-ocean reanalysis system** – thereby enhancing ECMWF reanalysis capability. ERA-CLIM2 will complement progress achieved, in the context of the EU FP7 project ERA-CLIM, in modeling, assimilation, collection and preparation of input observations, boundary conditions, and atmospheric forcing data for a comprehensive atmospheric reanalysis of the entire 20th century. Japan (JAMSTEC) produced and disseminated **ocean** reanalysis datasets for the **past 53 years** using 4DVAR assimilation and including biogeochemical data ([www.godac.jamstec.go.jp/estoc/e/top/](http://www.godac.jamstec.go.jp/estoc/e/top/)).

IGBP (Past Global Changes Project; PAGES) has extended the **global paleo-climate record**. Reconstructions of regional climate **over the last 2000 years** have been performed by a network of 9 regional working groups (including one for each continent, one for the Arctic, and one for oceans). Working groups are coordinated through the PAGES 2k Network. The USA (World Data Center for Paleoclimatology) has developed an improved infrastructure for archiving paleo-climatological data and making it available online. Further climate field reconstructions of temperature and precipitation are underway. Global-scale detailed synthesis will be released in 2016.

##### *Weather, Climate and Earth-System Prediction*

WMO (WWRP-THORPEX) and WCRP launched two joint projects: “Sub-seasonal to Seasonal” and “Polar Prediction”. These projects contribute to the common effort of the Numerical Weather Prediction and climate communities to **extend predictability** of current forecasting systems.

The **Subseasonal to Seasonal project (S2S)** aims to improve skills for subseasonal forecasts, quantify uncertainties and develop societal applications. S2S has rapidly become a major international project **leveraging expertise of both the weather and climate communities**. A multi-model ensemble forecast database following TIGGE protocols (see Task WE-01) has been developed.

The S2S community convened at the International Conference on Subseasonal to Seasonal Prediction (10-13 February 2014, Maryland, USA; [emc.ncep.noaa.gov/gmb/ens/s2s/](http://emc.ncep.noaa.gov/gmb/ens/s2s/)) to: (i) Improve forecast skill and understanding on the **timescale of two weeks to a season**; (ii) Promote its uptake by operational centers and; (iii) Foster their exploitation by the applications community.

The **Polar Prediction Project** aims to foster progress on: (i) coupled prediction systems; (ii) integrated approach to polar boundary layer parameterizations; (iii) use of all available polar observations; (iv) quantifying predictive limits for sea ice; and (v) engaging with relevant private sector actors (e.g. the shipping industry); see recommendations from the Polar Prediction Project Workshop (ECMWF, Reading UK, June 2013). The WCRP Polar Climate Predictability Initiative (PCPI) will be implemented in close collaboration with the Polar Prediction Project.

With the termination of the U.S. **TIGGE** archive at NCAR in 2015, ECMWF and China have elected to assume this responsibility and archive TIGGE-formatted variables from NCEP’s Global Ensemble Forecast System (GEFS). The US (NOAA NCDC) will use the GEO umbrella to provide for **interoperability of the archive, and post-processing** necessary to the GEFS data. NCDC will generate 12 TIGGE required variables, and reformat those and 67 other required variables necessary to continue the U.S. commitment to this WWRP/THORPEX/TIGGE and GEO WE-01 and CL-01 Tasks. This new activity will be operational by October 2014.

*Climate Observing Systems and Essential Climate Variables (ECVs)*

Representatives of observing systems and climate research assembled for two days (12-13 Dec 2013, Geneva, Switzerland) to discuss the roadmap for the **next assessment cycle of the GCOS programme**. The Status Report on the Global Observing Systems for Climate (comprised of a “Progress Report” and “Assessment of the **Adequacy of Global Observing Systems for Climate**”) will be prepared for submission to the sponsors and UNFCCC Parties in the course of 2014 and early 2015, to be submitted to the UNFCCC Secretariat in late summer 2015.

The Status Report will document how actions in the 2010 GCOS Implementation Plan have been or are being addressed, reviewing the **overall status of each Essential Climate Variable (ECV)** and identifying gaps. The new Implementation Plan should draw from the Assessment of the Adequacy of Global Observing Systems for Climate and the Progress Report. A draft version of the Plan will be available for public review in October 2015, with finalization in summer 2016 for delivery to the UNFCCC Subsidiary Body for Scientific and Technological Advice (SBSTA).

Within the framework of the **GCOS Cooperation Mechanism (GCM)**, a number of projects focusing on the availability of climate observations made progress or were completed. In addition, several projects, aiming at expanding and improving the GCOS Upper-Air and Surface Networks (GUAN and GSN), continued or were launched. The Report of the 6<sup>th</sup> GCOS Reference Upper-Air Network Implementation and Coordination Meeting (GUAN ICM-6, Greenbelt, USA, 10-14 March 2014), may be found at [wmo.int/pages/prog/gcos/Publications/gcos-180.pdf](http://wmo.int/pages/prog/gcos/Publications/gcos-180.pdf).

A project, led by the UK Met Office, to renovate 11 climate observing stations in **Madagascar** is underway. Funds in support of operations of the GUAN station in Yerevan, **Armenia**, have been provided by Japan (JMA) for 2013 (with a similar amount pledged for 2014). Work is ongoing to procure the necessary radiosondes and balloons, through WMO, for a further 2 years of operations.

The GCM projects in Angola and the Democratic Republic of Congo are yet to be completed. The Report of the 9<sup>th</sup> GCOS Cooperation Mechanism Board Meeting has identified activities for which requests have been expressed, however for which **funding has not been secured** (<http://www.wmo.int/pages/prog/gcos/Publications/gcos-186.pdf>).

A Tropical Pacific Observing System Workshop (San Diego, USA, 27-30 Jan 2014) was organized and co-sponsored by GCOS, GOOS, USA (NOAA), Japan (JAMSTEC), Korea (KIOST), and China (SOA). Objectives were to evaluate requirements for **sustained observations in the Tropical Pacific**, and make recommendations for the evolution of the Tropical Pacific Observing System to meet these requirements in the future. The meeting was prompted by the challenges in sustaining the Tropical Atmosphere Ocean (TAO/TRITON) **mooring array** supported by NOAA and JAMSTEC. In this regard, an evaluation would be timely as scientific applications have evolved, and so have observing systems since the TAO array was established.

The meeting recommended the establishment of a new project to make evolve the **Tropical Pacific Observing System (TPOS)** through to 2020. It also (i) reinforced the need for a TPOS to support ENSO research and forecasting, (ii) identified gaps in the observing system and new requirements, and (iii) highlighted the need for more biogeochemical and biological observations in the future, to address issues such as carbon fluxes, ocean acidification, productivity and biodiversity. Workshop documents and presentations may be found at [wmo.int/pages/prog/gcos/Publications/gcos-184\\_I.pdf](http://wmo.int/pages/prog/gcos/Publications/gcos-184_I.pdf); and [wmo.int/pages/prog/gcos/Publications/gcos-184\\_II.pdf](http://wmo.int/pages/prog/gcos/Publications/gcos-184_II.pdf).

A climate research and technological/capacity development hub named “MCCOE” was established in Indonesia. Japan further implemented an experiment (“INBOX”: **North Pacific Integrated Physical-Biogeochemical Ocean Observation Experiment**) to extend capability of Argo floats, monitor more parameters (Oxygen), and develop biogeochemical mooring observation for regionally-integrated and interdisciplinary ocean observations. A new drifting float was developed, capable of surveying depths of 4000 meters.

General observing networks' **status descriptions** and recommendations may be found in GCOS Reports (see <http://www.wmo.int/pages/prog/gcos/index.php?name=Publications>). All three GCOS Expert Panels (Atmosphere, Oceans, and Land) held face-to-face meetings in 2014. Reports are available at [wmo.int/pages/prog/gcos/Publications](http://wmo.int/pages/prog/gcos/Publications) (gcos-183, gcos-179, gcos-173 resp). The German Met Service (DWD) completed a comprehensive inventory report of the German Climate Observing Systems.

GCOS organized a workshop on “**Observations for Climate Change Mitigation**” (5-7 May 2014, Geneva, Switzerland) in collaboration with GOF-C-GOLD. The resulting report (GCOS- 185) is available online.

The **Global Observing Systems Information Centre** (GOSIC; [gosis.org](http://gosis.org)) continued to be populated. The GOSIC Portal provides access to data and information identified by GCOS, GOOS, GTOS and their partner programs, as well as specialized data access tools such as the GCOS Essential Climate Variables Data Access Matrix. The GOSIC is hosted at NOAA NCDC and supported by the US GCOS Program.

The ESA Climate Change Initiative (CCI; <http://www.esa-cci>) is producing Essential Climate Variables (ECVs) in response to **needs for climate-quality data expressed by UNFCCC**. Thirteen projects are producing ECV data sets; one additional project relies on users (i.e. climate modelling community) to provide feedback on the ECV products. All CCI projects have delivered freely available products that closely address GCOS recommendations for consistent, stable, and error-characterized data sets.

The focus is now shifting to **operational systems for ECV production**, e.g. systems that systematically provide ECVs to global climate observing systems. Strong links have been maintained with the science/modelling community and data users through workshops (e.g. Sea Ice Concentration and Thickness Evaluation Workshop, and Sea Surface Temperature User Workshop on Uncertainty). Data sets are also being promoted through 170+ publications related to the CCI.

#### *Easy Access to, and Use of, Climate Information*

The architecture of the **EC Copernicus Climate Change Service** (C3 Service) was developed. The Service will be organized around 4 complementary blocks: (i) Consistent Climate Data Store, (ii) Sectorial Information System, (iii) Evaluation and Quality Control platform, and (iv) Outreach and Dissemination platform.

Consultations with climate experts and various stakeholders of the C3 Service were held at ECMWF (17-19 Feb and 25-26 June 2014). These provided recommendations regarding the scope and functions of the C3 Service, and paved the way for discussions between the European Commission and ECMWF – with the goal of **ECMWF being authorized to operate the Service from November 2014**.

With regard to climate/weather numerical prediction guidance (from near real-time to seasonal and inter-annual), NOAA NCDC is using the Operational Model Archive and Distribution System (NOMADS) to implement an **Earth System Grid Federation** (ESGF) node contributing to GEOSS. The ESGF is now the WCRP-recommended data and information archiving and dissemination mechanism.

Through ESGF, WCRP is enabling **access to climate model outputs and observational products for all scientists in the world**, with data being available on consistent grids, uniformly formatted and documented. The Observations for Model Intercomparison Projects (Obs4MIPs) initiative for satellite data, and its reanalysis equivalent ana4MIPs aim at fostering seamless weather/climate research. The first WCRP initiatives that use this mechanism are the Coupled Model Intercomparison Project (CMIP), seasonal predictability experiments under the Climate system Historical Forecast Project (CHFP), and the Coordinated Regional Downscaling Experiment (CORDEX).

NOMADS Ensemble Probability Tool (NOMADS EPT) is a web-based application designed for short-term (1-20 day) generation of probability distribution functions (PDFs). Originally developed to easily define thresholds for extreme weather in percent probabilities, the NOMADS EPT is being advanced to operate for **on-line users to interrogate complex multi-model ensembles of seasonal and inter-annual down-scaled climate models**. Given the very high volume of data this tool must operate, advances in computing resources at NOAA's NCDC is being investigated.

The implementation of the Global Framework for Climate Services (GFCS) is now underway. The "Climate Services **Adaptation Programme** in Africa" (launched in Oct 2013) is the first multi-agency initiative to be implemented under GFCS. It will help build integrated frameworks to develop climate services for food security, nutrition and health, as well as disaster risk reduction in **Malawi and Tanzania**.

In the Pacific, the **Caribbean, South Asia** and the Arctic, GFCS is being implemented through a programme funded by Canada. The "Programme for implementing GFCS at **Regional** and National Scales" has as main objective to enhance resilience in social, economic and environmental systems to climate variability and change. The Programme was launched at the Regional consultation for Small Island Developing States in the Pacific that was held in March 2014 in the Cook Islands.

**National consultations** were held in **Belize** (October 2013), **Senegal** (March 2014), Tanzania (May 2014), Malawi (June 2014) and **Dominica** (August 2014) to identify gaps and needs and to establish the **internal coordination mechanisms** needed to ensure effective implementation of the Framework at national level. A Regional Workshop on Climate Services at the National Level for Latin America was held on 28-30 July 2014 in San Jose, **Costa Rica** to facilitate the identification of priorities for the implementation of the GFCS in the region. Additional regional workshops are being planned for South East Europe and the Arab region.

A new initiative to implement GFCS in the Sahel is being launched, directly contributing to the **UN strategy for the Sahel**. The initiative is supported by the Norwegian Refugee Council with deployments of experts to the region.

### 3.9 CL-02 Global Carbon Observation and Analysis

The EU-funded project GEOCARBON is developing a coordinated **Global Carbon Observation and Analysis System** (geocarbon.net). The project supported by the GEO Carbon office that aims at (i) enhancing communication flow among carbon communities and promoting their involvement in the GEO process; and (ii) disseminating project results and turning them into policy relevant information.

New Carbon products include the **2013 update of the global CO<sub>2</sub> budget** (this is a global effort led by the Global Carbon Project with the collaboration of GEOCARBON), and the **Surface Ocean CO<sub>2</sub> Atlas** (SOCAT) database (period 1968-2011), with over 60% more data than the previous version - this is the **world largest sea surface CO<sub>2</sub> database**.

A GEOCARBON **data portal** has been developed to enable **free exchange** of data and products (bgc-jena.mpg.de/geodb/geocarbon/Home.php). The **GEOCARBON data policy follows the GEOSS Data Sharing Principles**.

ESA is proceeding with its **satellite mission BIOMASS** (selected as its next Earth Explorer) which will provide unprecedented measurements of forest biomass to assess terrestrial carbon stocks and fluxes from 2020 onwards.

In addition, efforts continue towards: i) **measuring and evaluating CO<sub>2</sub> and CH<sub>4</sub>** from the ground (FLUXNET, TCCON, WMO-GAW, NOAA/ESRL/GMD CCGG Cooperative Air Sampling Network and other networks) and space (the recently launched OCO-2, GOSAT, SCIAMACHY and other satellite missions); ii) developing, improving and integrating different Carbon Cycle Data Assimilation Systems; iii) reconciling top-down and bottom-up flux estimates across a wide range of spatial and temporal scales; and iv) analyzing calibration and validation requirements for **combining ground- and space-based data** and improving linkages between satellite-derived **land-cover change** products and forest carbon **models**.

The **Carbon Community of Practice** – author of the GEO Carbon Strategy – published a scientific paper on “Current systematic carbon-cycle observations and needs for implementing a policy-relevant carbon observing system”. The latter underlines the need for a global coordinated carbon observing system, and describes the **status of current networks** (including gaps and weaknesses), and a strategy to develop that system, highlighting the main components.

The CEOS Carbon Task Force developed the **CEOS Strategy for Carbon Observation from Space** based on the GEO Carbon Strategy.



## DISASTERS

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

#### 3.10 DI-01 Informing Risk Management and Disaster Reduction

##### *Risk Assessment and Mitigation*

The CEOS Disasters Working Group is coordinating efforts from Space Agencies and stakeholders (ASI, CNES, CSA, DLR, ESA, JAXA, NASA, NOAA, and USGS) towards the implementation of a comprehensive **Strategy for the integrated use of Earth observations from satellite in Disaster Risk Management (DRM)**.

The **Strategy** includes the delivery of three pilots (Flood, Seismic Risk, and Volcano) and the establishment of a Recovery Observatory over the period 2014-2016 to demonstrate the (i) added value of increased CEOS coordination in this area; (ii) benefits of closer ties with users and ease of access to data; and (iii) potential for an increased role of space agencies in DRM in the context of the post 2015 disaster risk reduction framework.

The **Flood Pilot** (co-chaired by NASA and NOAA) will integrate information from existing near-real-time global flood monitoring and modeling systems in a Global Flood Dashboard, and deliver flood mitigation, warning and response products and services through three regional end-to-end pilots (Caribbean, Southern Africa, and Southern Asia).

The **Seismic Risk Pilot** (co-chaired by ESA and DLR) will (i) provide scientists with critical data for the generation of globally self-consistent strain rate estimates and the mapping of active faults at the global scale, (ii) support the full implementation of the Geohazards Supersites and Natural Laboratories initiative, and (iii) develop and demonstrate advanced science products for rapid earthquake response.

The **Volcano Pilot** (co-chaired by USGS and ASI) will demonstrate feasibility of systematic monitoring of Holocene volcanoes, while providing the operational community (such as Volcano Observatories and Volcanic Ash Advisory Centers) with space-based products for reducing the impact and risk from eruptions. CNES will develop a **Recovery Observatory**, whose main objective is to provide a multi-year database to support recovery from catastrophic disasters.

The **GEO Supersites** and Natural Laboratories (GSNL) initiative for open access to high-value seismic and volcanic data continues to progress under the leadership of the new Chair of the Scientific Advisory Committee (elected in July this year). Several Supersites have become **fully operational** thanks to contributions from ESA, CSA, JAXA, ASI and DLR for satellite SAR data, and from the USA (USGS) for GPS and seismic data. Permanent Supersites include: Hawaii, Icelandic volcanoes, Marmara Region, Mt Etna, and Vesuvius (European Supersites are funded by the EC). Four additional proposals (Ecuadorian volcanoes, Piton de la Fournaise, New Zealand volcanoes, and San Andreas Fault) have been accepted by the SAC (considered for adoption by the CEOS Steering group).

The **Global Earthquake Model** (GEM, [www.globalquakemodel.org](http://www.globalquakemodel.org)) and the Supersites initiatives agreed to develop joint pilot activities with the aim of incorporating GEM risk data and models into the Supersites concept. GEM will contribute vulnerability/exposure datasets to selected permanent Supersites. The GEM initiative aims to establish uniform and open standards to calculate and **communicate earthquake risk worldwide**, by developing a global, state-of-the-art and dynamic earthquake risk model, together with the communities exposed to this risk.

With regard to wildfire, activities aim at linking national, regional, and global systems to make spatial data more readily available, through a global wildfire information system of systems. A web prototype **Global Wildfire Information System** (GWIS) will be developed to provide harmonized information (e.g. fire danger, burnt areas, emissions, fuels) – building on initial activities of the GOFC-GOLD Fire Implementation Team and Regional Networks, and complementing ongoing activities.

*Regional End-to-End Pilots*

The GEO Caribbean Satellite Disaster Pilot (CSDP) and the Southern African Flood and Health Pilot (SAFHP) continue to develop a coordinated, timely and needs-based approach to the utilization of Earth Observation data for disaster management. The scope is the **full cycle of disaster management** (from mitigation to warning, response and recovery) from an end-to-end approach (data collection, to analysis, product generation and service delivery).

*Support to Operational Systems*

The International Working Group on Satellite Based Emergency Mapping (IWG-SEM; including JRC, USGS, DLR-ZKI, SERVIR, Sentinel Asia, UNOSAT, UN-SPIDER, ITHACA and SERTIT) released “Guidelines for Emergency Mapping” to advocate for **effective exchange and harmonization of emergency mapping efforts**.

The GEO Secretariat is working with the **International Charter** on Space and Major Disasters to encourage GEO Members to join the mechanism as “**Authorized Users**”. A registration process is currently in place to help validate the ability of national authorities to access and use Charter assets for disaster response, in accordance with Charter operational procedures.

In parallel, the Charter is continuing its effort to organize Authorized Users and Project Managers (PM) **training events**. The goal of these events is to strengthen the Charter’s capability to work with PM from all over the world (PMs coordinate Charter activations and interact with both civil protection users and space agency providers to ensure relevance of information).

Since December 2013, the International Charter on Space and Major Disasters has been **activated 33 times** (as of late August 2014). Metadata related to these activations is available through the Charter metadata catalog at [www.disasterschartercatalog.org](http://www.disasterschartercatalog.org). The catalog allows discovering and browsing a **unique record of over 3000 images**. Besides professional users, the catalog is providing Disaster Risk Reduction scientists with a clear and thorough picture of imagery datasets and related proprietary sources available for their studies and researches.

Secure World Foundation (SWF) and the GEO Secretariat organized a workshop entitled "Disasters Risk Reduction and Earth observations: a GEO perspective" as part of the GEO Ministerial Summit Week in Geneva. The side event brought together some 40 researchers and practitioners from UN Agencies, NGOs, industry, universities and the private sector working on all aspects of the use of Earth observation for disaster risk reduction and management. The main goal was to stimulate discussion between **data/service providers and end-end users**, figuring out feasible mechanisms to enable decision makers, urban/land planners and disasters managers to have access to actionable information useful to their daily work.

## ECOSYSTEMS

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

#### 3.11 EC-01 Global Ecosystem Monitoring

The new **GEO Global Network for Observations and Information in Mountain Environments** (GEO-GNOME) was presented to the GEO-X Plenary. GEO-GNOME will make full use of the partnership framework of GEO, capitalizing on existing efforts and outcomes (such as GLORIA and other global and regional initiatives).

GEO-GNOME aims to provide full and open-access to data and products, scientific results and future climate and environmental projections – fostering **exchange of data and information across different mountain areas** and between scientific communities and stakeholders, in particular local communities and decision makers. A first effort will focus on geophysical data, parameters and products (data from Digital Elevation Models, Numerical Weather Prediction, hydrological and climate models, ecosystem datasets, land cover, forest cover, and hazards maps). Socio-economic information (including tourism data) will be considered at a later stage.

The **NextData** project (<http://www.nextdatapoint.it/>), devoted to climate change in mountain regions, was contributed to GEOSS. The project supported monitoring and research on mountain environment and ecosystems. Italy (CNR), in collaboration with the Gran Paradiso National Park and other regional parks, conducted activities on **population dynamics of selected species**, Alpine lake ecosystems, and changes in resource-consumer relationships.

Italy (Ev-K2-CNR) continued to develop and maintain the **SHARE mountain ecosystems monitoring network**. SHARE (Station at High Altitude for Research on the Environment) is an integrated environmental network of monitoring stations, located in **Europe, Asia, Africa and South America**, providing high-altitude data on the atmosphere and climate. The SHARE and NextData information is openly available through the SHARE GeoNetwork (<http://share.evk2cnr.org/>), which provides a single access point to users.

Close contact was established with the International Network for Terrestrial Research and Monitoring in the Arctic (**INTERACT**), which consists of over **60 circumpolar and northern alpine research stations**. INTERACT helps build capacity for research and monitoring of Arctic ecosystems and biodiversity.

The USA (USGS), RCMRD and other partners (such as AAG and NatureServe) developed a **high-resolution terrestrial ecosystem map of Africa**. Physical and biological information (e.g. land surface forms, lithology, bioclimates, thermotypes) have been merged to provide a baseline for monitoring the impact of human activity (see [http://www.aag.org/galleries/publications-files/Africa\\_Ecosystems\\_Booklet.pdf](http://www.aag.org/galleries/publications-files/Africa_Ecosystems_Booklet.pdf)).

Austria (ZAMG) and partners collected phenological data over Europe and made them available to the scientific community via the **Pan European Phenology Database PEP725** (<http://www.pep725.eu>); whereas a few data records start in the 19<sup>th</sup> century, the majority starts after 1950. PEP725 convened a session on phenology/agrometeorology at the EMS/ECAM meeting (Sept 2013, Reading, UK) together with a follow-up session at the EGU 2014 (Vienna, Austria).

China (NRSCC, MOST) advanced the **Global Remote Sensing Monitoring on Ecosystem and Environment** program ([http://www.csi.gov.cn/index\\_en.html](http://www.csi.gov.cn/index_en.html)), which produces global datasets on ecosystems and the environment available to users worldwide. Ecosystem and Environment reports have been issued, featuring global surface water and terrestrial vegetation growth products. In 2014, four main areas were considered: (i) Urban and Rural Resident Land cover Distribution Between 2000-2010; (ii) Supply Situation of Maize, Rice, Wheat and Soybean; (iii) Large Terrestrial Surface Water areas; and (iv) Growth Conditions of Global Terrestrial Vegetation.

The **ABCC** program was expanded to Germany, Malaysia, ISDE and OGC. A scientific committee was established and the 7th workshop planned for 2014 in Quebec City, Canada. ABCC is a cooperative program of China, Australia, Brazil, and Canada to do a Comparative Study of Global Environmental Change Using Earth Observations. The program utilizes remote sensing data to produce data, tools and information on **snow/ice, grasslands, forests and aerosol variations**.

Contacts were initiated with the **European research infrastructure AnaEE** (<http://www.anaee.com/>). AnaEE is a continental, long-term, integrated research infrastructure for **experimental manipulation in the context of global change** which can provide **quantitative measurement of ecosystem responses to climate and land changes**. Linking AnaEE results with data from observational sites across Europe and GEO will enable models to be scaled-up to larger geographical areas.

Specific plans to include ecosystem models and data analysis methods were initiated, starting with the BioVeL: **Biodiversity Virtual e-Laboratory** in Sweden, which generate analytical resources for analyzing ecosystem data with genetic and species level information, with the goal of providing fields researchers, stakeholders and users with the necessary instruments for data analysis and ecosystem modeling.

Japan (JAMSTEC) exploited field sites for studies of bio-geoscience, including **boreal forests** in Alaska and Siberia, forest and **steppe** in Mongolia, **temperate** forest in Japan, and **tropical** forest in Borneo, which are used mostly as the ground truth data for remote sensing and flux measurements.

With regard to the preservation of World Heritage Sites, UNESCO (International Centre on Space Technologies for Natural and Cultural Heritage under the auspices of UNESCO, HIST) and China (CAS CEODE) promoted the use of an **Atlas of 40 Chinese World Heritage Sites** (up to 2010). This is the first professional Atlas illustrating world heritage sites using satellite and airborne remote sensing data. Collaboration between China (HIST) and Cambodia (APSARA) was established on using Earth observation technologies for monitoring the surroundings of the **Angkor Site**.

A Global Dry-land Observation Network was discussed by UNCCD and USA with the goal of providing global information on **arid and semi-arid ecosystems**; contacts were also established with the ILTER Network for data and information on water-limited ecosystems. In addition, Italy (CNR), France (LMD-ENS) and Israel (Ben Gurion University) conducted activities on **desert and savanna ecosystems** with the goal of collecting data and modeling efforts, and provide climate and environmental change scenarios for these ecosystem types.

Strong links were established with the **LifeWatch** European Infrastructure, which provides access to ecosystem and biodiversity data, data processing tools and virtual laboratories ([www.lifewatch.eu](http://www.lifewatch.eu)). In this framework, special attention is given to **lagoon, coastal and transitional water ecosystems**, with the aim of creating a network of coastal protected areas contributing to the GEOSS DataCORE.

The CAFF (Conservation of Arctic Flora and Fauna; [www.caff.is](http://www.caff.is)) continued the implementation of the **Circumpolar Biodiversity Monitoring Program** (CBMP; [www.cbmp.is](http://www.cbmp.is)), based on the long-term, coordinated, pan-Arctic monitoring of Arctic ecosystems. Development also continued on the **Arctic Biodiversity Data Service** (ABDS; [www.abds.is](http://www.abds.is)) for an online, interoperable and circumpolar data management system that will access, integrate, analyze and display biodiversity information. Other relevant CAFF products include the **Circum Arctic Boreal Vegetation Map** (CBVM; [www.caff.is/flora-cfg/circumboreal-vegetation-map](http://www.caff.is/flora-cfg/circumboreal-vegetation-map)).

A **Side-Event on mountain ecosystems** was held during GEO-X. Ecosystem contributions were also made to the GEO-X “Special Event on Biodiversity”.

## ENERGY

### Improving management of energy resources

#### 3.12 EN-01 Energy and Geo-Resources Management

The **Global Atlas for Solar and Wind Energy** is preparing its extension to all renewable energies (Geothermal energy in 2014, Marine Energies in 2015). The Atlas is the largest-ever initiative to assess renewable energy potential on a global scale ([irena.org/GlobalAtlas](http://irena.org/GlobalAtlas)). Data and web-services have been registered in a catalog developed and operated by France (MINES ParisTech). The catalog has been harvested by the GEOSS Broker and its content made **discoverable through the GEOSS Portal** and the Webservice-energy Portal (<http://www.webservice-energy.org>). The latter is a community portal dedicated to the Renewable Energy domain, giving access to a broad range of resources, web services, and GIS clients.

A **solar mapping** project is estimating solar energy fluxes spanning from 1983 through present. The resulting Atlas will cover 60 N to 60 S at approximately **10 km every 3 hours**. The project is intended to delivery data production system to the US National Renewable Energy Laboratory (NREL) using inputs generated from US NCDC. The International Renewable Energy Agency (IRENA) has also requested the final dataset. The development of a **long-term solar energy resource atlas** using a collection of the world's geosynchronous satellite observations and NOAA AVHRR imager observations has been launched under the **CEOS-coordinated energy activities**. Test data sets for validation have been produced (Mar 2014) to be delivered in June 2014. A presentation on the project progress was given to the American Solar Energy Society in July 2014.

A major EU-funded project was completed, delivering a powerful **decision-support tool**: the EnerGEO Knowledge Geoportal (<http://geoportal.energeo-project.eu/>). The portal brokers information that enables impact assessments of various energy mix scenarios. Users can discover information or register datasets, services or applications. The EnerGEO portal relies on international standards that form the foundation for information exchange based on metadata of spatial and non-spatial resources. It has been tested through a case study on biomass growth in Pakistan.

The EU-funded project ENDORSE developed and demonstrated **ten downstream services** ready to interface with the private sector (<http://www.endorse-fp7.eu/>). This user-driven project builds on Copernicus Core Services (e.g. MACC, SAFER and Geoland2). It addresses (i) energy sources such as the sun, wind and biomass; (ii) electricity **grid management**; and (iii) **building engineering** through daylighting in buildings. Users are part of the implementation team to ensure sustainable and transferable downstream services.

Collaboration on the development of a **BioEnergy Atlas for Africa** continued. South Africa provided ZAR 2 million in initial funding until 2014 and engaged with the International Renewable Energy Agency (IRENA), Germany (DLR), USA (NREL), Brazil (INPE), and Austria (Z\_GIS) through the FP7 Project EnerGEO. First results include data sets published under the BioEnergy Atlas for South Africa, and metadata made available through the GEOSS Broker. Most of these data sets are in the public domain, tagged for inclusion in the **GEOSS Data-CORE**.

A solar training was held in Sophia Antipolis (France) from 22-24 January 2014. This 3-day meeting focused on the use of Earth-observation based solar radiation information (available as GEOSS DataCORE) for **professionals of the solar energy industry**. 32 participants from EU, Africa and Middle East participated in this training.

In July 2014, a workshop on US-based renewable energy activities was held at the Federation of Earth Science Information Partners (ESIP) (Frisco, USA). Participants included representatives from NASA, NOAA/ESRL, NCAR, and NREL. Discussions focused on how to improve outreach to end-users and other non-science decision makers. A follow-up session is planned to support the forthcoming **US GEO 2nd Earth Observation Assessment**.

## HEALTH

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

#### 3.13 HE-01 Tools and Information for Health Decision-Making

A **Malaria Map-room** was further developed by the USA (NASA) and the International Research Institute for Climate and Society (IRI) to produce maps of Seasonal Climatic Suitability for Malaria Transmission (SCSMT). The maps show the number of **months suitable for malaria transmission**, based on climatological averages (e.g. rainfall estimates, MODIS vegetation products at 250m spatial resolution, MODIS Land Surface Temperature). Suitability is defined as the coincidence of precipitation accumulation greater than 80 mm, average temperature between 18°C and 32°C, and relative humidity greater than 60%. The latter are factors of **mosquito development time** as well as an indicator of Plasmodium parasite development within the mosquito vectors (see [iridl.ldeo.columbia.edu/maproom/Health/Regional/Africa/Malaria/CSMT/index.html](http://iridl.ldeo.columbia.edu/maproom/Health/Regional/Africa/Malaria/CSMT/index.html)).

Likewise, a **Meningitis Map-room** is providing information tools for epidemic meningitis ([www.iridl.ldeo.columbia.edu/maproom/Health/Regional/Africa/Meningitis/](http://www.iridl.ldeo.columbia.edu/maproom/Health/Regional/Africa/Meningitis/)). The latter features **observed distribution maps** of meningitis epidemics **during 1841-1999** and **predicted probability maps** of meningitis epidemics. These risk maps are derived from an environmentally-driven model using absolute humidity profiles and land-cover type.

A **Metadata Access Tool for Climate and Health (MATCH)** was further developed by the US Global Change Research Program (USGCRP) as a searchable clearinghouse that provides **access** to metadata for health surveillance, climate, ocean and environmental data sets through a single online portal. MATCH characterizes and provides links to **publicly available US data sets, early warning systems, and tools** related to health impacts of global climate change; it is designed to facilitate and improve the quality of research and data stewardship, and includes points of contact and caveats about data ([match.globalchange.gov](http://match.globalchange.gov)).

#### 3.14 HE-02 Tracking Pollutants

##### *Mercury*

Italy (CNR-IIA) and partners are developing an EU-funded **Global Mercury Observation System (GMOS)** by harmonizing standard operating procedures for monitoring mercury and its compounds in air, precipitation samples, surface water, soil, sediments, vegetation and biota. The sharing of data from this network helps understand temporal and spatial patterns of mercury transport and deposition to, and evasion from, terrestrial and aquatic ecosystems.

The GMOS **monitoring network has been fully established** and historical datasets and metadata have been completed. A **cyber(e)-infrastructure** is collecting **near real-time data** from ground-based sites and a **Quality Assurance/Quality Control** system has been implemented and is undergoing testing. A data portal has been established at [www.gmos.eu/sdi](http://www.gmos.eu/sdi). Key contributors include the UNEP Mercury Programme, the Hemispheric Transport of Air Pollutants Task Force (TF HTAP), the European Monitoring and Evaluation Program (EMEP), MercNet/AMNet initiative in USA, CAMNet in Canada, and other international monitoring and modeling efforts.

Networking activities are carried out that specifically build **individual, institutional and infrastructure capacity** related to GMOS. Increased use of Earth observation in policy and decision making is promoted, encouraging enhanced participation in GEO and GEOSS.

GMOS will directly support the implementation of the **Minimata Convention** that was adopted by a thousand delegates from about 140 nations on 10 October 2013 in Kumamoto, Japan. The treaty seeks to decrease the discharge of mercury into the **air, water and land**, promote proper storage/disposal of

mercury, and **reduce the use/discharge of mercury in artisanal gold mining in developing countries** (a GEF project aimed at monitoring mercury emissions is a direct contribution).

#### *Persistent Organic Pollutants*

UNEP (Stockholm Convention Secretariat), in cooperation with the Czech Republic (RECETOX) and other partners, is leading the implementation of a Global Monitoring Plan (GMP) for **Persistent Organic Pollutants (POPs)**. The GMP aims to support the monitoring of POPs and the effectiveness evaluation of the **Stockholm Convention**.

For the second phase of the GMP (2010-2015), attention is given to gathering baseline data for the **10 new POPs** listed in the Stockholm Convention, in addition to covering existing data gaps and assessing how POPs **concentrations have evolved** since first monitoring reports.

Data on POPs have been collected from both the active and passive air monitoring networks as well as through bio-monitoring programmes. A web-portal is now providing **access to this data and advanced visualization tools** ([www.pops-gmp.org](http://www.pops-gmp.org)).

The Global Environmental Assessment Information System (GENASIS) has been inaugurated by the Czech Republic (Masaryk University) to provide **comprehensive information on contamination of the environment by chemicals** with a focus on persistent organic pollutants (POPs). GENASIS provides up-to-date information on spatial and temporal trends in POPs concentrations in the environment and human tissues, and includes analysis and visualization tools as well as GMP data management systems.

The Stockholm Convention is a **global treaty to protect human health** and the environment from POPs through a range of measures aimed at reducing and ultimately eliminating their releases. POPs are recognized as chemicals of global concern due to long-range transport in the atmosphere, persistence in the environment, ability to bio-accumulate and bio-magnify in ecosystems and significant negative effects on human health and the environment. The POPs listed under the Convention are **pesticides, industrial chemicals** and by-products including dioxins and furans, and other chemicals.

## WATER

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

#### 3.15 WA-01 Integrated Water Information

##### *New Water Initiative*

Concerted efforts have made a partnership with GEO essential to tackle the water **post-2015 development agenda**. This partnership will ensure linkages with agencies that hold key Earth observations (remotely sensed and in-situ) and information, such as US (NASA, NOAA), Japan (JAXA), ESA and CEOS.

To commence this **partnership between GEO and the WHO-UNEP-UNHABITAT** tripartite Secretariat, two meetings have been held (30-31 May 2014 in Tokyo, Japan and 11-12 August 2014 in Washington DC, USA). Objectives were to develop a proposal for a monitoring system based on Earth observations, novel data, data integration, and analysis & interpretation tools; for the proposed UN **Water Sustainable Development Goal (SDG)** with a focus on waste water, water quality and water resources management. The proposal was presented to a special session devoted to the Water SDG during the World Water Week in Stockholm (1 Sept 2014).

Through the preparation of the SDGs, the UN Open Working Group noted a dedicated goal on water encompassing all 3 key areas of the water sector: drinking water and sanitation/hygiene (WaSH); wastewater management and **water quality (WWQM)** and water resources management (WRM).

With the support of the Swiss Agency for Development and Cooperation (SDC), WHO, the UN Human Settlements Programme (HABITAT) and UNEP signed a **collaborative agreement** initiating the next generation monitoring mechanism for WWQM and WRM, complementing the efforts of the WHO/UNICEF Joint Monitoring Programme for water supply and sanitation (see [www.wssinfo.org](http://www.wssinfo.org)) which has been monitoring the WaSH sector since 1990.

##### *Water Cycle Products and Services*

Japan continued to develop the **JAXA Global Rainfall Watch** (<http://sharaku.eorc.jaxa.jp/GSMaP/>) offering **hourly global rainfall maps in near-real-time** (approximately 4 hours after observation). Maps also feature infra-red cloud images merged from Japan (JMA) MTSAT satellite, US (NOAA) GOES satellites and EUMETSAT Meteosat satellites. A JAXA Water Cycle portal has also been further developing to expand access to water cycle data.

The Integrated Global Water Cycle Observations (IGWCO) Community of Practice, in collaboration with CEOS and Japan (JAXA), has developed a **strategy for water-cycle observations in GEO** (delivered at the GEO-X Plenary in 2014). The 10th IGWCO Community of Practice Meeting was held on May 29-30, 2014 (University of Tokyo, Japan). Objectives were to: (i) develop and document ideas for the GEOSS Water Strategy implementation plan; (ii) provide strategies to more strongly engage other SBAs; (iii) propose new approaches and enable commitments to strengthen IGWCO contributions in the areas of **integrated data sets, information systems, capacity development and user engagement**.

##### *Capacity Development and Maintenance*

CIEHLYC, the community for spatial and hydrographic information for Latin America and the Caribbean has been presenting a series of monthly webinars in Spanish since the beginning of 2014. Objectives include: (i) Share information stressing the importance of open access to information and data for the benefit of the Latin American and Caribbean Region; (ii) Find potential applications and collaborations among scientists and decision makers; and (iii) Expand and strengthen the network of research and applications as it relates to the water cycle.



The presentations cover a wide range of Earth observations applications, including remote sensing and in-situ monitoring in the areas of freshwater and oceans. These webinars are also a convenient way for technical people and decision makers in the region to learn about GEO and its scientific and societal benefits.

#### *Water Quality Information*

The “GEO Inland and Coastal **Water Quality**” working group advanced, through a webinar series, timely topics such as Global Observatory of **Lake Responses to Environmental Change** (Globolakes), Global Lakes Sentinel Services (GlaSS), Global Lake Ecological Observatory Network (GLEON), Networking Lake Observatories in Europe (NETLAKE), and Global Lake Temperature Collaboration (GLTC). This activity will continue into 2015.

A GEO Water Quality town hall meeting was held in Perugia Italy on Sept 5, 2014. The purpose of the meeting was to educate and update scientists on the past and current activities. Topics ranged from communication strategies, coordinated research, and organizing a **GEO Water Quality Summit** in Geneva in April 2015.

#### *Information Service for Cold Regions*

The **GEO Cold Regions initiative** is evolving towards facilitating project coordination and data interoperability within GEOSS. A related rationale document has been developed. Involvement of several communities has been strengthened. A LinkedIn group has also been set up and maintained to disseminate information and engage users. GEO Cold Regions was presented at the 2014 Arctic Observing Summit.

The Cold Regions initiative aims to be comprehensive and include **national/international programs and projects over the Arctic, Antarctic, the Himalaya-Third Pole and mountainous cold regions**. Participants include the: WMO Global Cryosphere Watch, US National Snow and Ice Data Center, Sustaining Arctic Observing Networks (SAON), Canadian Cryospheric Information Network/Polar Data Catalogue, Norwegian Meteorological Institute, Antarctic land cover mapping, International Network for Terrestrial Research and Monitoring in the Arctic (INTERACT), Polar Space Task Group (PSTG), Pan-Eurasian Experiment (PEEX), World Glacier Monitoring Service (WGMS), Third Pole Environment (TPE) Program, Polar View, the Swiss Experiment Platform (SwissEx) and ICIMOD.

The Global Cryosphere Watch (GCW) has developed a portal based on existing **cryosphere data archives and observation stations**. The GCW Data Portal is dedicated to data management and to the provision of information on selected datasets (<http://gcw.met.no>). The Portal will publish WMO Information System (WIS)-compliant descriptions of GCW data and products into WMO’s Global Information System Centers (GISCs) catalogues, and will use GEOSS interoperability standards where possible.

GCW has initiated the development of a network of surface measurement sites, called CryoNet, with initial emphasis on Europe, Canada, and Asia. CryoNet Regional Workshops were held in Beijing in December 2013 and Santiago, Chile in October 2014.

A **Third Pole Environment (TPE) Database** (<http://www.tpedatabase.cn>) has been created and made **publicly searchable**. The Chinese snow pack observation project over the Tibetan Plateau is now in its 3<sup>rd</sup> year, and the data portal and website are under construction using the GEO framework (**Snow Observations over Tibetan Plateau**, <http://www.tibetsnow.org/>), part of the data is downloadable.

An **Arctic Monitoring Website** came online (<http://www.polarportal.dk/en/home>). Related Danish Arctic research institutions presented updated knowledge on the condition of 2 major components of the Arctic: The **Greenland** Ice Sheet and the Arctic Sea Ice.

Japan (JAMSTEC) has been providing capacity through the Cryosphere Data Archive Partnership (CrDAP) ([jamstec.go.jp/acdap/](http://jamstec.go.jp/acdap/)), and Norway (Norwegian Space Centre) and ESA have been building the **CryoClim cryosphere climate monitoring service**. CryoClim has produced satellite data derived glacier products for mainland Norway and Svalbard, and global aggregated sea-ice products (1979-present) and snow products (1982-present). These products are accessible from the CryoClim **Portal** ([www.cryoclim.net](http://www.cryoclim.net)).

Discussion is underway with the Canadian Cryospheric Information Network (CCIN) to determine if selected **Polar Data Catalogue** (PDC) data sets can be **registered in the GEOSS Common Infrastructure**. This decision relies partly on receiving approval from dataset providers. Additionally, subject to availability of resources, data management of the Canadian International Polar Year collection will continue, in collaboration with other Canadian partner organizations.

ICIMOD and its network of partners in the Hindu Kush-Himalayan region updated and published **glaciers database** through its mountain geoportal (<http://geoportal.icimod.org/>), interfacing with the World Glacier Monitoring Service (WGMS) and Global Land Ice Measurements from Space (GLIMS) to make the database available. The **mountain geoportal** in ICIMOD published improvised snow cover products weekly. The glaciers mass-balance study in Nepal and Bhutan started in close collaboration with national partners.

There are several activities related to the **Interagency Arctic Research Policy Committee** (IARPC) implementation plan ([nsf.gov/geo/plr/arctic/iarpc/start.jsp](http://nsf.gov/geo/plr/arctic/iarpc/start.jsp)). The US NSF is supporting the Arctic and **Antarctic** Data Consortium (A2DC), aimed at coordinating activities among different funded groups to archive, manage and curate data from Polar projects. The **Arctic hub** (<http://www.arctichub.net>) favors the connection among the Arctic observing communities, providing a forum for exchanging ideas and best practices.

A **Side-Event on Information for Cold Regions** was held during the Geneva Summit Week in January. Options for developing a GEO Cold Regions Community Portal to GEOSS were explored. The portal would expand outreach of, and maximize synergies among, thematically-wide GEO activities and thematically deep participant activities, thereby exploiting their complementary roles. A related paper was initiated – supported by portal activities of the community (such as SAON).

The GEO Cold Regions vision was presented to the **Arctic Circle 2014 Assembly**. INTERACT proposed to organize an international workshop on snow cover changes and their consequences, in collaboration with several arctic organizations and related to the ICARP (International Conference on Arctic Research Planning) III process. The ISRSE36 included a Polar and Cold Regions theme in its Symposium programme (Berlin, May 2015).

The 4<sup>th</sup> meeting of the Polar Space Task Group (PSTG-4) was held at the Goddard Space Flight Center of NASA (Maryland, USA), from 29 Sept to 1 Oct 2014. The 3rd PSTG SAR Coordination Working Group meeting took place on 1 Oct. 2014.

## WEATHER

### Improving weather information, forecasting and warning

#### 3.16 WE-01 High-Impact Weather Prediction and Information

The WMO World Weather Research Programme (WWRP) is developing and maintaining TIGGE (THORPEX Interactive Grand Global Ensemble) – a **user-friendly database of global multi-model ensemble weather forecasts** for improved predictions of high-impact weather events. Forecast providers include: Australia (BOM), Brazil (CPTEC), Canada (CMC), China (CMA), France (MétéoFrance), Japan (JMA), Korea (KMA), UK (UKMO), USA (NCEP) and ECMWF.

The TIGGE data is available for scientific research via **two data portals** hosted by ECMWF (<http://tigge.ecmwf.int/>) and **China** (CMA, <http://bridge.cma.gov.cn:8080/tigge/>). ECMWF and China have agreed to continue archiving TIGGE data for the next five years. The ECMWF portal is also improving access to time series data, delivering data in **different formats** and further developing the Ensemble Prediction Systems (EPS).

TIGGE activities mainly relate to the optimal generation and combination of multi-model ensemble forecasts, and to the development and testing of prototype **multi-model ensemble products** through the WMO Severe Weather Forecast Demonstration Projects (SWFDP).

Examples of products include ensemble-based **early warnings** produced in quasi real time. The warnings summarize four types of **extreme weather (warm, cold, precipitation, wind)** by plotting colors and symbols **on a single map**. The probabilities leading to the warnings are calculated both from individual ensembles and from the Multi-Model Grand Ensemble – combining forecasts from ECMWF, Japan JMA, US NCEP, and UKMO.

Work also continues in close conjunction with SWFDPs to assess the potential **benefits and utility** of TIGGE ensemble products for severe weather prediction. Prototype products have been developed based on gridded forecast data (e.g. for **tropical cyclones** or **heavy rainfall risk**). Research and development to identify the optimal way of using ensemble predictions is also being planned.

The Europe-funded FP7 project GEOWOW ended in August 2014. Its weather aim was to provide improved access to the TIGGE archive through the **GEOSS Common Infrastructure** (see Task IN-03). Also GEOWOW helped develop TIGGE LAM, an extension of the global TIGGE archive to include regional Limited Area Model ensembles for Europe.

Another aspect of GEOWOW was the interoperability of data between different scientific domains. One GEOWOW **cross-domain activity (weather and water)** was the **modelling of river discharge** using TIGGE meteorological inputs, validated against river flow observations. Work also included the standardisation of hydrological data in order to improve **data exchange**.

With regard to high-impact weather prediction in Africa, resources have been limited due to unsuccessful funding bids. The focus is now on completing research into four cases of **extreme weather events across the African continent**, and in particular how these were handled by the available numerical prediction models. It is hoped that these case studies will be completed by the end of 2014.

## LIST OF ACRONYMS

AARSE	African Association of Remote Sensing of the Environment
ACQWA	Assessing Climatic change and impacts on the Quantity and quality of Water
ADC	Architecture and Data Committee
AeroCOM	Aerosol Comparisons between Observations and Models
AG	Agriculture
AIT	Asian Institute of Technology
AMDAR	Aircraft Meteorological Data Relay
AMESD	African Monitoring of the Environment for Sustainable Development
ANTARES	A Network for the Enhancement of the Education and Scientific Research
APEC	Asia-Pacific Economic Cooperation
APFM	Associated Programme on Flood Management
APN	Asian Pacific Network for Climate Change Research
AR	Architecture
ASCOPE	ESA Active LIDAR
ASEAN	Association of Southeast Asian Nations
ASI	Italian Space Agency
ASSEDS	NASA Active LIDAR
AVHRR	Advanced Very High Resolution Radiometer
AWCI	Asian Water Cycle Initiative
B08FDP	Beijing 2008 Olympic Games Forecasting Demonstration Project
B08RDP	Beijing 2008 Olympic Games Research and Development Project
BGR	German Geological Survey
BI	Biodiversity
BIOMASS	ESA p-band radar for above-ground biomass
BIOSTRAT	Specific Support Action (SSA) funded by the EU Sixth Framework Programme and aims to further develop the EU Biodiversity Research Strategy
BRGM	French Geological Survey
CASTOR	CAapture and geological STORAge of CO <sub>2</sub>
CATHALAC	Water Centre for the Humid Tropics of Latin America and the Caribbean
CB	Capacity Building
CBC	Capacity Building Committee
CBD	Convention on Biological Diversity
CBERS	China-Brazil Earth Resources Satellite
CEOP	Coordinated Energy and Water Cycle Observations Project
CEOS	Committee on Earth Observation Satellites
CFP	Call for Participation
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, Columbia University, USA
CIMA	(CIMA Foundation) International Center of Environmental Monitoring
CIMO	Joint Commission for Instruments and Methods of Observation
CL	Climate
CMAP	Merged Analysis of Precipitation
CNES	French Space Agency
CO2GeoNET	European Network of Excellence on the geological storage of CO <sub>2</sub>
CO2ReMoVe	Research into Monitoring and Verifying Carbon Dioxide geological storage

CoP	Community of Practice
CPC	Climate Prediction Center
CSIR	Council for Scientific and Industrial Research, South Africa
CUAHSI	Consortium of Universities for Advancement of Hydrologic Science
CURAT	Ivory Coast Centre Universitaire de Recherche et d'Application en Télédétection
DA	Data Management
DEM	Digital Elevation Model
DevCoCast	Provides processed land and ocean satellite data and value-added products in Developing Countries
DI	Disasters
DIVERSITAS	An international programme of biodiversity science
DLR	German Aerospace Center
EARS	Dutch Remote-Sensing Company
EBONE	European Biodiversity Observation Network
EC	Ecosystems
EC	European Commission
ECDC	European Center for Disease Prevention and Control
ECMWF	European Centre for Medium-range Weather Forecasts
ECV	Essential Climate Variables
EDEN	Emerging Diseases in a changing European Environment
EEA	European Environmental Agency
EN	Energy
EnerGEO	Earth observation for monitoring and assessment of the environmental impact of energy use
EO	Earth Observations
EPS	Ensemble Prediction System
ERSL	Environmental Remote Sensing and Image Processing Laboratory
ESA	European Space Agency
ESRI	Environmental Systems Research Institute
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
FAO	Food and Agriculture Organization
FAPAR	Fraction of Absorbed Photosynthetically Active Radiation
FDPs	Forecast Demonstration Projects
FDSN	International Federation of Digital Seismograph Networks
FLUXNET	Network of Regional Networks Integrating Worldwide CO <sub>2</sub> Flux Measurements
FOSS4G	Free and Open Source Software for Geospatial
FP6	European Commission funded projects
FP7	European Union 7 <sup>th</sup> Framework Programme
FPAR	Fraction Photosynthetically Available Radiation
FRA	Forest Resource Assessment
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
GEMS	Global and regional Earth-system (Atmosphere) Monitoring using Satellite and in-situ data
GEO	Group on Earth Observations
GEO BON	Group on Earth Observations Biodiversity Observation Network
GEOBENE	Global Earth Observation Benefit Estimation: Now, Next and Emerging
GeoCapacity	Assessing European Capacity for geological storage of Carbon Dioxide
GeoHazData	Interoperable and distributed metadata system for inventorying hazard maps

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
GEOSCHEM	Goddard Earth Observing System-CHEMistry
GEOSS	Global Earth Observation System of Systems
GEWEX	Global Energy and Water Cycle Experiment
GFMC	Global Fire Monitoring Center
GFZ	German National Research Center for Earth Sciences
GGMN	Global Groundwater Monitoring Network
GGOS	Global Geodetic Observing System
GIFS	Global Interactive Forecast System
GIS	Geographical Information System
GISIN	Global Invasive Species Information Network
GLOBCARBON	ESA Global Land Products for Carbon Model Assimilation
GLOBCOLOUR	ESA Node for Global Ocean Colour
GLOBCOVER	ESA Global Land Cover Service
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
GPCC	Global Precipitation Climatology Centre
GPM	Global Precipitation Measurement
GPS	Global Positioning System
GRIB	GRIdded Binary
GRUAN	GCOS Reference Upper Air Network
GSICS	Global Space-based Inter-Calibration System
GSN	Global Seismographic Network
GTOS	Global Terrestrial Observing System
HARON	Hydrological Applications and Run-Off Network
HE	Health
HEPEX	Hydrological Ensemble Prediction Experiment
IAG	International Association of Geodesy
IAS	Invasive Alien Species
ICSU	International Council for Science
IEEE	Institute of Electrical and Electronics Engineers
IGACO	International Global Atmospheric Chemistry Observations
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
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
ILWIS	Integrated Land and Water Information System
INPE	Brazilian National Institute for Space Research
InSAR	Interferometric Synthetic Aperture Radar
INTA	Instituto Nacional de Técnica Aeroespacial, Spain
INTERACT	International Network for Terrestrial Research and Monitoring in the Arctic
IOC	Initial Operating Capability

IOC	Intergovernmental Oceanographic Commission
IOCCG	International Ocean Colour Coordinating Group
IP3	GEOSS Interoperability Process Pilot Projects
IPT	Integrated Provider Toolkit
IPWG	International Precipitation Working Group
IPY	International Polar Year
IRI	International Research Institute for Climate and Society
IRIS	Incorporated Research Institutions for Seismology
ISC	International Seismological Centre
ISCGM	International Steering Committee for Global Mapping
ISDE	International Society for Digital Earth
ISDR	International Strategy for Disaster Reduction
ISESCO	Islamic Educational, Scientific and Cultural Organization
ISLSCP	International Satellite Land-Surface Climatology Project
ISO	International Standards Organization
ISPRS	International Society for Photogrammetry and Remote Sensing
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
JAMSTEC	Japan Agency for Marine-Earth Science and Technology
JAXA	Japan Aerospace Exploration Agency
JCOMM	Joint WMO-IOC Technical Commission on Oceanography and Marine Meteorology
KIOST	Korean Institute for Ocean Science and Technology
LAI	Leaf Area Index
LAM	Limited Area Model
LANDSAT	Earth Resources Technology Satellite
LIDAR	Light Detection and Ranging
LIS	Land Information System
MEPS	Meso-scale Ensemble Prediction Systems
MERIS	Medium Resolution Imaging Spectrometer
MERIT	Meningitis Environmental Risk Information Technologies
MODIS	Moderate Resolution Imaging Spectroradiometer
MoU	Memorandum of Understanding
NADM	North American Drought Monitor
NARSS	National Authority for Remote Sensing and Space Sciences, Egypt
NASA	National Aeronautics and Space Administration
NASG	National Administration of Surveying, Mapping and Geoinformation
NBII	National Biological Information Infrastructure
NCAR	US National Center for Atmospheric Research
NCDC	US National Climatic Data Center
NCEP	US National Centers for Environmental Prediction
NEPTUNE	The North-east Pacific Time-series Undersea Network Experiments
NetCDF	Network Common Data Form
NMHS	National Meteorological and Hydrological Service
NPOESS	National Polar-orbiting Operational Environmental Satellite System
NPP	Net Primary Productivity

NWP	Numerical Weather Prediction
OCO-2	NASA Orbiting Carbon Observatory
OECD	Organization for Economic Cooperation and Development
OGC	Open Geospatial Consortium
OS	Open Source
OSFAC	Observatoire Satellitaire des Forêts d'Afrique Centrale
OSS	Open Source Software
PAAM	Protected Areas Assessment and Monitoring
PAGER	Prompt Assessment of Global Earthquakes for Response
PAY	Production, Acreage, and Yield
PEEX	Pan Eurasia Experiment
PCTM	Parameterized Chemistry and Transport Model
POGO	Partnership for Observation of the Global Ocean
POPs	Persistent Organic Pollutants
PROMOTE	PROtocol MOniTORing (for the GMES Service Element: Atmosphere)
PUMA	Project supporting African nations in their use of data and services provided by the new Meteosat Second Generation (MSG) family of European weather satellites.
QA4EO	Quality Assurance Framework for Earth Observation
RAMSAR	Convention on Wetlands, Ramsar, Iran, 1971
RECETOX	Research Centre for Toxic Compounds in the Environment
RDP	Research and Development Project
SADC	Southern African Development Community
SAFARI	Societal Applications in Fisheries & Aquaculture using Remotely-Sensed Imagery
SAON	Sustaining Arctic Observing Networks
SAR	Synthetic Aperture Radar
SBA	Societal Benefit Area
SBSTA	Subsidiary Body for Scientific and Technological Advice
SCOR	ICSU Scientific Committee on Oceanic Research
SCIAMACHY	SCanning Imaging Absorption spectroMeter for Atmospheric CHartography
SDI	Space Data Infrastructure
SDI	Spatial Data Infrastructure
SDS	Sand and Dust Storm
SELPER	Sociedad Especialista Latinoamericana en Percepción Remota (Latin-American Specialist Society in Remote Perception)
SIF	Standards and Interoperability Forum
SIOS	Svalbard Integrated Arctic Earth Observing System
SIT	Strategic Implementation Team
SIT22	CEOS Strategic Implementation Team meeting in Tokyo
SOA	China State Oceanic Administration
SPOT	Système Probatoire d'Observation Terrestre
SPOT-VGT	SPOT Vegetation
SSC	Species Survival Commission
SST	Sea Surface Temperature
STC	Science and Technology Committee
TerraLib	Open source GIS software library
TerraView	GIS application built on the TerraLib GIS library
THORPEX	The Observing-system Research and Predictability Experiment
TIGER	ESA-launched initiative focusing on the use of space technology for water
TIGGE	THORPEX Interactive Global Grand Ensemble
TOVS	NOOA TIROS (Television Infrared Observation Satellite) Operational Vertical Sounder



TPE	Third Pole Environment
UIC	User Interface Committee
UK	United Kingdom
UN	United Nations
UNECA	United Nations Economic Commission for Africa
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational Scientific and Cultural Organization
UNESCO-IHE	Institute for Water Education
UNOOSA	United Nations Office for Outer Space Affairs
UNOSAT	United Nations Operational Satellite Applications Programme
US	User Engagement
USA	United States of America
USGS	United States Geological Survey
USOFDA	US Office of Foreign Disaster Assistance Project Management
VENUS	Victoria Experimental Network Under the Sea
VI	Vegetation Index
WA	Water
WCRP	World Climate Research Programme
WDC	World Data Center
WE	Weather
WFPHA	World Federation of Public Health Association
WHO	World Health Organization
WIGOS	WMO Integrated Global Observing System
WIKI	Page or Collection of Web pages designed to enable anyone who accesses it to contribute or modify content, using a simplified markup language
WIREC	Washington International Renewable Energy Conference
WIS	WMO Information System
WMO	World Meteorological Organization
WWRP	World Weather Research Programme