Summary Assessment of Progress – Targets and Tasks

This document is submitted to GEO-XII Plenary for decision.

Summary Assessment of Progress – Targets and Tasks

This document is divided in two parts

PART I

2015 Assessment of Progress
Against the GEOSS 2015 Strategic Targets

Target Assessment

PART II

GEO 2012-2015 Work Plan
Implementation Report

Task Assessment

PART I

2015 Assessment of Progress Against the GEOSS 2015 Strategic Targets

Target Assessment

INTRODUCTION

This 2015 Assessment of Progress is the fourth and final effort 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.

This final Target consists of a summary assessment at the level of the Target featuring a pyramid diagram (see below), rationale for Target rating, and recommendations for the next decade.

It is important to recall that the "GEO Strategic Plan 2016-2025: Implementing GEOSS" and the 2016 Transitional Work Programme already address the key recommendations, as the result of a successful coordination effort among the IPWG, the Boards, the Monitoring and Evaluation Working Group and the Secretariat during 2014-2015 period.

PYRAMID DIAGRAM

The pyramid diagram aims to provide a compact and comprehensive view of GEOSS implementation progress at the end of the first decade. 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*); and
- 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:

G	Green: Achieved, minor recommendations for the next decade
Y	Yellow: Not completely achieved, some recommendations for the next decade
R	Red: Not achieved, substantial recommendations for next decade

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.

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; and
- 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) the inputs received by the current GEO Task Components Teams, in response to a Secretariat request; 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).

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).

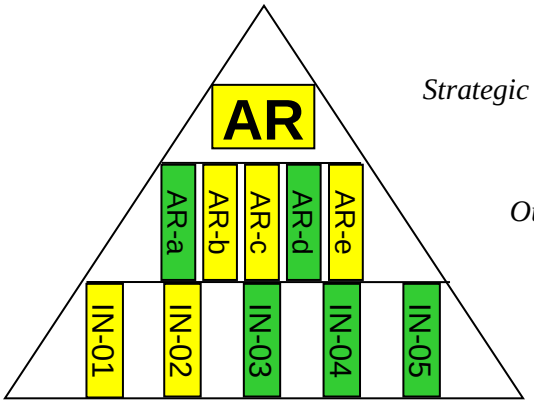
Three-Year Evolution (2012-2015)
Target Assessment

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

2015 Targets 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.



Strategic Target

Outcomes (Demonstrated by bullets)

Work Plan Tasks

Rationale for Target Rating

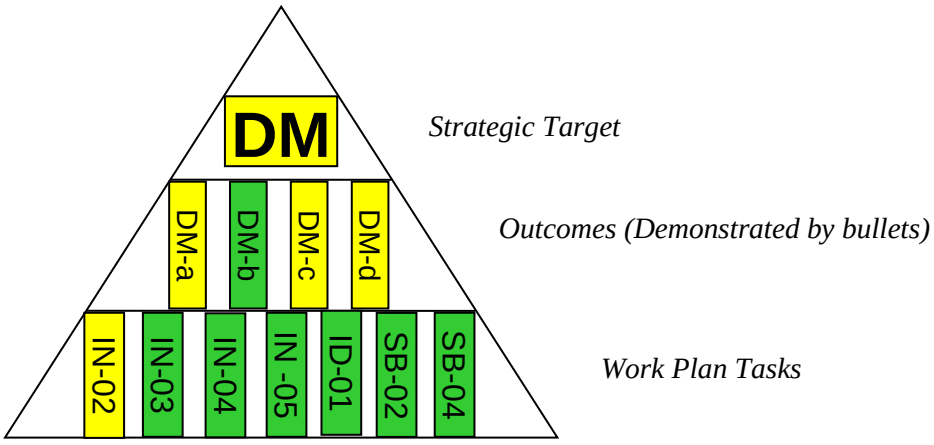
The development and operations of the GEOSS Common Infrastructure (GCI) has been an important achievement of GEO in the first decade. The number of information resources discoverable and accessible via the GCI has grown significantly but the number of users from the Societal Benefit Areas and related Tasks remains limited. 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 GCI requires continuous development to keep pace with a fast-moving digital landscape and a growing number of data infrastructure initiatives and new data sources. Integration and effective use of these different data streams from space and in-situ remain a challenge.

Recommendations for the Next Decade

- **AR1.** Sustain the operations and evolution of the GEOSS Common Infrastructure (GCI) taking into account the rapidly changing landscape in technology offerings and in the production and consumption of EO. Promote the Architecture Principles of openness, effectiveness, flexibility, sustainability and reliability as the basis for the evolution of the GCI, and ensure its interoperability with relevant research and policy-driven data infrastructures. Ensure that the GCI supports the implementation of the Data Sharing and Data Management Principles;
- **AR2.** Increase collaboration and joint activities between the GCI and data providers, on the one hand, and scientific and policy-making users to ensure that the indicators, information, and data needed to support scientific advance and policy-making are easily available and accessible through the GCI. Shift focus from data discovery to ready-to-use information resources (data, products, services, models, and tools). Develop a GEO Knowledge Base to share not just data, but knowledge of how the data can be used to address key scientific or policy questions, and foster a community of users addressing similar problems. Prioritize efforts and demonstrate added value focusing first on Flagship and global initiatives; and
- **AR3.** Increase efforts to coordinate the provision, and improve the integration, of space-based and *in situ* data at global, regional, and national levels, including new data sources, such as sensor networks and citizens, and improve integration of environmental and socio-economic data.

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

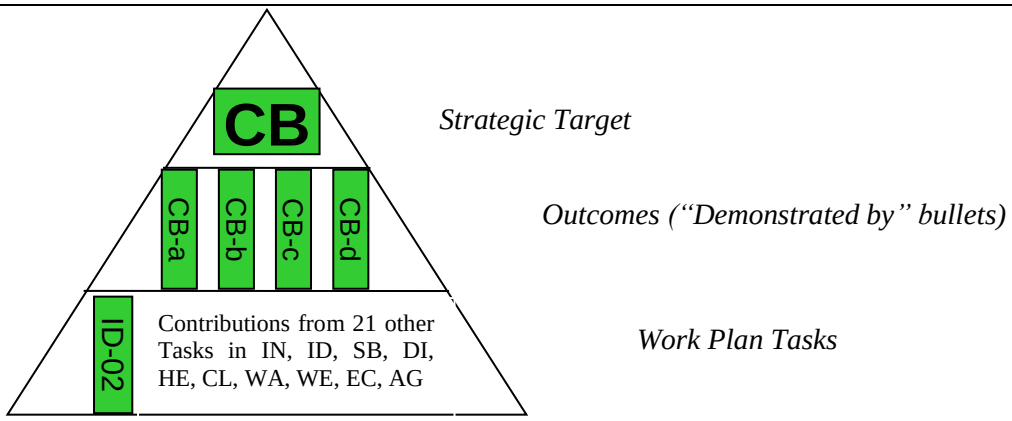
Data management is progressing on a number of fronts (e.g., processing, validation, quality control, modelling, visualization), and the adoption by the GEO Plenary of agreed Data Management Principles is a very welcome step towards reducing gaps and variations in practices that vary considerably from country to country and organization to 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.

Recommendations for the Next Decade

- **DM1.** Contribute to the implementation of the GEOSS Data Sharing Principles through good data management practices that allow data to be shared as Open Data, promptly and at minimum cost;
- **DM2.** Support providers of data to GEOSS (in either public, private, or voluntary sectors, including citizen science or related initiatives) to implement the Data Management Principles of discoverability, accessibility, usability, and, where relevant, preservation, and curation. Provide such support through guidelines, best practice, and promotion of training material; and
- **DM3.** Work towards harmonization of key global datasets contributing to Societal Benefit Areas in collaboration with Flagships and Initiatives in GEOSS, and new activities proposed in the framework of the UN Global Geospatial Information Management (UN-GGIM). 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.

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

The Capacity Building Target has been reached: the coordination of efforts to produce and use Earth observation and derived information products is enhanced, with special emphasis on developing countries. A considerable number of capacity building activities have been carried out across 22 GEO Tasks and information on these initiatives has been captured. Key actors in capacity building met numerous times during the 10-year period, which led to improved coordination and planning of activities. A capacity building resource facility, GEOCAB, was established, providing information on capacity building material, training opportunities, free or low-cost software, and other background information. The information focuses on technical aspects of Earth observation (acquiring skills), as well as awareness raising for decision makers. Resource mobilization for capacity building was successful with contributions from GEO Member States and Participating Organizations, of which the European Commission deserves special mention. A survey of performance indicators for capacity building was carried out. Although quantitative performance indicators are difficult to measure (the competence level acquired would have to be assessed in an independent framework for each individual capacity building activity), the survey yielded interesting results and led to the development of an impact assessment framework that was used to test the effectiveness of capacity building in 8 different regions. The course "Bringing GEOSS Services into Practice" that was developed, improved and delivered many times shows how different target groups can benefit from and contribute to GEOSS.

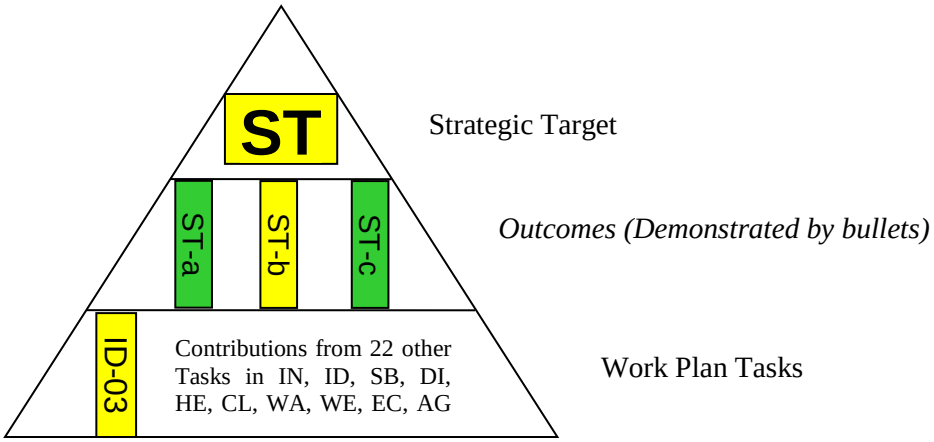
Recommendations for the Next Decade

- **CB1.** Although special emphasis has been given to developing countries (Africa, in particular), there is still a substantial need to address capacity building in developing countries through a joint effort of GEO Members and Participating Organizations, notably through AfriGEOSS;
- **CB2.** The GEOCAB capacity building resource facility needs to be provided with more material and information, and the visibility of the portal needs to be increased;
- **CB3.** Resource mobilisation for capacity building activities and coordination (needs assessment, gap analysis, promotion) warrants continuous attention; and
- **CB4.** Adoption of a non-binding and non-intrusive system (or indication) of certification of capacity building activities carried out in the framework of the next 10-year plan would

facilitate assessment of the efficiency, effectiveness, and impact of the capacity building activities.

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

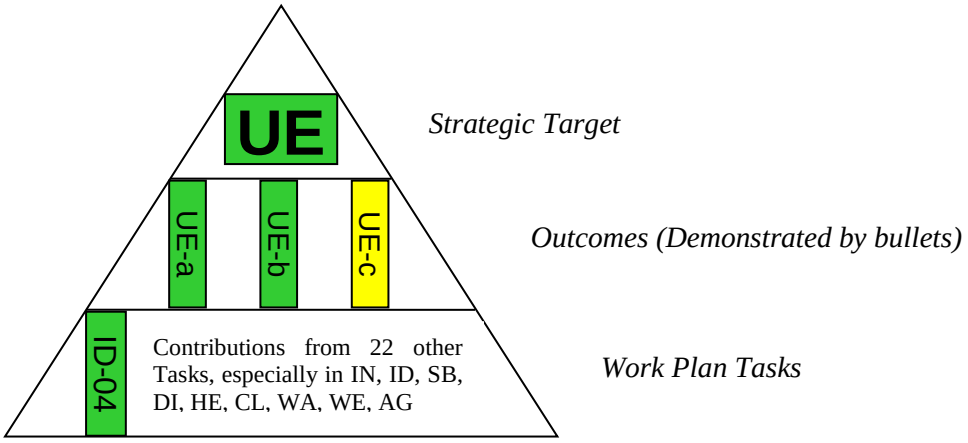
The status of the Science and Technology Target has not changed during the past year. This is a consequence of three factors: (i) most GEO Work Plan Tasks (23 out of 26) contribute to the Science and Technology Target so, whilst there have been significant advances in some areas, the effort and its impact remains variable, diffuse and hard to capture; (ii) the dedicated Task ID-03 has had its own notable successes, such as the well-attended and received Science and Technology Fora, but it addresses only a small subset of the S&T activities needed to underpin the transverse approach taken in GEOSS to Science and Technology; and (iii) the full implementation of the GEO Science & Technology Roadmap, therefore, is incomplete, with some elements continuing to fall between these diffuse and transverse approaches.

Recommendations for the Next Decade

- **ST1.** The proposed Programme Board should establish a way to take ownership of the Science and Technology Roadmap, reviewing and updating both its content and its implementation;
- **ST2.** In the interim, identify advocates to begin the review and potential transition of S&T elements between now and when the Programme Board is able to take ownership; and
- **ST3.** Continue to inform the Science & Technology Task (ID-03, replaced by GD-08) 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

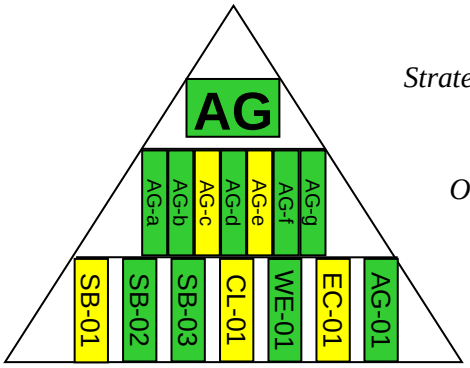
User engagement has increased over the first decade of GEO. Nearly all of the Work Plan Tasks have some kind of user engagement activity, from small to robust. Those listed in the triangle have more mature activities and serve as examples of how to denote many different kinds of engagement. The increased use of geo-spatial data in all Societal Benefit Areas and, in particular, in developing Countries (UE-c) was mostly met through completion of Societal Benefit Tasks SB-01 through SB-05. This Target is green overall due to the accomplishments over the past 10 years, which include the development and publication of User Engagement Strategies; development of a survey to assess Task user bases and distribution of the results; development of a user typology; and development and prototype of the GEO Professorships concept by Mines ParisTech, IEEE GEOSS user-oriented workshops, and regular contributions to EarthZine.

Recommendations for the Next Decade

- **UE1.** Provide a more focused user engagement follow-up process that incorporates the best practices of user engagement already collected, while filling identified gaps in the overall GEO user engagement methodology;
- **UE2.** Encourage user engagement or customer-oriented Participating Organizations and Observers to further refine all aspects of user engagement; and
- **UE3.** Actively engage in and help coordinate the collection of user requirements, user experiences, use cases, stories, and other user engagement data and information.

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.



Strategic Target

Outcomes (Demonstrated by bullets)

Work Plan Tasks

Rationale for Target Rating

GEOGLAM has been successfully implemented on an experimental basis and its products are being extensively used to promote sustainable agriculture. 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 facilitated the development of tools (CROP Monitor), nomenclature, and products welcomed by the users that helped to consolidate contributing experts and institutions and identify gaps and future developments. The JECAM (pilot) sites and the European SIGMA project are progressing well.

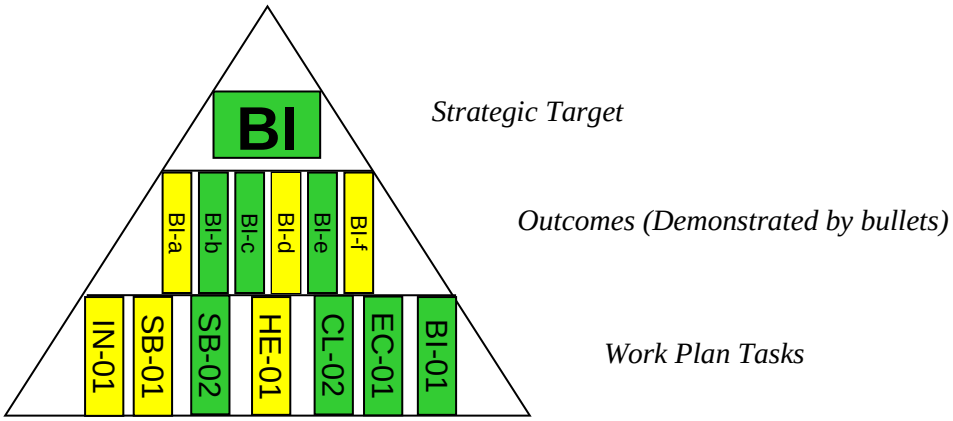
Recommendations for the Next Decade

- **AG1.** Support coordination of GEOGLAM activities by: (i) appointing national contacts; (ii) providing financial and technical support for the reinforcement of the 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 an 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 accessible through the GEOSS Common Infrastructure;
- **AG5.** Support the maintenance of, and make datasets available through, the GEO Global Land Cover Information Portal; and 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, France, Germany, 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 ; and

- **AG8.** (i) Propose contributions related to /rangeland/ pasture management; and (ii) liaise with key stakeholder / users and clarify the best perspective / focus for this activity (where EO fill an information gap), which is probably the 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

The foundations for a comprehensive ecosystem monitoring capability and facilitation of a worldwide biodiversity observation network to collect, manage, share, and analyze observations have been put in place. Essential Biodiversity Variables (EBV) have been defined and tools have been developed (i.e., BON-in-a-Box) for biodiversity monitoring. Progress would have been quicker if more resources had been available for capacity building, coordination, and long-term *in situ* and remotely-sensed biodiversity observations.

Recommendations for the Next Decade

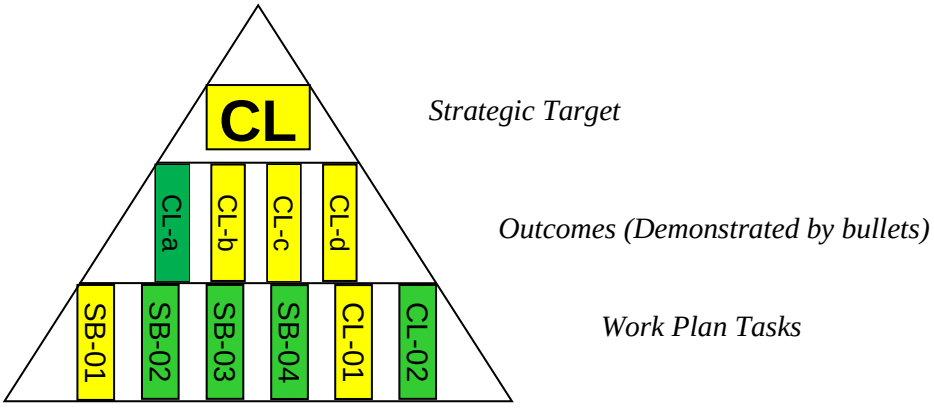
- **BI 1.** Support development of national or regional Biodiversity Observation Networks (BONs; these will help countries meet their decision-making and reporting requirements, e.g., under the Convention on Biodiversity (CBD) and other Multilateral Environmental Agreements (MEAs) by: (i) appointing 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; and (iv) supporting GEO BON partners to increase capacity and make wider use of citizen science;
- **BI 2.** GEO should: (i) support the development of national or regional Biodiversity Observation Networks; (ii) host workshops and other activities that support the development of "BON-in-a-Box" (BiaB); (iii) facilitate development of the Global Wetland Observing System (GWOS); and (iv) adopt the Essential Biodiversity Variables (EBVs) for the monitoring of biodiversity change, by both *in situ* and remote sensing means;
- **BI 3.** GEO Members and Participating Organizations participate in the development of the biodiversity field site network (for Genes, Species and Ecosystems), which will enhance coordination of existing field site activities and improve capacity;
- **BI 4.** Support full and open access to data and information relevant to biodiversity by: (i) providing commercial data as an in-kind contribution to support the availability of satellite

data for biodiversity change monitoring; and (ii) providing access through GEOSS to *in situ* biodiversity data;

- **BI 5.** Support maintenance of, and make datasets available through, the GEO Global Land Cover Information Portal; and communicate data requirements for Land Cover Land Use to the Land Cover Task Team; and
- **BI 6.** Support global coordination activities through the GEO BON office by: (i) secondment of experts to the distributed international GEO BON office; and (ii) supporting and/or hosting GEO BON Advisory Board meetings, Implementation Committee meetings, and GEO BON all-hands meetings; one 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

Work continues toward this ambitious target but a greater investment is needed to realize an effective and sustained Global Climate Observing System and associated information system. Specific requirements for climate observations have been established, and a process for periodic updates has been implemented by the GCOS programme and its implementation plan using a continuous Improvement and Assessment Cycle. Although the quality and length of the climate record is increasing (e.g., reanalysis, key climate datasets, such as paleo), not all datasets meet good quality standards. Significant improvements in modelling and predictions and access to these data have been implemented through several member institutions (e.g., US NOAA, China). New and planned satellite missions will have been recently launched (e.g., NASA OCO-2) or planned (e.g., ESA-Biomass, China-TanSat). There have been significant advances in establishing a carbon observation and analysis system in support of monitoring-based decision-making and related environmental treaty obligations. The global carbon budgets (considering both CO_2 and CH_4) 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. Great strides have been made to focus and collaborate across model data adaptation, mitigation, and downscaling objectives across GEO, such as CORDEX, WCRP, the Earth System Grid Federation (ESGF), and the NOAA Operational Model Archive and Distribution System (NOMADS).

Recommendations for the Next Decade

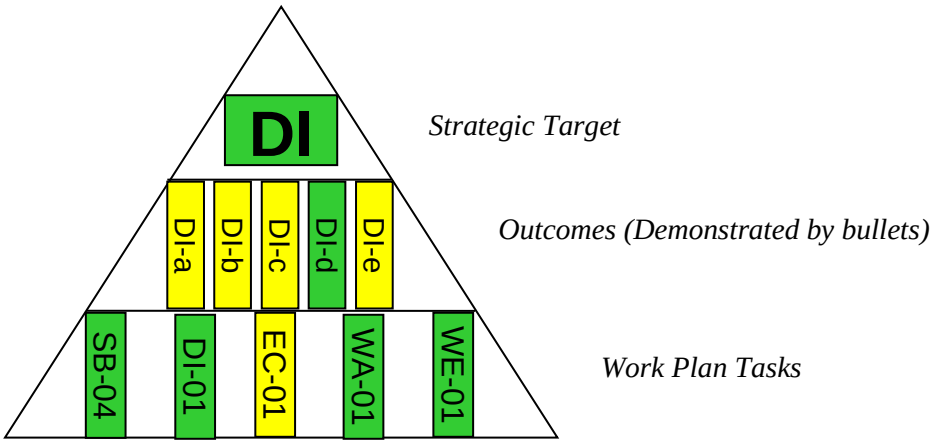
- **CL1.** Implement Easy Access to and Use of Climate Information has been performed to streamline and narrow the goals to focus the Task on assessing the state of the climate (reanalysis), longer term NWP models (Severe Wx, and Seasonal), and climate model (AOGCM) projections. This will be achieved through improved infrastructure for big data access and understanding at the national level for those that produce guidance products;
- **CL2.** For Members and Participating Organizations that own climate or carbon-related data: align data policies with the GEOSS Data Sharing Principles; and 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 populate 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;

- **CL3**. Improve coordination between GEO and the Global Framework for Climate Services (GFCS); and build linkages at the national level between activities implemented under the two frameworks;
- **CL4** Promote participation of national institutions as well as the integration of relevant regional and global monitoring efforts, in GEO Work Plan Task CL-02 "Global Carbon Observation and Analysis", and support the transition from the CL-02 Task toward a more effective global initiative on an integrated greenhouse gases observation and information system;
- **CL5.** Participate and contribute to the GCOS Improvement and Assessment cycle, and contribute to the preparation of the new GCOS implementation programme and align activities with it;
- **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.** 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;
- **CL8.** 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);
- **CL9:** Follow the CEOS Strategy for Carbon Observations from Space as the satellite component of a global carbon observing system in the frame of GEO;
- **CL10.** Contribute activities supporting the Research and Development Implementation Plan of the Global Forest Observations Initiative (GFOI). Support the delivery of forest carbon data to developing countries through the GFOI; and
- **CL11**. Advance architectures for climate monitoring using guidelines outlined in "A Strategy Towards an Architecture for Climate Monitoring from Space" (Joint CEOS, CGMS, WMO, and published in 2013). It is a foundation for the observation and monitoring pillar of the Global Framework for Climate Services (GFCS).

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

Through the Sendai Framework for Disaster Risk Reduction 2015-2030, a global coordination mechanism has been established for all phases of the risk management cycle associated with hazards, and with full recognition of the key role of EO data and information. GEO has played its role in the definition of the Sendai framework and in the development of proposals to address it. Additional actions required from the GEO community include:

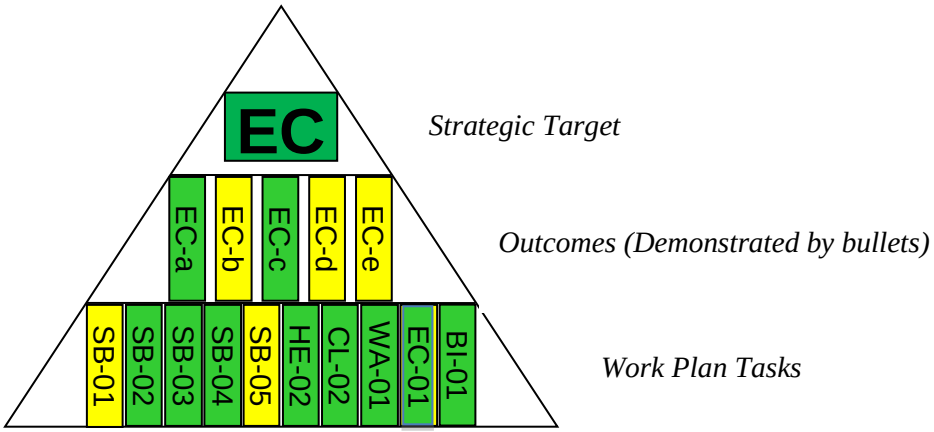
Recommendations for the Next Decade

- **DI1**. For Members and Participating Organizations that own data, software systems, and products relevant to disaster risk reduction (including calibration/validation data and ancillary data): and increase the level of contribution to and participation in the Disasters Work Plan Task (DI-01);
- **DI2**. Expand the use of satellite imagery and surface data to reduce exposure/vulnerability to disaster risks posed by natural and man-made hazards;
- **DI3**. 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 disaster risk and supporting crisis management operations;
- **DI4**. 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;
- **DI5**. 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; and
- **DI6.** Support the implementation of the Sendai Framework for Disaster Risk Reduction with concrete activities and pilot projects involving national and local users, making sure that Earth observations and space-based information (as a complement to socio-economic data) are

supporting its implementation, which include mechanisms to provide timely access to data, information and tools.

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

Through a range of projects, the basis for a wide-ranging monitoring capability for all ecosystems and the human impacts on them has been developed. New initiatives were launched to better address the Ecosystems Target, including the large European H2020 Project "ECOPOTENTIAL: Improving Future Ecosystem Benefits through Earth Observations", that includes 47 partner organisations in Europe and beyond, and other, more specific, EU Projects such as SWOS. Contact with the Belmont Forum for mountain ecosystems has been established (Belmont CRA "Mountains as Sentinels of Change"). In addition, in the last few years there has been major progress (USGS) on two fronts related to ecosystem observation by remote sensing. First, the ELUs (Ecological Land Units) have been updated to Version 2. Second, a large effort was initiated to map global EMUs (Ecological Marine Units), from data, in 3D, in a manner analogous to the way ELUs were made. Close interactions across Work Plan Tasks (in particular, with Biodiversity and Blue Planet) have been established which further accelerate progress.

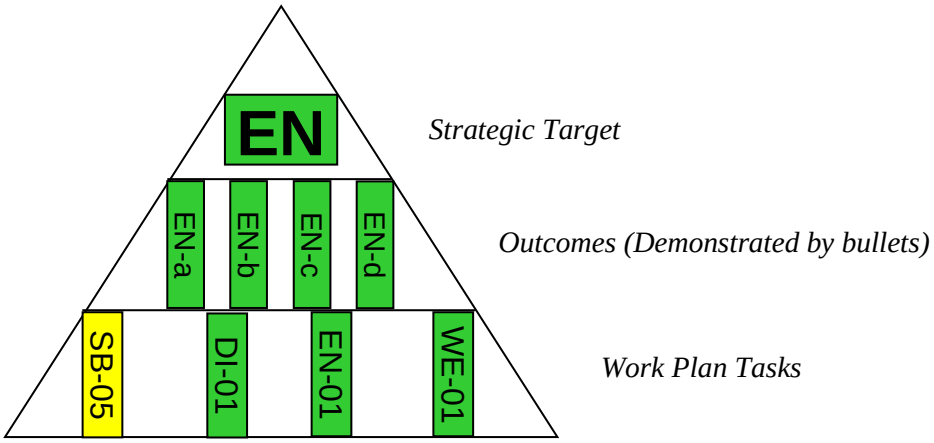
Recommendations for the Next Decade

- **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). Contact with UNESCO and other organizations involved in the Blue Planet initiative was established in the framework of the EU project, ECOPOTENTIAL, which includes marine and coastal ecosystems**;**
- **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); in the framework of ECOPOTENTIAL, a dryland observation network is under discussion;

- **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; the EU project SWOS is dedicated to the wetland observation system;
- **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, in synergy with the activities of the Mountain Research Initiative (MRI); close contacts with MRI, the Belmont Forum CRA "Mountains as Sentinels of Change", and other regional mountain networks are ongoing, resulting in a proposed GEO initiative on mountain observatories;
- **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; ECOPOTENTIAL is building an open-access Virtual Laboratory Platform to share data, results, analysis methods and models; and
- **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

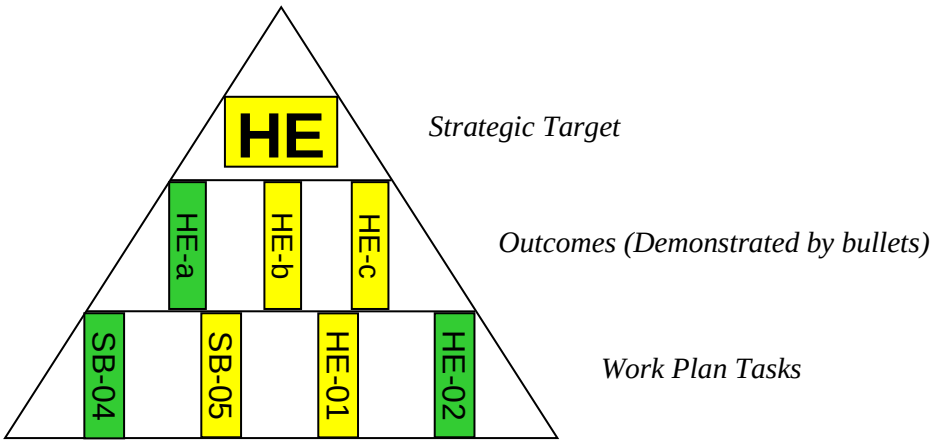
Earth observations and information are increasingly used for the resource assessment, monitoring, and forecasting of renewable energy sources (including solar, wind, ocean, hydropower, and biomass) and geological resources (e.g., minerals, raw material). Non-renewable types of energies do not influence 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.

Recommendations for the Next Decade

- **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 Participating Organizations active in renewable energy (e.g., China, Denmark, EC, Germany, Japan, South Africa, Spain, UK and USA): (i) disseminate information about GEO energy tools and products; and (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 Participating 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; and (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; and
- **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

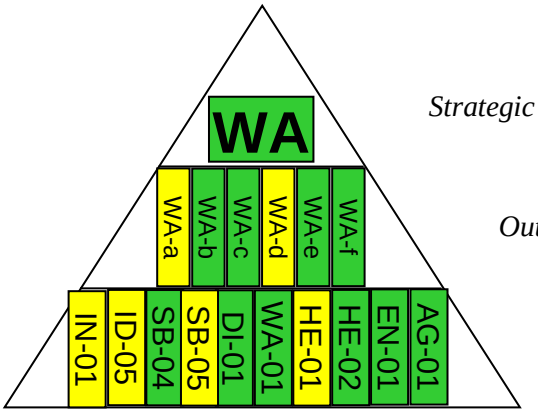
The availability of environmental information for health decisions continues to improve as a result of this Target. Activities on Malaria, Dengue, Rift Valley Fever (using environmental information for decision-making) are progressing and tools have been identified for outbreak-prone areas. Translation of tools for use by the local governments is yet to be realized. Activities on pollutant monitoring (e.g., mercury, Persistent Organic Pollutants) are also advancing. 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 a sufficient level. Additionally, a lack of resources is 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. More interaction between GEO experts is also desired for knowledge and experience sharing.

Recommendations for the Next Decade

- **HE1.** Expand national and/or international participation in GEO health-related activities; support the implementation of Tasks that are key to improve the use of EO-related information for decision-making within the Health SBA: Tools and Information for Health Decision-making, Tracking Pollutants, Global Urban Observation and Information, and Impact Assessment of Human Activities;
- **HE2.** Provide national data related to atmospheric levels of Persistent Organic Pollutants and mercury, mercury in the food chain, mercury in gold mining, 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; and
- **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.



Strategic Target

Outcomes (Demonstrated by bullets)

Work Plan Tasks

Rationale for Target Rating

GEO has achieved the Water Target because it has produced comprehensive sets of data and information products that support the management of water resources. In particular, GPM has led to a new suite of products, and SMOS has led to new soil moisture products. The GRACE mission has led to new groundwater products, and new ET products have also been developed both regionally and globally. New initiatives sponsored by the European Commission (e.g., Earth2Observe) and by commitments by CEOS, GTN-H and the members of GEOGLOWS have also contributed to achievement of the Target.

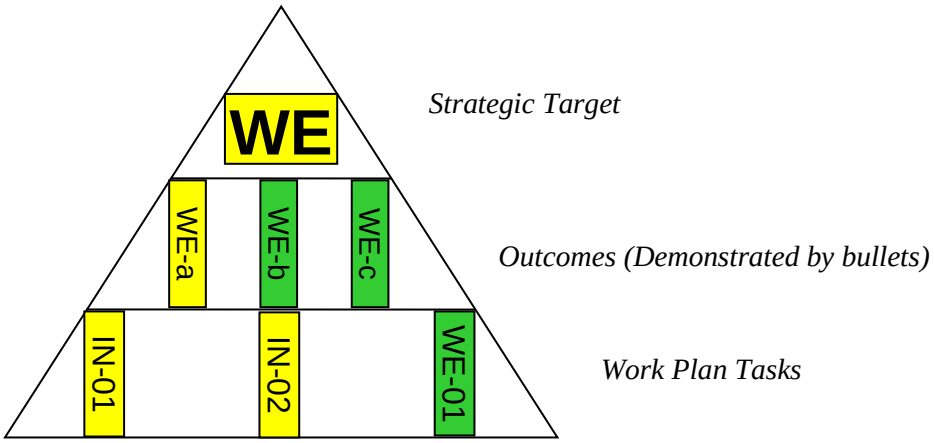
Members and Participating Organizations, including CEOS, are addressing many of the recommendations in the GEOSS Water Strategy. More SBAs are now engaged in helping to achieve the Water Target. For example, interactions with the Biodiversity Task on wetlands, the Agriculture and Energy Tasks through the Water-Energy-Food Nexus, and indicators for monitoring the proposed Water Sustainable Development Goal, have provided new opportunities and activities.

Recommendations for the Next Decade

- **WA1**. A new initiative to develop a plan for enhancing *in situ* observations if needed to support all observations, but especially runoff and storage waters;
- **WA2**. Observational networks, infrastructure and expertise need to be strengthened through capacity building and aid programmes in developing countries;
- **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 developed and funded. GEO Members and Participating Organizations are encouraged to address these challenges; and
- **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) has advanced sufficiently well through the efforts of the WMO, while the second Component (Easy Access to, and Use of, High-impact Weather Information) did not, due to a lack of resources (there was no improvement in 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-2015 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; and
- See also "Recommended Actions" under the Architecture Strategic Target.

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-XI Plenary. It provides a summary of the progress made in each cross-cutting and Societal Benefit Area (SBA) of GEO.

Consistent with the Work Plan structure, the report is organized around Tasks to underline key areas of implementation and support the monitoring and evaluation of GEOSS implementation and the assessment is provided through a set of summary tables, including, for each Task: (i) An "Overview" of progress and policy linkages at the Task level *(first column)*; and (ii) "Highlights" of GEO Members' and Participating Organizations' achievements *(second column)*.

To help the reader more easily evaluate overall progress, the tables have been color-coded.

Readers interested in details are referred to the set of forms provided by Task and Task Component Points of Contact and to the presentations delivered during the 2015 GEO Work Plan Symposium (5-7 May, Geneva, Switzerland).

The 2015 GEO Work Plan Symposium (convening about 100 participants) represented a key opportunity to highlight progress, exchange information, and start the discussions on how to transition into the next GEO decade.

A majority of the activities included in the 2012-2015 GEO Work Plan will continue in 2016, as reported in the 2016 GEO Work Programme (GEO-XII Document 15), where they have been re-organized to reflect the different implementation mechanisms identified in the "GEO Strategic Plan 2016-2025: Implementing GEOSS", and to address recommended actions.

WORKPLAN 2012-2015 TASKS

INFRASTRUCTURE

IN-01 Earth Observing Systems
IN-02: Earth Data Sets
IN-03: GEOSS Common Infrastructure
IN-04: GEOSS Communication Networks
IN-05: GEOSS Design and Interoperability

INSTITUTIONS & DEVELOPMENT

ID-01 Advancing GEOSS Data Sharing Principles
ID-02 Developing Institutional and Individual Capacity
ID-03 Science and Technology in GEOSS
ID-04 Building a User-Driven GEOSS
ID-05 Catalyzing Resources for GEOSS Implementation

INFORMATION FOR SOCIETAL BENEFITS

SB-01 Oceans and Society: Blue Planet
SB-02 Global Land Cover
SB-03 Global Forest Observation
SB-04 Global Urban Observation and Information
SB-05 Impact Assessment of Human Activities
AG-01 Global Agricultural Monitoring and Early Warning
BI-01 Global Biodiversity Observation (GEO BON)
CL-01 Climate Information for Adaptation
CL-02 Global Carbon Observation and Analysis
DI-01 Informing Risk Management and Disaster Reduction
EC-01 Global Ecosystem Monitoring
EN-01 Energy and Geo-Resources Management
HE-01 Tools and Information for Health Decision-Making
HE-02 Tracking Pollutants
WA-01 Integrated Water Information (including Floods and Droughts)
WE-01 High-Impact Weather Prediction and Information

GEO 2012-2015 WORK PLAN	IMPLEMENTATION REPORT	SUMMARY ASSESSMENT

G	Green: Satisfactory progress
Y	Yellow: Fair progress
R	Red: Unsatisfactory progress

INFRASTRUCTURE

IN-01 Earth Observing Systems

	Overview	Highlights
Y	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. *Evidence of Use/ Policy Linkages:* • Reanalysis products (combining modeling, space and in-situ) support IPCC reports and provide critical climatology information; • ECV database is a key tool to evaluate progress of the Climate Monitoring Architecture and assess gaps in measurements; • In-Situ recommendations used in Copernicus regulation in Europe; • A position paper for the need of preservation the frequencies used by Earth Observation systems and networks coordinated in ITU-R meetings and GEO Principals towards WRC-15.	• 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; • New CGMS-CEOS Working Group on Climate is focused on an Essential Climate Variable (ECV) Inventory (www.ecv-inventory.com) developed by CEOS, CGMS, and WMO which includes 200+ data records. Future plans to expand this inventory to include in-situ data records; • Monthly precipitation datasets covering over 100 years (1900-2010) – to enable climate change detection; • CEOS currently operates 131 missions. 12 new CEOS missions were launched in 2014: Sentinel-1A (ESA/EC) , GPM+OCO-2+ISS-RapidScat+SMAP+ CATS (NASA), ALOS-2+Himawari-8 (JAXA/JMA), DMSP-F19 (NOAA), CBERS-4 (INPE/China), KOMPSAT-3A (KARI), Meteor-M N2 (Russia). 13 missions are planned for 2015 launch; • CBERS ground stations in South Africa and Spain ready for CBERS-4 data; • Action plan underway for realization of the GGOS-2020 International Terrestrial Reference Frame; 36 sites involved in GGOS network evolution; • WMO and GEO jointly developed its Preliminary Position Paper for WRC-15 (15th World Radiocommunication Conference). The Steering Group on Radio Frequency Protection actively participated in several ITU-R meetings to raise the profile of WRC-15 agenda items relevant to Meteorology, Climatology and Earth observation communities. WMO continuously promotes active engagement of Member countries with national telecommunication administrations for radio frequency protection. 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.

IN-02 Earth Data Sets		
	Overview	**Highlights**
Y	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. *Evidence of Use/ Policy Linkages:* • Global mineral mapping from ASTER imagery; • Applications based on land terrain; • Disaster risk reduction; • Data Management Principles contribution to UNGGIM.	• GEOSS Data Management Principles were discussed at GEO-XI in Geneva and to be incorporated in the "GEO Strategic Plan 2016-2025: Implementing GEOSS". The Task Force mandate was extended until the next GEO-XII Plenary in developing Implementation Guidelines; • High-resolution (5m) global Digital Elevation Model (DEM) 3D-map under development. Lower-resolution free-of-charge version (30m) in preparation; • Higher-resolution (30m) global elevation data released for Africa (SRTM); • Numerous global datasets under development, including OneGeology and Global Human Settlement and Roadmap; • New version of Global Map (1km-500m resolution) released - providing basic geospatial information through international cooperation among National Mapping Organizations; • 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: • We have worked with national/international organizations to identify and then register their datasets into the GEO Portal. Outreach to task leaders has helped to identify needs to steer our activities. Coordination with other tasks has provided superior information to what was being used; • SoilGrids1km webservice is available at: http://www.isric.org/content/soilgrids). The product has been registered in GEOSS Portal (http://tinyurl.com/pbtjq44) in 2014. Operational training and education programme, with (2) regional partnerships trained in compiling/harmonising soil legacy data. Revised procedures manual for eSOTER published and eSOTER project completed (2012/3). Contributed to IUSS WG SIS on Soil Information Standards.Earth System Spatial Grid (ESSG) developed to support GEOSS data cloud management, sharing and access, integrated analysis and applications.

IN-03 GEOSS Common Infrastructure (GCI)		
	Overview	**Highlights**
G	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) *Evidence of Use/ Policy Linkages:* • Large data catalogs configured to enable direct download of individual files/images; • Providers make extensive use of the GEOSS Portal (incl. South Africa (SAEON), Brazil (INPE), CEOS, EEA, UNEP, WMO (WIS)); • Future Earth Infrastructure linkage.	• GCI operation ensured 24hours/day and 7days/week; • New features of GEOSS Portal and associated GCI components implemented such as user authentication, data access download, use metrics, general ranking algorithms, and user profiling (usability improved based on extensive user input); • Number of resources discoverable via the GEOSS Common Infrastructure (GCI) around 174 million, and growing; • DataCORE pledges gradually registered and made accessible; • Search results from the GEOSS Portal now providing description of resources, links to resources (e.g. Web pages providing access); • GEOSS Community Portals Guidelines being established; • Analysis of interoperability between WMO WIS and GEOSS Common Infrastructure in progress - to allow for a two-way discovery of resources; • Refined GEOSS resources registration process developed through the Component and Service Registry (CSR) and Discovery and Access Broker (DAB).

IN-04 GEOSS Communication Networks		
	Overview	**Highlights**

G	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).
	Evidence of Use/ Policy Linkages:
	• UV index, fire detection maps produced by Brazil (INPE) with GEONETCast data;
	• GEONETCast data applied to crop production and forest modeling (EU Agricab project).
		• 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; Citclops: Monitoring water colour; WeSenselt: Water Monitoring, flood prediction:
		  • Set-up of GEONETCast-Americas;
		  • Transition of FenYungCast to CMACast;
		  • Increase of EUMETCast bandwidth and transition of European service to DVB-S2;
		  • GEONETCast Product navigator that identifies GEOSS Data Core products and is interoperable with the GEO Portal;
		• 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:
		  • User Fora organized in Americas and Africa to improve GEONETCast services. Contribution to Capacity Building initiatives (e.g. Africa, Asia, Eastern Europe and Balkan, and Central&South America);
		  • Preparation for routine Landsat broadcast to African countries underway; Support for projects in Africa ongoing (e.g. AMESD, MESA, AGRICAB, and EAMNET);
		  • Introduction of a Training Channel following a request from the GEO Capacity Building community;
		  • Inclusion of additional data and products to cover almost all GEO SBA's and support GEO various initiatives (GEOGLAM, AfriGEOSS, Disaster, etc).

IN-05 GEOSS Design and Interoperability		
	Overview	**Highlights**
G	Activities to improve interoperability within GEOSS are underway. Key contributions include the Architecture & Implementation Pilots (AIP) and Standards & Interoperability Forum (SIF). Active participation from the community is needed. *Evidence of Use/ Policy Linkages:* • Global exchange of in-situ water observations using WaterML (with WMO Hydro); • Demonstration for West African States of Global Atlas for Solar and Wind Energy; • Flood crop loss assessment based on remote sensing; • Global drought monitoring based on vegetation indices.	• 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; • "Apps" under development; they should be easy-to-use & interactive, and address specific user problems in quasi-real-time; • 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); • Tutorials for GEOSS users/providers released (help in understanding how to publish, register, discover, access, and use GEOSS resources).

INSTITUTIONS & DEVELOPMENT

ID-01 Advancing GEOSS Data Sharing Principles

	Overview	Highlights
G	• The Data Sharing Working Group (DSWG), during the transition year of GEO, dedicated efforts on identifying DSWG's role in GEO's new structure, envisioning GEO Data Sharing Strategies for the next decade as well as short-term targets and activities. Healthy communication among DSWG members were maintained through frequent email exchanges and regular teleconferences every three weeks.	• Contribute to GEO Strategic Plan 2016-2025 by providing Data Sharing Principles Post-2015 and the reference document; • Contribute to the Transitional Work Programme 2016 by putting together the Foundational Task GD-01 Advancing GEOSS Data Sharing Principles; • Make proactive conversations with ExCOM, IPWG and other GEO groups to identify DSWG's role in the new GEO structure; • Meet at the Work Plan Symposium 2015 to discuss GEO Data Sharing strategy for the next 10-year period and activities in 2015-2016; • Co-organize data sharing side events at Mexico City Plenary to advocate benefits of data sharing and to identify challenges and potential solutions for implementing Data Sharing Principles in developing countries.

ID-02 Developing Institutional and Individual Capacity

	Overview	Highlights
G	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. *Evidence of Use/ Policy Linkages:* • Uptake and improvement on the EGIDA methodology; • Increased GEO Membership; • EOPOWER developed Impact Assessment used to evaluate EO projects; • Increased registration of capacity building resources in GEOCAB Portal.	• Enhanced regional capacity-building networks in the scope of existing projects (DevCoCast, GEONETCast, GEONETCab, EO2HEAVEN, SEOCA, CEOP–AEGIS, AgriCab, AMESD, SERVIR, TIGER, EnerGEO, GMFS, OBSERVE, BalkanGEOnet, EnviroGRIDS, SA-GEO, NCRS-Madagascar, EcoArm2ERA, AFRIMET, CIMHET, EO2Heaven, SERVIR, INPE-FAO Work Programme, VLab, GFOI & SILVACARBON, EOPOWER and AfriGEOSS); • GEOCAB (Global Earth Observation Capacity Building) Portal launched (http://www.geocab.org) – to better coordinate existing capacity building efforts and inform future planning, now with over 1000 registered resources; • Improvement of coordination among capacity-building networks through the GEOCAB and GEOSS portals; numerous items registered, e.g. GEONETCast Toolbox; INPE Data Catalog; • Increased availability of tools and training opportunities focusing on Societal Benefit Areas (e.g. EnviroGRIDS, http://portal.envirogrids.net); • Access to data and information improved through AfroMaison Broker (portal enabling geospatial data discovery in Africa); CIMHET (virtual centres for severe weather prediction in South America); SANSA EODC (catalogue linked to South African EOS portal); • Capacity building undertaken in Tropical Forest Monitoring using TerraAmazon system; • 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; • Strengthen engagement with CEOS Working Group on Capacity Building & Data Democracy and other organizations for better coordinated capacity building; • AfriGEOSS Implementation Plan submitted to GEO-XI Plenary and impacts of the initiative already notable; • AmeriGEOSS initiative scheduled to be launched in November 2015.

ID-03 Science and Technology in GEOSS		
	Overview	**Highlights**
Y	The engagement of Science and Technology (S&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. *Evidence of Use/ Policy Linkages:* • User Registration Registry populated by Communities of Practice and external users; • Use of EGIDA methodology in research projects and outreach activities; • GEOSS S&T Meeting Portal: About 200 visits per day; • GEOSS S&T Stakeholder Workshops: Linkages with international agendas e.g. UN Sustainable Development Goals, Future Earth.	• Analysis of "Users in GEO" since 2005 delivered during 2014 GEO Work Plan Symposium; User engagement is a demanding task consisting of gathering, implementing, and evaluating user requirements – not once, but over and over; • Through a survey to assess Task user base it was found all Work Plan Tasks have a user in mind; some know the person by name. All Tasks are indirectly supporting user engagement through their activities; • Outreach performed through Earthzine; new audiences encouraged; • Served as the point of contact for the Communities of Practice and met with their representatives regularly; • Provided a more structured approach to Community of Practice development; • Held regional User Engagement Sessions to gather needs of the various communities, develop networks, and share information on regional applications; • Development and publication of User Engagement Strategies; • Development of a user typology; • Developed a draft of the Professorships concept, to prototype via Mines ParisTech; • GEOSS user-oriented workshops.

ID-04 Building a User-Driven GEOSS		
	Overview	**Highlights**
G	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 *Evidence of Use/ Policy Linkages:* 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.	• Promotion and dissemination of Earth observations and information in regions (via EOPOWER, IASON and other projects) - developed Marketing toolkits and Success stories; • Small task force established on "Mobilizing Resources for Water" (pilot); Webinar series organized on water-cycle monitoring; • 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; • Draft plan underway for a comparative study on international research funding; • Ministerial showcase video "Cold Regions through a Modern Explorer's Eyes" awarded; • Impact assessment methodology; • Courses and workshops on 'Bringing GEOSS services into practice', impact assessment and short courses for professionals; • Reports on marketing of earth observation; • Reports on promotion and dissemination activities.

ID-05 Catalyzing Resources for GEOSS Implementation		
	Overview	**Highlights**
Y	Progress on resource mobilization for GEOSS in the areas of capacity building (individual, institutional, infrastructure) and Research and Development (R&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. *Evidence of Use/ Policy Linkages:* • Future Earth (10-year Research Programme); • Development agendas, e.g. UN Sustainable Development Goals (SDGs).	• Promotion and dissemination of Earth observations and information in regions (via EOPOWER, IASON and other projects); • Small task force established on "Mobilizing Resources for Water" (pilot); Webinar series organized on water-cycle monitoring; • 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; • Draft plan underway for a comparative study on international research funding; • Ministerial showcase video "Cold Regions through a Modern Explorer's Eyes" awarded.

INFORMATION FOR SOCIETAL BENEFITS

SB-01 Oceans and Society: Blue Planet		
	Overview	**Highlights**

Y	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.
	
	Evidence of Use/ Policy Linkages:
	• Ocean forecasting (GODAE Ocean View) applied for instance to naval operations, seasonal prediction, search & rescue, oil spill response;
	• 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;
	• EU, Canada and US Research Alliance on the Atlantic Ocean.
		• Mobile app under development – for identifying plankton and producing crowd-sourcing data on species distribution (proposal made to the Architecture Implementation Pilot; AIP-7);
		• 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;
		• Blue Planet White Paper (http://www.oceansandsociety.org/files/whitepaper.pdf), Book, and Website released (www.oceansandsociety.org);
		• Collaboration with GEOBON (Task BI-01) underway for identification of Essential Ocean Variables for biology & ecosystems;
		• 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;
		• Efforts ongoing to disseminate information to under-served communities (with Task IN-04);
		• Periodic workshops held on societal applications in fisheries and aquaculture;
		• Scholars trained and regional pilot projects initiated as part of POGO joint capacity building activities;
		• Side Event held at GEO-X Plenary with high-level representation from the European Commission and Intergovernmental Oceanographic Commission (IOC);
		• The 2nd Blue Planet Symposium was held in Cairns, Australia from May 27-29, 2015. The program included presentations, posters, discussion and workshop sessions focussed around the six Blue Planet Components. Of particular emphasis during the symposium was:
		  • Observations in the Asia-Pacific region;
		  • Linking observations to societal benefit areas, particularly in coastal environments and Small Island Developing States;
		  • Showcasing operational oceanography;
		  • Enhancing user engagement;
		  • Satellite observations in the Southern Hemisphere;
		  • Links to freshwater aquatic systems;
		  • Blue Economy.

SB-02 Global Land Cover

	Overview	Highlights
G	Progress continues towards a suite of global land-cover datasets, based on improved and validated land-cover scenes. Major contributions relate to China, USA, GOFC-GOLD, ESA, and EC. More work is needed to efficiently coordinate activities and communicate related societal benefits. *Evidence of Use/ Policy Linkages:* • UN-REDD (Reducing Emissions from Deforestation and Forest Degradation); • UNFCCC; • Convention on Biological Diversity (CBD).	• International network created where GEO members can express needs for land-cover products and contribute national/international land-cover efforts; • New gobal land cover products delivered in 30m and 300m resolution; • Precise mapping (30m) of global open water released after validation for 2000 and 2010; • Geo-Wiki crowdsourcing tool under constant development; • Concept for a collaborative Global Land Cover Information Service System being explored; • Independent validation database for global land cover products in preparation; Direct contribution to Biodiversity, Ecosystem, Agriculture, and Forest activities; • Connection of major Global Land Cover websites/portals underway to facilitate data sharing and accuracy assessment of land-cover products; • Working group on Land Cover for Africa created to lead the development of a medium to high resolution map for Africa (contribution to AfriGEOSS initiative); • Training courses and regional network meetings held in China, Europe, and USA.

SB-03 Global Forest Observation

	Overview	Highlights
G	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 & Development (R&D). *Evidence of Use/ Policy Linkages:* • GFOI data stored and processed through FAO Space Data Management System; • Methods & Guidance Document used by FAO, UN-REDD and World Bank; • Data supply to GEO demonstrator countries increasing year-on-year; • UNFCCC/UN-REDD (Reducing Emissions from Deforestation and Forest Degradation)+ safeguards(agriculture, ecosystems, land use).	• GFOI coordination office no longer at the GEO Secretariat. Being transitioned to FAO. Interim Office in Australia; • Methods and Guidance Document for "estimating emissions/removals of greenhouse gases in forests" distributed and used since January 2014; First trial in Ghana; training materials and decision support tools were developed, translation into Spanish and French completed, and brochures and videos released; • Regional capacity building activities developing: 1st workshops planned for SE Asia (Jan 2014), Africa (June 2014), and S-America (2015); Close cooperation with FAO and UN-REDD+. .Australia also has focused programmes with Indonesia and Kenya for developing national capacity, as does Norway with Tanzania; • In the period 2011 – 2015, the CEOS SDCG has prepared, and coordinated the initial implementation of a coordinated global baseline data acquisition strategy for EO data (Element 1) involving a number of space-based 'core' data that can be used and shared free-of-charge for GFOI purposes, a coordinated strategy for national data acquisitions (Element 2) which accommodates countries that have specific technical requirements or heritage and experience on working with a particular EO data source or type, and a data acquisition and supply strategy in support of GFOI R&D activities (Element 3); • The GFOI R&D Component has produced a Review of Priority Research & Development Topics: R&D related to the use of Remote Sensing in National Forest Monitoring as well as the GFOI R&D Plan for 2015+ and a summary of archive data acquired over GFOI R&D study sites 2009-2011. Additionally, three expert workshops have been held, covering: sensor interoperability and complementarity, forest degradation, and vegetation biomass estimation.

SB-04 Global Urban Observation and Information		
	Overview	**Highlights**
G	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. *Evidence of Use/ Policy Linkages:* • Users/stakeholders include the World Bank, UN Habitat and local users; • 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.	• 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 (www.indstate.edu/cuec/UrbanSupersites/home.html); • Temporal variations of light detections used to assess electric-power grid performance; Global radiance VIIRS images released (nightly, monthly, annual; see ngdc.noaa.gov/eog/viirs.html); • Global Urban Area Map (AGURAM) in preparation; 3734 cities of more than 0.1 million people mapped using ASTER (15m); • Global Urban Footprint derived from SAR data of the TanDEM-X mission (50 m); Time-series analysis (1975-2010) produced, describing the spatio-temporal development of 26 mega-cities; • The fine-scale human-settlement map of Europe for 2012 made from automatic processing of 2.5-m resolution SPOT data was done and is freely accessible from the web platform of the European Environmental Agency (EEA); • The Global Human Settlement Layer made from the processing of Landsat data records of the last 40 years (1975-2014) passed the alpha test in October 2014, with final publication in 2016; • USGS National Land Cover Database (NLCD) 2011 products released, incl. impervious surface changes between 2001-2006, and 2006-2011; • Proposal for a Global Urban Remote Sensing Laboratory (GURSLab) under review (tool for on-line processing, visualizing, and sharing of urban data); • Textbook on "Global Urban Monitoring and Assessment through Earth Observation" published; www.crcpress.com/product/isbn/9781466564497). 1st Urban Task Symposium in conjunction with EORSA 2012 in Shanghai, China, June 9-11, 2012; 2nd Urban Task Symposium in conjunction with JURSE 2013 in Sao Paulo, Brazil, April 21-23, 2013; 3rd Urban Task Symposium organized in conjunction with EORSA 2014, Changsha, China, June 11-14, 2014; International Workshop on Global Urban Observation and Monitoring from Space, Athens, Greece, March 31-April 1, 2014; 1st Global Human Settlement Workshop, Ispra, Italy, October 21-23, 2014; GEO Urban Session in JURSE 2015 in Lausanne, Switzerland, March 30-April 1, 2015; GEO Urban Sessions (five sessions) in AAG annual conference in Chicago, Illinois, U.S.A., April 21-25, 2015.

SB-05 Impact Assessment of Human Activities		
	Overview	**Highlights**
Y	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. *Evidence of Use/ Policy Linkages:* • European Innovation Partnership (EIP) on Raw Materials; • Flagship initiative "Resource Efficient Europe"; • Africa Mining Vision 2050.	• 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 (http://energeo.researchstudio.at/energeo/catalog/main/home.page); • 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); • 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; • 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)); • 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; • e-training facilities for impact monitoring of mineral resource exploitation under development (ImpactMin project); • Working group on coal and environment under development as part of the Energy Community of Practice.

AG-01 Global Agricultural Monitoring and Early Warning System		
	Overview	**Highlights**
G	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. *Evidence of Use/ Policy Linkages:* G20 – In 2011, Ministers of Agriculture decided to create GEOGLAM and AMIS (Agricultural Market Information System) to reduce crop price volatility; Inclusion of the monthly GEOGLAM Crop Monitor into the AMIS Market Monitor. (http://www.amis-outlook.org/).	• Preparation of first meeting of GEOGLAM Advisory Committee (Mexico City, 9 November 2015); on-going finalisation of the package describing achievements, challenges and funding issues, to be sent to the AC members; • Monthly 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 Market Monitor; • GEOGLAM Crop Monitor tool improved (Assessment Interface) – to enable comparison of national data (global, regional and national), by crop type and accounting for crop calendars. Modified versions being developed for EWCM and RAPP; • Progress on the phase 1 implementation of SAR based rice crop monitoring in Asia Rice Crop team (AsiaRiCE) to promote the value of satellite based rice area / growth estimation in selected provincial areas in SE Asian countries and operate rice crop outlook using agro-met information provided by JAXA in cooperation with ASEAN food security information system project (AFSIS) for SE Asian countries; • Progress on the development of EWCM, Early Warning Crop Monitor, for an international monitoring on countries at risk, with a meeting in Rome (13-14 May 2015): (i) FAO GIEWS (Global Information & Early Warning System); (ii) US FEWSNET (Famine Early Warning System); (iii) EC MARS Food Security Bulletins; and (iv) China CropWatch Drought & Food security activities; • Progress on the development of RAPP, Rangeland and Pasture Productivity, with a meeting in Campinas (Brazil, 20-22 July 2015); • New project launched: ESA-funded GEORICE (SAR-based rice monitoring in Vietnam), in cooperation with AsiaRiCE; • JECAM (Joint Experiment on Crop Assessment and Monitoring) cooperation continued; work on a multi-user license for RadarSat-2 imagery; 2015 JECAM Science Workshop planned (Brussels, Belgium, 16-17 November 2015); • 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 AsiaRiCe and/or JECAM partners); • National projects for capacity development ongoing (in Argentina, Pakistan, Ukraine, and South Africa); • Second version of Global Cropland Map (wiki-based) published.

BI-01 Global Biodiversity Observation (GEO BON)		
	Overview	**Highlights**
G	The GEO Biodiversity Observation Network (GEO BON) is evolving towards an interoperable network of networks that collects, manages, shares and analyzes observations. *Evidence of Use/ Policy Linkages:* • Providing input to Convention on Biological Diversity (CBD) Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) and Ad Hoc Technical Expert Group (AHTEG); • Contributing to Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES); • Connections with UN Convention on Wetlands (Ramsar).	• Five projects funded to develop specific biodiversity concepts, including invasive species, butterfly monitoring guidelines, RS EBVs, BON in a Box development by Colombia; • Essential Biodiversity Variables (EBVs) concept matured and development plan created. Remote Sensing for EBVs concept developed and published in Nature; • BON-in-a-Box (BiaB) prototype under development for Latin America and funding forthcoming to start work on BON in a Box Africa next year; • Marine Biodiversity Observation Network (MBON) organized and focused on partnership development for its first phase-- Pole to Pole MBON in the Americas; • Concepts on "Global Biodiversity Change indicators" developed and presented at CBD meeting of experts and IPBES Global Assessment on Land Degradation and Restoration; • New GEO BON website developed and launched; • Bolivian Biodiversity observatory initiated; • Asia Pacific BON continues good progress. Workshop held at GEOSS Asia Pacific Symposium in Beijing.
CL-01 Climate Information for Adaptation		
	Overview	**Highlights**
Y	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. *Evidence of Use/ Policy Linkages:* • UNFCCC Subsidiary Body for Scientific and Technological Advice (SBSTA) and IPCC.	• New ECWMF reanalysis project (ERA-CLIM2) started in Jan 2015 – to develop a new coupled atmosphere-land-ocean reanalysis system and improve the climate record; • Ocean reanalysis datasets produced for past 53 years (incl. biogeochemical data); • 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; • "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; • Status Report on Global Observing Systems for Climate under preparation – for submission to GCOS sponsors and UNFCCC Parties in 2015; • Several GCOS Cooperation Mechanism (GCM) projects completed,making more climate observations available; • Portal (GOSIC) to access climate observations and Essential Climate Variables (ECVs) under continuous development; • EC Copernicus Climate Change Service operational in 2015; • Earth System Grid Federation GEOSS node under implementation (data/information archiving and dissemination mechanism); • GFCS Climate Services Adaptation Programme under implementation.

CL-02 Global Carbon Observation and Analysis		
	Overview	**Highlights**
G	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. *Evidence of Use/ Policy Linkages:* • UNFCCC; • IPCC; • Carbon information is central to the design of mitigation policies and adaptation measures with major implications on cost-management.	• The GEO Carbon Community of Practice published the GEO Carbon Strategy; • The CEOS Carbon task Force developed the CEOS Strategy for Carbon Observation from Space, based on the GEO Carbon Strategy; • Annual updates on the global CO2 budget, provided by the Global Carbon Project (77 contributors from 14 countries and 46 organizations; presented at UNFCCC COP; globalcarbonproject.org); • 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); • Numerous carbon datasets released, potentially available through the GEOSS Portal as DataCORE resources (full and open access); • The GEOCARBON project made progress towards a coordinated Global Carbon Observation and Analysis System; • GEOCARBON Portal in operation to enable free exchange of carbon data and products (geocarbon.net); • Concept for an Integrated Global Greenhouse Gas Information System (IGIS) developed – to inform policy and strategies on GHG emissions; • Development of ICOS (Integrated Carbon Observation System), a European research infrastructure; • ESA satellite mission BIOMASS under preparation (will provide unprecedented measurements of forest biomass to assess terrestrial carbon stocks and fluxes from 2020 onwards); • Measuring and evaluating CO2 and CH4 from ground networks.

DI-01 Informing Risk Management and Disaster Reduction		
	Overview	**Highlights**

G	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.
	
	Evidence of Use/ Policy Linkages:
	• Hyogo Framework for Action 2005-2015;
	• UNISDR Post-2015 Framework for Disaster Risk Reduction.
		• **GEO Geohazards Supersites** initiative evolving towards providing easy and free-of-charge access to satellite and ground-based datasets; 7 permanent and 4 event supersites are now supported by CEOS space agencies (space imagery committed by ASI, CNES, CSA, DLR, ESA, JAXA, NASA):
		  • **Permanent volcanic supersites**: Hawai'i (USA), Iceland, Mt. Etna Volcano (Italy), Mt. Vesuvius/Campi Flegreii (Italy), New Zealand (Ruapehu, Tongariro, Lake Taupo and White Island volcanoes), Ecuador (Tungurahua, Cotopaxi);
		  • **Permanent Seismic supersites**: Marmara Sea/North Anatolian Fault Zone (Turkey);
		  • **Event supersites**: Nepal earthquakes (2015), Sinabung Eruption (2014, Indonesia), Ludian Earthquake (2014, China), Napa Valley Earthquake (2014, USA);
		• **Satellite-based Advanced Fire Information System (AFIS)** developed to provide near-real-time fire information to users across the globe;
		• **CEOS Pilots:** 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 Seismic Hazards;
		• **Recovery Observatory** in planning to organize data and plan coordinated acquisitions for (i) Built-area damage assessment, and (ii) Reconstruction planning & monitoring.
		GEO-DARMA is a new GEO initiative proposed by the CEOS space agencies for the GEO 2016 WP. GEO-DARMA aims to support operational risk reduction activities through the implementation of end user priorities in line with the Sendai Framework for Risk Reduction 2015-2030, on a trial basis in regions of the developing world. GEO-DARMA is an extension of the concept of the current CEOS disaster pilots projects and will involve major international and regional stakeholders as well as national and local end users. In the first months, the GEO-DARMA initiative will seek independent identification of disaster risk management priorities at regional level (e.g. most prevalent hazards and most severe impact; hurdles in implementing effective DRR and resilience measures in the region,…) by authoritative Regional Institutions.

EC-01 Global Ecosystem Monitoring		
	Overview	**Highlights**
G	Efforts to assess the state and trends of world ecosystems from remote sensing, field data and ecosystem models are fully operational. Linkages with GEO BON, EU BON and Belmont Forum have been established. Links with Blue Planet and Cold Regions are developing. Mountain activities have evolved into a major GEO initiative that requires support from Members and Organizations. *Evidence of Use/ Policy Linkages:* • UNESCO World Heritage Programme; • UNESCO Large Marine Ecosystems; • UNEP; • Alpine Convention; • Carpathyan Convention; • Convention on Wetlands (Ramsar); • Networks of Protected Areas and National Parks.	• EU H2020 Project "ECOPOTENTIAL: Improving Future Ecosystem Benefits through Earth Observations" approved. The project (2015-2019) includes 47 partners from several countries and focuses on mountain, arid and semi-arid, coastal and marine ecosystems; • The global ELUs (Ecological Land Units) have been updated to version 2 by USGS; • Effort by USGS to map global EMUs (Ecological Marine Units), from data in 3D, in a manner analogous to what made for the ELUs; • The GEO Global Network for Observations and Information in Mountain Environments (GEO-GNOME) has been established to monitor and predict the state and change of mountains; • Link are established with the ongoing Belmont Forum CRA "Mountains as Sentinels of Change"; • NextData project continuing – 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 (nextdataproject.it); • World Heritage Sites, Biosphere Reserves and Geoparks set up for preserving key ecosystems; • Free-access real-time platform for marine conservation under development (integrating and monitoring Earth observation and human pressure data; SEAWETRA); • 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; • Linkages with Cold Regions (WA-01) and Oceans (SB-01) activities explored.

EN-01 Energy and Geo-Resources Management		
	Overview	**Highlights**
G	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. *Evidence of Use/ Policy Linkages:* • More than 45'000 users/year of GEO solar/wind products; • IRENA (International Renewable Energy Agency) Work Programme.	• Web-service Energy Community Portal launched – providing a catalogue of data and tools (OGC Compliant; webservice-energy.org); • 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; • Long-term Solar Energy Atlas launched; • 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); • 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); • Several European projects ongoing on Climate Forecasting Tools for Renewable Energy Resource Mapping (e.g. CLIM-RUN; EUPORIAS; SPECS).

HE-01 Tools and Information for Health Decision Making		
	Overview	**Highlights**
Y	The Health & 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. *Evidence of Use/ Policy Linkages:* Post-2015 development agendas, e.g. UN Sustainable Development Goals (SDGs).	• Globally integrated Cholera Early Warning System under implementation – based on regional pilots in areas such as Uganda, Bangladesh, Puget Sound, Chesapeake Bay; • Regional hazards outlooks in preparation for food security across Africa; • Requirements for geospatial standards relevant to health and environment under development; EO2HEAVEN (Earth **O**bservation and Environmental Modelling for the Mitigation of Health Risks) results disseminated to the OGC Domain Working Group on Health; • 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%); • Meningitis map-room in operation to provide information tools for epidemic meningitis (e.g. observed distribution maps during 1841-1999 and predicted probability maps); • Information clearinghouse for tick-borne diseases in preparation; • 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); • The Global Expanded Water Monitoring Initiative (GEMI) held a 1st stakeholders meeting on 29-30 January 2015 at the WHO, during which Earth observations were recognized as an important contribution for strengthening Water SDG monitoring frameworks.
HE-02 Tracking Pollutants		
	Overview	**Highlights**
G	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 POs. *Evidence of Use/ Policy Linkages:* • Minamata Convention on Mercury; • Stockholm Convention on Persistent Organic Pollutants (POPs).	• Ground-based observing system for mercury in operation; • Infrastructure collecting near real-time mercury data from ground-based sites; Quality Assurance/Quality Control system implemented; Historical datasets and metadata completed; • GMOS web portal (gmos.eu) up and running – providing information about project development, capacity building, support to policy, major findings, publications, and press releases; • The GMOS SDI now contains bio monitoring information regarding mercury contamination related to the food chain, and direct exposure at high air concentrations in contaminated sites such as artisanal small scale gold mining; • Collection of Persistent Organic Pollutants (POP) data ongoing in all UN regions – for ambient air, human milk/blood, and water; • 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; • Regional Global Monitoring Plan Reports in preparation for 2015 endorsement by UN Regions.

WA-01 Integrated Water Information (incl. Floods and Droughts)		
	Overview	**Highlights**
G	Water activities mainly rely on the work of the GEO Water Community of Practice and regional capacity building initiatives (Asia, Africa, and Latin America & Caribbean). Work on Cold Regions (Cryosphere) is making good progress through numerous contributions from ongoing projects and systems. *Evidence of Use/ Policy Linkages:* • 2 million TRMM files (4.5 Terabytes) distributed to ~2000 users/month; • Indicator applications developed for UNESCO (WWAP); • Great Lakes Service adopted by International Joint Commission for Canada-US Basins; • Transboundary basin management (Asian Water Cycle Initiative AWCI, and African Water Cycle Coordination Initiative AfWCCI); • UN Sustainable Development Goals; • Belmont Forum's Call for Proposals on Arctic Observations.	• 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; • GEO Great Lakes project adopted as an operational service in the Great Lakes area (http://data.glos.us/geo-greatlakes/); • GEOWOW river-discharge project completed (www.geowow.eu) 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; • 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; • New Arctic website launched to help non-remote-sensing scientists place polar change in context (http://staging.nsidc.org/soac); • CryoClim service for monitoring climate change in the cryosphere now operational and contributed to GEOSS (cryoclim.net/cryoclim/index.php); 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; • CEOS and GTN-H are preparing actions in response to the GEOSS Water Strategy 2014; • Joint initiative (e.g. with ICSU Global Water System Project (GWSP), FAO) on the role of Earth observations in the SDG process and the Water-Energy-Food Nexus; • 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; • Launching a water quality community of practice.

WE-01 High-impact Weather Prediction and Information		
	Overview	**Highlights**
G	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. *Evidence of Use/ Policy Linkages:* • More than 100 routine users downloading and analyzing TIGGE forecast data; • About 140 scientific papers published so far.	• Prototype early-warning products developed for: (i) tropical cyclone track & strike probability, and (ii) extreme weather (heavy rainfall, strong winds, very hot or cold); To be trialed through WMO Severe Weather Forecast Demonstration Projects; • 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); • TIGGE has become a focal point for a range of research projects, including research on ensemble forecasting, predictability and the development of products to improve the prediction of severe weather; • TIGGE data made available for research after a 48-hour delay; regularly accessed by over 100 users (e.g. universities); • 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; • New database of European (regional) weather forecasts developed and registered in the GEOSS Common Infrastructure (apps.ecmwf.int/datasets/data/tigge_lam/); • 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; • Sub-seasonal to seasonal prediction dataset in planning (global forecasts up to 60 days at lower temporal and spatial resolutions); • Strong support from European project GEOWOW (ended in Aug 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
AMIS	Agricultural Market Information System
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
ASSENDS	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	CApture and geological STORage of CO_2
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_2
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_2 Flux Measurements
FOSS4G	Free and Open Source Software for Geospacial
FP6	European Commission funded projects
FP7	European Union 7th 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 Warming 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 AerospaceExploration 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