

2007-2009 Work Plan Progress Report

This 2007 progress report describes how the Group on Earth Observation's (GEO) 2007 – 2009 Work Plan has helped to advance the 10-Year Implementation Plan 2005 – 2015 for the Global Earth Observation System of Systems (GEOSS). In addition to providing an overall summary assessment of each of GEO's nine Societal Benefit Areas and four Transverse Areas, it highlights key activities and outputs that illustrate the progress achieved.

To help the reader more easily evaluate this progress, the report includes an annex featuring an “at-a-glance” summary table of the 72 practical Tasks around which the work plan has been organized. The table has been colour-coded to represent the Secretariat's assessment of progress: green stands for “excellent or very good”, yellow represents “progressing but more effort is required”, and red signifies “insufficient progress”.

Two additional annexes indicate the links between the Work Plan's Tasks and the two-year and six-year targets that the 10-Year Implementation Plan has set out for measuring progress and maintaining momentum. Where relevant, these tables also indicate any links to Early Achievements; these voluntary contributions to GEOSS implementation are described in detail in the Annex to the Report on Progress being presented to the Cape Town Ministerial Summit.

In this way, the report allows the reader to track how the Work Plan Tasks and the Early Achievements have advanced the 10-Year Implementation Plan over the past year. Those readers interested in greater detail about the progress on specific Tasks are referred to the Task Sheets, which are posted at <ftp://ftp.wmo.int/Projects/GEO/TaskSheets/2007-09/>.

Because performance indicators for evaluating the societal value and benefits (or outcomes and impacts) provided by GEO and GEOSS continue to be elaborated (see Document 26), such indicators are not used in this report.

OVERVIEW OF PROGRESS

The Secretariat believes that, while gaps remain, overall progress on the Work Plan this year has been impressive. At least two thirds of the Tasks are making very good progress. Importantly, the Architecture Tasks, whose successful completion is so vital for establishing the underlying structure of GEOSS, are fully on track. With much of the GEOSS architecture in place it will be possible to advance more quickly on the operational issues and the Societal Benefit Areas.

Another very positive sign has been the growth of various GEO Communities, which offer expanded opportunities for GEO Members and Participating Organizations with shared interests and concerns to interact, share ideas and work together. These Communities have been the driving force behind such important outputs presented to the Plenary as the GEO Energy Strategic Plan (see Document 21), the Interim Report on Data Sharing Principles (Document 27) and the Seville Road Map for Mobilizing Resources to Implement GEOSS (Document 23).

Although not conceived as a part of the Work Plan, the numerous Early Achievements that GEO Members and Participating Organizations have voluntarily contributed are also an encouraging sign of progress. Many of the Achievements directly support specific Work Plan Tasks, while others contribute more broadly to the longer term implementation of GEOSS.

Some parts of the Work Plan have not progressed as well as could be hoped. A number of Tasks have not even been started, while others got off to a very late start. Many of the delays have been due to difficulties in identifying an appropriate Task Lead. The Health area in particular has suffered from a late start; fortunately, the Secretariat has been reinforced by a seconded expert from the Republic of Korea as well as by a short-term contractor, which now promises to move this issue forward. The Tasks requiring the most urgent attention are DI-06-04, HE-07-01 and -02, WE-07-01, AG-06-01 and US-07-01, -02 and -03.

As a result of the work that has been dedicated to the Tasks and Early Achievements, two thirds of the 106 two-year targets (70 of 106) have seen very good to excellent progress (and so are coloured green in Annex II). One fourth (27/106) have progressed but need more action (yellow), while eight percent (9/106) have made insufficient progress (red).

1 DISASTERS

The work on disaster issues is progressing well. The Task teams are now well developed, and cooperation amongst the various disaster-related Communities has greatly increased. The work is focusing more on forecasting, prevention and mitigation than on response measures, thus confirming the essential role of Earth observations in all phases of the risk-management cycle. Next steps will include starting up the activities and identifying the proper teams for the proposed end-to-end risk-management projects on geohazards and flood management.

The improvement and coordination of **global seismographic networks** is proceeding satisfactorily. The task team met in July to review progress and decided to expand the scope of the task slightly. To raise awareness of the issue and enlarge the Community involved, the GEO Secretariat co-sponsored a dedicated session, "Operating High-Performance Seismic Networks: Challenges and Tools," at the American Geophysical Union Assembly in Acapulco, Mexico on 22-25 May.

The GEO activities on **tsunami early warning** are being re-assessed following a June meeting of the Tsunami Working Group. Progress is being made on implementing the Indian Ocean Tsunami Early Warning System, which is being coordinated through the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization (UNESCO/IOC), as well as through bilateral contacts amongst the participating Governments and organizations.

The **Geohazards Community of Practice** is consolidating its membership and activities through the process of collaborating on GEOSS. This has resulted in the successful transition of the Geohazards theme from the Integrated Global Observing Strategy (IGOS) into the GEO framework, thus generating an Early Achievement for the Cape Town Ministerial Summit.

The World Meteorological Organization's Congress recently decided to include five strategic goals for **reducing the risk of disasters** as part of the WMO "Strategic Plan 2008-2011 and Beyond". It also decided to strengthen its activities on disaster risk reduction by supporting the relevant work being undertaken through GEO.

An effective mechanism for coordination between users and providers has been put in place for **satellites that support risk management**. This mechanism will complement the International Charter on Space and Major Disasters that has been agreed by major space agencies and will identify options for its future evolution. A Group on User Requirements and a Group on Architecture have been established and have each met once. The User Group produced a first draft of a User Requirements Document in October. An Early achievement is being presented to the Summit.

GEO is coordinating with the United Nations' International Strategy for Disaster Reduction (ISDR) on implementing the **Hyogo Framework for Disaster Risk Reduction** by contributing to the definition and implementation of a multi-hazard risk-management approach. An important meeting on this issue

took place during the First Session of the Global Platform for Disaster Risk Reduction, which was held in Geneva in June.

The implementation of a **Global Early Warning System for Wildland Fire** is proceeding well. A prototype African component is being made available for the Cape Town Ministerial. The prototype will be reviewed by a dedicated workshop on African fire issues in November in Accra, Ghana.

2 HEALTH

After a late start, the work on the health aspects of GEOSS is now progressing well. In particular, collaboration between the Earth observation and health communities has been strengthened through activities on meningitis, sand and dust storm warning, and air pollution and air quality.

The **Meningitis Environmental Risk Information Technologies (MERIT) project** aims to more effectively utilize current knowledge about epidemic meningococcal meningitis and its interaction with the environment. This promises to increase the effectiveness of prevention and response control strategies in Africa. The World Health Organization (WHO) and a number of other partners met for a Meningitis Environmental Risk Consultative Meeting in Geneva on 26-28 September and adopted a series of recommendations.

The **Task Force on Hemispheric Transport of Air Pollution** issued its draft 2007 Interim Report on Integrated Atmospheric Pollution Monitoring, Modelling and Forecasting based on contributions from international experts and the deliberations of meeting and workshops. Key inputs were obtained from the Task Force's Workshop on Integrated Observation for Assessing Hemispheric Transport of Air Pollution, which was sponsored by GEO and the World Meteorological Organization (WMO) in Geneva on 24-26 January.

Very good progress has been made towards developing international systems for both **sand and dust storm warning**. A WMO/GEO Expert Meeting on an International Sand and Dust Storm Warning System to be held in Barcelona on 7-9 November is expected to recommend actions for developing a routine global warning system and reducing risks by integrating the various numerical prediction and observing systems on sand and dust storms and establishing effective cooperation between data producers and user communities.

The **Air and Health Community of Practice** held a meeting on the Applications of Environmental Remote Sensing to Air Quality and Public Health in Maryland, USA on 8-9 May. The meeting promoted further collaboration amongst atmospheric and earth scientists and public health researchers in the field of environmental health research and applications.

3 ENERGY

The Work Plan on energy issues is advancing well, with major activities undertaken by committed members of the GEO Energy Community of Practice, whose members include France, Germany, the Netherlands, the USA, the European Space Agency (ESA), the Global Ocean Observing System (GOOS), and the Institute of Electrical and Electronics Engineers (IEEE). In some cases, however, these activities do not fully cover all aspects of a particular Task. One example is the Energy Environmental Impact Monitoring Task, for which the "impact monitoring" aspects are not currently addressed. GEO Members, Participating Organizations and Committees are invited to suggest complementary contributions to help remedy this situation.

During the reporting period, the Energy Community and its members:

- **Launched a web-portal for the GEO Energy Community of Practice**, featuring activities in nine energy domains: biomass, coal, gas and oil, geothermal, hydro-power, nuclear, ocean, solar and wind. This regularly updated portal now serves as an interactive tool enabling the Energy Community to develop new activities and share information. (See www.geoss-ecp.org.)
- **Developed a Strategic 5-10 Year Plan** to support detailed planning over the upcoming decade. This ‘living’ document will serve as a framework for securing support for, and integration of, ongoing and future GEO energy activities. The Strategic Plan is the key deliverable of the Using New Observation Systems for Energy Task and the GEOSS two-year Target 26. It is being presented to the GEO Plenary in Cape Town.
- **Identified user requirements for wind and solar energy management** after wide consultation within the Energy Community. A draft report on solar-energy user requirements was developed within the framework of Task 36 of the International Energy Agency’s (IEA) Solar Heating and Cooling Programme. Further work on user requirements will be performed within the European Commission’s Coordination Action MESOR (Management and Exploitation of Solar Resource Knowledge) project, which started in June. A similar approach is being applied to the requirements of wind energy users.
- **Defined Earth observation priorities common to many GEOSS societal benefit areas.** The Energy Community worked with the User Interface Committee to define “... Earth observation priorities common to many GEOSS societal benefit areas, involving scientific and technical experts, taking account of socio-economic factors, and building on the results of existing systems’ requirements and development processes.”
- **Designed and implemented a plan for the GEO early achievement on “Solar Energy Data for Developing Countries”.** This Early Achievement combines databases from around the world to provide easy access to solar radiation information and to better inform energy-policy planning, particularly in developing countries. The first version of the so-called SoDa service web-portal combines the Surface Meteorology and Solar Energy from the National Aeronautics and Space Administration (NASA) of the US and the Helioclim database of the Ecole des Mines de Paris in France. It automatically selects the database offering the best quality for the selected site. (See www.soda-is.com/eng/services/meteo_eng.html#ssehc.)
- **Undertook key research on CO₂ geological storage** in connection with the European Framework Programme 6 project CO2ReMoVe. Areas of progress include: (i) methods for base-line site evaluation; (ii) new tools for monitoring storage and possible well and surface leakage; (iii) new tools for predicting and modelling long-term storage behaviour and risks; (iv) rigorous risk-assessment methodology for a variety of sites and time-scales; and (v) guidelines for best practice for the industry, policy makers and regulators.
- **Developed outreach initiatives.** In collaboration with the GEO Architecture and Data Committee, the Energy Community organized a GEO workshop on Arctic sea ice, climate change and energy activities entitled “2007 International Polar Year (IPY) Geonorth Conference” on 20-24 August in Yellowknife, Canada. A new “IEEE Journal of Selected Topics in Earth Observations and Remote Sensing” was launched; its first thematic issue on “Earth Observations and Wind Energy” may be followed later by a thematic issue on solar energy.
- **Prepared for the GEO Ministerial Summit.** The Energy Community of Practice submitted five texts describing Early Achievements, including the Energy Community of

Practice, Solar Data for Developing Countries, Solar and Wind Energy User Requirements, Biomass Resource Assessment, and ENVISOLAR (Space-based environmental information for solar energy industries). It also submitted articles for the GEO book “The Full Picture” on the Energy Community of Practice, Solar Energy and Wind Energy.

4 CLIMATE

The implementation of the Climate Work Plan is making good overall progress, and strong leads have been identified for all Tasks. Many Task contributors are also playing a significant role, although this could be strengthened through improved intra-task coordination.

The various Task teams, GEO Members and Participating Organizations have:

- **Identified priorities in reanalysis and ocean/atmosphere data assimilation techniques** through the preparatory process for the Third World Climate Research Programme (WCRP) International Conference on Reanalyses, to be held in Tokyo on 28 Jan.-1 Feb. 2008. These priorities include: (i) applications using reanalysis data; (ii) comparison and validation of characteristics of each reanalysis; (iii) data assimilation technique for reanalysis; and (iv) strategy and international cooperation for future reanalysis. Aspects of ocean and land reanalysis will also be considered.
- **Reinforced international efforts in climate data reprocessing** through strong interactions with the Global Climate Observing System (GCOS), WCRP and the Committee on Earth Observation Satellites (CEOS). These efforts relate to the activities of the WCRP Observation and Assimilation Panel (WOAP) and the creation of a working group on the “Development of Improved Observational Datasets for Reanalyses”, which was established early this year.
- **Developed an Action Plan in response to the GCOS Implementation Plan.** Adopted by CEOS, the Action Plan will address society’s need for the sustained and coordinated provision of climate data records. Focal points were designated and action teams formed to implement 17 priority actions. Initial results indicate progress on Essential Climate Variables related to sea ice, sea level, snow cover, albedo, land cover and fire disturbance. In addition, one first national success can be reported: NASA and the National Oceanic and Atmospheric Administration (NOAA) of the US announced a plan on 11 April to restore a key ozone layer climate sensor known as the Ozone Mapping and Profiler Suite (OMPS) to its National Polar-orbiting Operational Environmental Satellite System (NPOESS) programme. This important announcement fulfils one priority action in the CEOS response.
- **Developed proposals for a terrestrial framework.** The Global Terrestrial Observing System (GTOS) and its collaborators designed standards and methodologies for the 13 terrestrial Essential Climate Variables identified in the GCOS implementation Plan (see www.fao.org/gtos/topcECV.html). Two progress reports were prepared and submitted in May to the 26th Session of the Subsidiary Body for Scientific and Technological Advice (SBSTA) of the UN Framework Convention on Climate Change. Stakeholders will further help to review and finalize these reports (see www.fao.org/gtos/topcFRAME.html).
- **Initiated a major Weather, Climate and Earth-System Prediction Project for the 21st century.** This work was conducted by the World Weather Research Programme (WWRP) of the World Meteorological Organization (WMO), WCRP, the International Biosphere-Geosphere Programme (IGBP), and the natural-hazard and socioeconomic communities. The project aims to increase the capacity of natural-hazard managers and environmental policy makers to minimize and adapt to societal and environmental vulnerabilities arising

from high-impact weather and climate variability and change. Core elements include: (i) high-resolution observations and models of the atmosphere, ocean, land and biogeochemical processes; (ii) high-resolution global and regional data-assimilation; (iii) advanced high-performance computing capabilities; (iv) an internationally-coordinated multidisciplinary forecast information system and archive; (v) underpinning research; and (vi) information to assist critical decision-making processes regarding sustainable development and adaptation to and mitigation of weather and climate events.

Three supporting documents have been prepared for the Ministerial Summit: a description of an early achievement, an article for the upcoming GEO book “The Full Picture”, and a one-page executive summary, all pointing to the “Socioeconomic and Environmental benefits of a Revolution in Weather, Climate and Earth-System Analysis and Prediction”.

5 WATER

The work plan on water issues is on track and progressing well. Based on comments made by GEO Members, and in line with the requirements of the Integrated Global Observing Strategy (IGOS) Water Theme, the Secretariat has proposed merging the in-situ and remote sensing-related Tasks and to reflect this merger as a Work Plan update.

The 3rd **Hydrologic Ensemble Prediction EXperiment (HEPEX)** Workshop, hosted by the EU Joint Research Center and held in Stresa, Italy on 27-29 June, reviewed the advances being made in hydrologic ensemble forecasts, systems and applications. It explored such topics as user and operational perspectives, the review of testbed projects, observations and data assimilation, application of atmospheric forecasts, and hydrologic uncertainty.

The First Steering Committee meeting for the **International Hydrological Database on Lakes and Rivers (HYDROLARE)**, held in St. Petersburg, Russian Federation in May, made progress towards establishing a HYDROLARE Centre. The Centre will focus on closing significant gaps in surface-water observations.

The Third Planning Meeting of the **Global Terrestrial Network for Hydrology (GTN-H)**, held on 17-21 September, explored a strategy for fostering linkages between the GTN-H, Integrated Global Water Cycle Observations (IGWCO), WMO, GCOS, and GEO.

Representatives from NOAA, NASA and Brazil’s National Space Research Institute (INPE) held discussions in July about their participation in **capacity building**. NOAA has promised to contribute a concept for an advanced training facility in South America. It has also sponsored work by the Hydrology Prediction Center of San Diego, USA for a flash flood warning system that has been tested in Central America and is now available for application in other countries.

A representative of the Integrated Global Observing Strategy Partnership (IGOS-P) Integrated Global Water Cycle Observations (IGWCO) theme has been participating in two NASA grants. The work involves examining lake and reservoir water quality using Landsat and MODIS. Discussions are underway with Japan regarding a capacity building water quality proposal for Southeast Asia. Capacity building proposals for other regions, such as Africa and Latin America, are also being considered.

The WMO is cooperating with the European Space Agency (ESA) on improving the availability of **altimetry data** for projects being undertaken by the WMO’s World Hydrological Cycle Observing System (WHYCOS). The focus is on combining these remotely-sensed data with *in situ* water level observational data of major trans-boundary rivers.

The GEO Secretariat has overseen the drafting of a combined project plan and concept proposal on the **Hydrological Applications and Run-Off Network (HARON)**. It has also established contacts with

the Research Infrastructure Unit of the European Commission's Directorate-General for Research. There is increasing interest in this activity. Discussions are underway to promote HARON as a key vehicle for executing a new task on the Integration of In-Situ and Satellite Data for Water Cycle Monitoring. Because of the project's broad scope, it has the potential to absorb the principal features of two other tasks (WA-06-05 and WA-07-02) and to supersede them.

6 WEATHER

Most of the Task teams working on weather issues have made excellent progress during the reporting period. Activities on capacity building, research and development, and the strengthening of global observing systems have all advanced. Particular attention continues to be paid to extending the benefits of improved weather prediction and warning to all GEO Societal Benefit Areas.

The WMO's Global Observing System (GOS) continues to advance the **Surface-based Global Observing System for Weather** by meeting the evolving requirements of various users for sustainable observational data and information on the state of the Earth and its atmosphere. In addition to maintaining the level of inputs from the WMO's World Weather Watch (WWW) programme, GOS has improved the availability of data from both marine sources and Aircraft Meteorological Data Reporting (AMDAR) systems. The availability of GOS data continues to be routinely monitored, and GOS coordinates with its members to pursue regular improvements. GOS updated its Implementation Plan for Evolution of Surface- and Space-based Subsystems (EGOS-IP) in July.

GOS also organized a second workshop on the **Re-design and Optimization of the Space-Based component of GOS** on 21-22 June in Geneva. The workshop supported GEO's goals for a **Space-based Global Observing System for Weather** by initiating a review and update of the baseline for the space-based GOS. The workshop emphasized the importance of developing a new vision of GOS whereby observations of Essential Climate Variables would be ensured through operational and other long-term missions rather than being dependent solely on research and development missions that lack plans for continuity.

Excellent progress has also been made on the **THORPEX Interactive Global Grand Ensemble (TIGGE)**. Five centres (the European Centre for Medium-Range Weather Forecasts, NOAA's National Centers for Environmental Prediction, the UK Met Office, the Japanese Meteorological Agency, and the Chinese Meteorological Administration) are now providing data to three archive centres. The remaining five data providers (Brazil's Center for Weather Forecasts and Climate Studies, the Korea Meteorological Administration, the Meteorological Service of Canada, Australia's Bureau of Meteorology Research Centre, and Meteo France) have signed on to the project and should start providing data before the end of this year. It is anticipated that, along with TIGGE, limited-area ensemble prediction systems (TIGGE-LAM) will also form important components of the proposed Global Interactive Forecasting System. A workshop covering developments in TIGGE and TIGGE-LAM was held in association with the European Meteorological Society in October.

Continuing its work to protect the 2008 Beijing Olympics from the risks of high-impact weather events, the Task team conducted the second system trial for the **Beijing 2008 Forecast Demonstration Project (B08FDP)** from 1 July-31 August. Real-time enhanced observation data were provided to eight participating systems, which then ran in real time to test their forecasting ability. A verification system confirmed that all the systems' products were indeed delivered in real time. A further trial involving six participating systems was conducted from 24 July-31 August. The third B08FDP/RDP workshop (B08RDP stands for Beijing 2008 Olympics Mesoscale Ensemble Prediction Research and Development Project) was held in Qingdao, China on 20-22 September.

No inputs or progress reports have yet been received from task leader Australia regarding **Data Assimilation and Modelling for Operational Use**.

7 ECOSYSTEMS

Improving the management and protection of terrestrial, coastal and marine ecosystems presents a significant challenge as it encompasses ecosystem services, conditions and extent. Progress on ecosystems issues has therefore been rather uneven. Work has advanced on the protected areas monitoring component of the Ecosystem Observation and Monitoring Network; other aspects of the Network, however, still need greater support.

The **Integrated Global Carbon Observation (IGCO)**, which is developing a global carbon-observing system, has been off to a slow start. A number of advances have been made however:

- A global standard has emerged for data-basing flux data, post-processing (correction, gap-filling, error removal) of flux data, and flux site ancillary data; and
- The observation network has expanded significantly, and now includes the existing CarbEurope and AmeriFlux (North and South Americas) and the new CarbAfrica and Ozflux networks.

Progress has also been achieved on the protected areas monitoring component of the **Ecosystem Observation Network**. Other facets of the Network, however, need further support, including land surface parameters, upscaling *in situ* data, global phenology (satellite and *in situ*), a global sampling frame for ecosystems and a global terrestrial *in situ* network (plot data).

Remarkable progress has been made on **global ecosystems classification and mapping**. The US Agency for International Development (USAID), with matching funds from The Nature Conservancy, is funding the US Geological Survey's (USGS) efforts to classify and map African ecosystems. This effort, which was launched at AfricaGIS 2007 in Ougadougou, Burkina Faso, aims to enlist African collaborators, especially ecosystem classification and mapping specialists. US ecosystem footprints are close to completion, with best-yet landforms and bioclimates now mapped for the nation. China has launched the China GEOSS Ecosystems Mapping Project, and Australia's project is in the pipeline. The Leads on these activities are now looking for further support for similar work in Indonesia and the Asia/Pacific region.

8 AGRICULTURE

Work on the agricultural component of GEOSS got off to a slow start this year. Momentum started to pick up, however, following a major workshop on agricultural monitoring, which was co-sponsored and supported by the GEO Secretariat and hosted by the Food and Agriculture Organization of the UN (FAO) in Rome. Major players in the agriculture community took this opportunity to accelerate their work, particularly in the fields of agricultural monitoring and food security.

A new strategy is being pursued to advance the work plan on **Data Utilization in Aquaculture**. The aim now is to integrate the activities of selected experts from both the fisheries and Earth observation communities in order to accelerate the assimilation of Earth observations into aquaculture management. In addition to raising the quality of work in this area, this new approach should provide a much-needed stimulus to the implementation of ecosystem-based management worldwide. A medium-term goal is to hold an international symposium after five years or so to showcase the results. A new proposal entitled Societal Applications on Fisheries and Aquaculture using Remotely-sensed Imagery (SAFARI) featuring ten elements is currently being evaluated by the Canadian Space Agency.

GEO and IGOL (Integrated Global Observations for Land – an IGOS theme) convened a workshop on 16-18 July at FAO Headquarters in Rome to develop a **strategy for global agricultural monitoring** in the framework of GEO. The 47 participants representing 25 national and international organizations established the “GEOSS/IGOL Agricultural Monitoring Community of Practice”. The workshop reviewed the current state of agricultural monitoring through a series of presentations, discussions and breakout sessions. It enhanced the definition of the GEO Operational Agricultural Monitoring System Task and developed a set of priorities and recommendations calling for the GEOSS/IGOL Agricultural Monitoring Community of Practice to implement this Task through a set of subtasks.

The work on **agricultural risk management**, which focuses on the use of seasonal forecasts in agriculture to alleviate food shortages, drought and desertification, as well as on the use of integrated agricultural management and crop simulation models with climate forecasting systems, is progressing well. Strategies to improve water management and thus yields and incomes include crop diversification and better irrigation, concentration on a combination of locally adapted traditional farming technologies, seasonal weather forecasts, and warning methods. The impact of different sources of climate variability and change on the frequency and magnitude of extreme events is particularly important.

Uganda and Slovenia have agreed to be the new task leaders for **Training Modules for Agriculture**. Uganda has been identified as a new leading member. The University of Montana will be the new point of contact (POC) for **Improving Measurements of Biomass**.

The **Forest Community of Practice** has been very active, especially within the Committees. The Community and the GEO Secretariat have been involved in planning the remote sensing support to the FAO 2010 Forest Resource Assessment. Excellent coordination has been achieved with the land cover activities, especially the ESA-led GLOBCOVER activity. Participants include FAO, the UN Environment Programme, the European Commission's Joint Research Centre (JRC), the International Geosphere-Biosphere Programme (IGBP) and the Global Observations of Forest Cover and Global Observations of Land Dynamics (GOFC-GOLD) Implementation Team Project Office.

The **GEO Forest Monitoring Symposium** will be hosted by Brazil (INPE) in April 2008.

9 BIODIVERSITY

Biodiversity represent one of the key areas where GEOSS can significantly enhance the use of Earth observation data to monitor status and trends. Highlights for the biodiversity work programme involve invasive species monitoring, specimen data collection and management, biodiversity information systems, and the formation of a new GEO-initiated Global Biodiversity Monitoring Network.

Highlights of the activities relating to **invasive species monitoring** include:

- The results of an invasive species information managers needs assessment survey conducted in May have been posted on the web (see www.gisnetwork.org)
- The alpha version of the prototype system to search and integrate data across diverse invasive species information systems was completed in June (see monsoon.nrel.colostate.edu/cwis438/websites/GISINDirectory/)
- The beta version of the prototype system was completed in October (see <http://squall.nrel.colostate.edu/cwis438/websites/GISINDirectory/>)
- An Invasive Species Monitoring System Data Providers Workshop will be held in early 2008 and
- The Global Invasive Species Information Network (GISIN) data providers toolkit is making progress and is now scheduled to be created by May or June 2008.

The **Biodiversity Observation Network** is making significant progress. Two teleconferences and two meetings of the *ad hoc* steering committee meeting have been held. The Biodiversity Community of Practice is developing the Network's foundation documents (including "GEO Biodiversity Observation Network: A framing document on the design and implementation of the Global Biodiversity Observation Network"). These documents will be used for the 2nd Workshop on the GEO Biodiversity Observation Network: Design and Implementation, to be held in early 2008.

Significant progress is also being made on **capturing historical biodiversity data**. An outline for a strategic plan for digitisation has been created, and interactions with the GEO Biodiversity Observation Network have been affirmed. Cooperation with Interoperability Process Pilot Project on a demonstration using historical biodiversity data to study adaptation of biodiversity to climate change will and demonstrated at the Cape Town Ministerial. This project includes model interoperability and interoperability between the Global Biodiversity Information Facility (GBIF) and components of the World Meteorological Organization Information System (WIS).

10 ARCHITECTURE

The work plan for developing the architecture of GEOSS has made significant progress during 2007 and reflects the GEO community's strong commitment to advancing this critical issue. The two next steps for building on this progress are a) establishing operational procedures for the GEOSS registry, web portal and clearing house, and b) working with members of other GEO Committees, in particular the User Interface Committee (UIC), to address the lack of user requirements and identify which architecture would work best.

The GEO Members and Participating Organizations continue to make good progress on promoting the **interoperability of Earth observation systems**. The registries listing and describing the components, services and standards that together constitute GEOSS have been further expanded and evaluated. Meanwhile, the Architecture and Data Committee (ADC) has established a Standards and Interoperability Forum (SIF) to speed up the work on interoperability. It has issued a call for participation (CFP) to engage the GEO community in establishing the Forum's terms of reference; some 40 people have already agreed to contribute. Similarly, an *ad hoc* team of systems engineers is addressing the basic interface functions of the GEOSS components. A number of observing instruments and other components that have been presented as candidates for inclusion in GEOSS have been evaluated through GEOSS Interoperability Process Pilot Projects (IP3).

A prototype **GEO Web Portal**, the **GEOSS Clearinghouse** and associated information services are currently being established to improve users' access to GEOSS data and services. A minimum set of standard interfaces and metadata content and exchange standards have been recommended. The team carrying out this work met in Frascati, Italy on 5-6 June to launch a number of working groups. Each group has developed its own scenario to show how the GEOSS pilot architecture would operate and provide information services to users. Ensuring that the Portal and Clearinghouse meet the needs of users will require continued inputs from and coordination with all GEO Committees.

An Architecture Task team has produced a series of practical **strategic and tactical guidance documents** to assist GEO Members and Participating Organizations with moving their systems towards greater interoperability. These documents are being published as brochures and in electronic format. The Architecture and Data Committee is also planning to establish a web site to provide more information on these issues to the GEO community.

The work on **international protection for radio frequencies** has focused on a large number of advocacy initiatives aimed at convincing national and international bodies responsible for managing radio frequencies of the importance of dedicating certain frequencies to Earth observations. Recognizing their shared interest in ensuring the availability and affordability of information and communications technology in developing countries, including for Emergency Telecommunication in

Disaster Mitigation and Response, GEO (through its Secretariat) and the International Telecommunication Union (ITU) continue to discuss a framework agreement on this issue.

The availability of an accurate, homogeneous, long-term and stable **global geodetic reference frame** for geodetic data is essential for achieving many of the societal benefits promised by GEOSS. The team working on this issue is currently drafting a strategy and a reference document on the Global Geodetic Observing System (GGOS) to the year 2020 in order to provide guidance to the GEO community. The European Space Agency and the International Association of Geodesy/Global Geodetic Observing System (IAG/GGOS) will organize the GGOS 2007 workshop on 5-6 November in Frascati, Italy.

Now in the process of establishing itself as a **GEOSS Operational Exemplar**, the WMO Information System (WIS) has made good progress in its efforts to improve the connectivity and access of meteorological offices to environmental information. It is also working to improve accessibility and interoperability for a wider range of users through the GEOSS interoperability processes and arrangements. In addition, GEO and WIS initiated discussions on how WIS can contribute to user needs through GEOSS during the 4th ICG-WIS workshop in Reading, UK on 6 September.

11 DATA MANAGEMENT

The Work Plan on the transverse area of data management is progressing well. Major achievements have been realized in the area of data sharing principles. These include the development of a common set of guidelines for calibration and validation as well as a calibration/validation philosophy for GEOSS. The GEO Cal/Val Web Portal has also made good progress.

The Implementation Guidelines for the **GEOSS Data Sharing Principles**, together with an overview on Data Sharing Laws, Principals, Policies, and Illustrative Case Studies, was discussed by the Architecture and Data Committee in Washington DC on 11-12 September. The Guidelines were well received. Following further discussions, a final version is expected to be available for the Cape Town Plenary.

Work on the **GEOSS Data Quality Assurance Strategy** is being conducted in close cooperation with the Committee on Earth Observation Satellites (CEOS). An October workshop started developing GEOSS Calibration and Validation Guidelines for remotely-sensed and *in situ* data. The GEO Cal/Val Portal has been further advanced with the support of the CEOS Working Group Cal/Val (WGCV).

A May workshop reviewed the progress being made by GEO on **ensemble technique forecasting**. Several national meteorological services, including the Japan Meteorological Agency, Australia's Bureau of Meteorology, the US Navy and Research Laboratory and the National Climate and Data Center (NCDC), and Meteo France have formally joined the Ensemble-Technique Forecasting Demonstration. The GHRSSST-PP Multi-Product Ensemble (GMPE) has created a median ensemble sea-surface temperature map based on the median average of various different but homogenized analyses. There is increasing interest from operational systems, particularly in the US, the UK, and France, in this type of analysis.

The discussions on **digital elevation model (DEM) interoperability** are progressing well. Japan and the US have indicated to the GEO Secretariat that they are considering contributing high-resolution digital elevation models to GEO.

The Architecture and Data Committee is now coordinating its efforts on the **GEOSS Best Practices Registry** with other GEO Committees with the aim of developing a small registry. It may also issue a call for participation (CFP).

The Committee has defined a distributed infrastructure for creating a **sensor web to facilitate the creation of an *in situ* observing network**. This sensor web (an amorphous network of spatially

distributed sensor platforms that communicate with one another wirelessly) is being set up as a base layer for GEOSS sensors and components. A workshop will be organized in 2008 to further promote the sensor web concept and start the integration process.

NASA has established a team of systems engineers to advance the development of **Virtual Constellations** aimed at addressing gaps in GEOSS coverage. Two new candidates – ocean colour and disaster management – have been identified for potential future Earth observation constellations.

A preliminary system design has been completed for **integrating and analyzing water cycle applications** using the Asian Water Cycle Initiative (AWCI), one of the GEO Early Achievements, as an example.

12 CAPACITY BUILDING

Steady progress has been made under the Work Plan on capacity building. Although some Tasks started off slowly, leads have now been identified for each one and leads and they are now making advances. Capacity building activities have been identified in the water, weather, energy, ecosystems and disasters Societal Benefit Areas. Key remaining challenges include integrating capacity building into all GEO Tasks, broadening participation in existing Tasks, and identifying cross linkages between Tasks.

During the reporting period, the Capacity Building Committee and the Task teams:

- **Made strong progress in expanding the geographic coverage of the GEONETCast information dissemination system.** Most recently, the Asia Pacific Regional Workshop on GEOSS Information Access on 10-11 October in Beijing, China announced the formal operational use of FengYunCast for that region. Russia has now confirmed its interest in joining the project and using the Russian satellite distribution system MITRA as another GEONETCast regional hub. In addition, the GEONETCast Implementation Group has agreed on an initial GEONETCast Global Design Document and distributed it to interested parties. The Group will demonstrate GEONETCast's global capability at the Cape Town Ministerial Summit. The development of regional user communities is being pursued through planned regional workshops and other forums.
- **Organized a Capacity Building Donor's Symposium.** Hosted by Spain in September in Seville, the Symposium did not succeed in attracting as many donor representatives as had been hoped. Nevertheless, the strong showing from the Earth observation community, particularly from developing countries, provided an opportunity for exchanging ideas on how better to engage donors. A key outcome was the development of road map for engaging donors in the work of GEO.
- **Developed a series of capacity building workshops.** The UN Environment Programme is organizing workshops in Latin America with CATHALAC (Centro del Agua del Trópico Húmedo para América Latina y el Caribe), in Albania with the Ministry of Environment, Forestry and Water Administration, in Georgia for the Southern Caucasus region with the Center for Monitoring and Prognostication of the Ministry of Environment Protection and Natural Resource and in Mozambique with the Ministry for Co-ordination of Environmental Affairs. These workshops focus on improving in-country coordination amongst national environmental authorities and organisations, remote sensing agencies and programmes, and other relevant entities. They establish priorities for improving access to and management of environmental observing data and networking. They also improve coordination amongst national statistical organisations; remote sensing agencies; and Ministries responsible for issues such as environment, forests, wildlife and water.

- **Held a workshop on Knowledge Sharing for Improved Disaster Management and Emergency Response.** The event was organized with the United Nations Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER) on 29-31 October in Bonn, Germany. The next step is to continue working on the concept of a Disaster Knowledge Portal as a means of increasing the flow of existing knowledge to end users will be completed.
- **Set up the Chlorophyll Global Integrated Network (ChloroGIN).** Established through the Partnership for Observations of the Global Ocean (POGO), ChloroGIN links participating centres around the globe committed to promoting *in situ* measurements of chlorophyll and combining them with satellite-derived estimates. It seeks to ensure its own sustainability by promoting the development of physical infrastructure and human capacity (for example via a workshop in Mombasa, Kenya). Possible linkages with the HARON Task have been identified.
- **Organized a numerical prediction workshop.** Led by the Korean Meteorological Agency, this event attracted participants from 15 countries across the globe.
- **Developed the Committee's requirements for the capacity building component of the GEO web portal.**

ANNEX I – PROGRESS ON 2007-2009 WORK PLAN TASKS

Tasks	Status
DISASTERS	
DI-06-02 Seismographic Networks Improvements and Coordination	G
DI-06-03 Integration of InSAR Technology	G
DI-06-04 Tsunami Early Warning System at Global Level	R
DI-06-07 Multi-hazard Zonation and Maps	G
DI-06-08 Multi-hazard Approach Definition and Progressive Implementation	Y
DI-06-09 Use of Satellites for Risk Management	G
DI-06-13 Implementation of a Fire Warning System at Global Level	G
DI-07-01 Risk Management for Floods	Y
HEALTH	
HE-06-03 Forecast Health Hazards	Y
HE-07-01 Strengthen Observation and Information Systems for Health	R
HE-07-02 Environment and Health Monitoring and Modelling	R
HE-07-03 Integrated Atmospheric Pollution Monitoring, Modelling and Forecasting	Y
ENERGY	
EN-06-04 Using New Observation Systems for Energy	G
EN-07-01 Management of Energy Sources	G
EN-07-02 Energy Environmental Impact Monitoring	G
EN-07-03 Energy Policy Planning	G
CLIMATE	
CL-06-01 Sustained Reprocessing and Reanalysis Efforts	G
CL-06-02 Key Climate Data from Satellite Systems	G
CL-06-03 Key Terrestrial Observations for Climate	G
CL-06-05 GEOSS IPY Contribution	G
CL-06-06 Global Ocean Observation System	G
CL-07-01 : Seamless Weather and Climate Prediction System	G

WATER	
WA-06-02 Forecast Models for Drought and Water Resource Management	G
WA-06-05 In-situ Water Cycle Monitoring	Y
WA-06-07 Integrated Earth Observation Water Resource Management	Y
WA-07-01 Global Water Quality Monitoring	Y
WA-07-02 Satellite Water Quantity Measurements and Integration with In-situ Data	Y
WEATHER	
WE-06-01 Surface-based Global Observing System for Weather	G
WE-06-02 Space-based Global Observing System for Weather	G
WE-06-03 THORPEX Interactive Global Grand Ensemble (TIGGE)	G
WE-06-05 Numerical Weather-Prediction Capacity Building	G
WE-07-01 Data Assimilation for Operational Use	R
WE-07-02 Weather Demonstration Project for the Beijing 2008 Olympic Games	G
ECOSYSTEMS	
EC-06-01 Integrated Global Carbon Observation (IGCO)	Y
EC-06-02 Ecosystems Classification	G
EC-06-07 Regional Networks for Ecosystems	G
EC-07-01 Global Ecosystem Observation and Monitoring Network	Y
AGRICULTURE	
AG-06-01 GEOSS Agriculture Strategic Plan	R
AG-06-02 Utilization in Aquaculture	G
AG-06-04 Forest Mapping and Change Monitoring	G
AG-06-07 Training Modules for Agriculture	Y
AG-07-01 Improving Measurements of Biomass	Y
AG-07-02 Agricultural Risk Management	G
AG-07-03 Operational Agricultural Monitoring System	G
BIODIVERSITY	
BI-06-03 Capturing Historical Biodiversity Data	G
BI-07-01 Biodiversity Observation Network	G
BI-07-02 Invasive Species Monitoring System	G

USER ENGAGEMENT	
US-06-01 Identify Priorities and Synergies between SBAs	Y
US-06-02 Pilot Communities of Practice	G
US-07-01 Nowcasting and Forecasting User Applications	R
US-07-02 Millennium Development Goals	R
US-07-03 Environmental Risk Management	R
ARCHITECTURE	
AR-06-11 Radio Frequency Protection	G
AR-07-01 Enabling Deployment of a GEOSS Architecture	G
AR-07-02 GEOSS Architecture Implementation Pilot	G
AR-07-03 Global Geodetic Reference Frames	G
AR-07-04 WIS -- GEOSS Operational Exemplar	G
DATA MANAGEMENT	
DA-06-01 GEOSS Data Sharing Principles	G
DA-06-02 GEOSS Quality Assurance Strategy	G
DA-06-03 Ensemble-Technique Forecasting Demonstrations	G
DA-06-04 Data, Metadata and Products Harmonisation	Y
DA-06-05 Guidance Document for Basic Geographic Data	Y
DA-06-09 GEOSS Best Practices Registry	Y
DA-07-01 DEM Interoperability	G
DA07-02 Global Land Cover	G
DA-07-03 Virtual Constellations	G
DA-07-04 Sensor Web Enablement for In-Situ Observing Network Facilitation	G
DA-07-05 Higher Level Data Product Tools	Y
DA-07-06 Data Integration and Analysis System	Y
CAPACITY BUILDING	
CB-06-04 GEONETCast	G
CB-07-01a Engaging Donors	G
CB-07-01b Identifying Best Practices, Gaps and Needs	Y
CB-07-01c Capacity building Performance Indicators	Y
CB-07-01d Building National and Regional Capacity	G
CB-07-01e Open Source Software	G
CB-07-02 Knowledge Sharing for Improved Disaster Management and Emergency Response	Y

ANNEX II – PROGRESS TOWARDS 2-YEAR TARGETS

2-Year Target (short description)	Status	Related Tasks	Related Early Achievement (as submitted to Cape Town Ministerial)
DISASTER			
Strengthen International Charter	G	DI-06-04 Implementation of a Tsunami Early Warning System at Global Level DI-06-08 Multi-hazard Approach Definition and Progressive Implementation DI-06-13 Implementation of a Fire Warning System at Global Level DI-07-01 Risk Management for Floods	Global Wildland Fire Early Warning System Improved use of Satellites for Risk Management TerraSAR-X – a new system in the System of Systems Sentinel Asia Implementation of the Center for Satellite Based Crisis Information IGOS-P Geohazards theme and Community of Practice
Access to SRTM data	Y	DI-06-05 Create a plan for production of coastal zone maps and DEM	Global Digital Elevation Model
Expand seismic network	G	DI-06-02 Seismographic Networks Improvement and Coordination DI-06-04 Implementation of a Tsunami Early Warning System at Global Level	International Federation of Digital Seismograph Network: increased coverage and data availability for global earthquake monitoring The German Indonesian Tsunami Early-Warning System (GITEWS)
Facilitate pilot studies	Y	DI-06-04 Implementation of a Tsunami Early Warning System at Global Level DI-06-08 Multi-hazard Approach Definition and Progressive Implementation	GMES The Network of Centers of the Italian Civil Protection System

		<p>DI-06-13 Implementation of a Fire Warning System at Global Level</p> <p>DI-07-01 Risk Management for Floods</p>	<p>Introducing GEO Earth observation research activities in the 7th Framework Programme of Community Research</p> <p>Building GEOSS with modern Information and Communication Technologies: Contribution from FP7 & FP6 Community Research in Europe</p>
Facilitate on-going capacity building	G	<p>CB-07-01 Engaging Donors; Identifying Best Practices, Gaps and Needs; Capacity building Performance Indicators; Building National and Regional Capacity; Open Source Software.</p> <p>DI-07-01 Risk Management for Floods</p>	
Facilitate use of geostationary satellites	G	DI-06-09 Use of Satellites for Risk Management	
Integrate InSAR Technology to warning/prediction systems	G	DI-06-03 Integration of InSAR Technology	
Inventory of geologic and hazards zonation maps	G	DI-06-07 Multi-hazard Zonation and Maps	
Advocate further development of the GSDI	G	<p>DI-06-07 Multi-hazard Zonation and Maps</p> <p>DI-06-08 Multi-hazard Approach Definition and Progressive Implementation</p>	
Produce a comprehensive gap analysis	Y	CB-07-01c Capacity building Performance Indicators	
HEALTH			
Advocate high resolution EO	Y	<p>HE-07-01 Strengthen Observation and Information Systems for Health</p> <p>HE-07-03 Integrated Atmospheric Pollution Monitoring, Modelling and Forecasting</p>	<p>WMO Sand and Dust Storm Warning System (SDSWS) in support of diseases prevention and improvements in human health</p>

Facilitate the establishment of exchanges between health care experts	Y	<p>HE-06-03 Forecast Health Hazards</p> <p>CB-07-01 Engaging Donors; Identifying Best Practices, Gaps and Needs; Capacity building Performance Indicators; Building National and Regional Capacity; Open Source Software.</p> <p>US-06-02 Pilot Communities of Practice</p>	Improving Timely Warning and Detection of Meningitis Outbreaks and Intervention Strategies
Facilitate mechanisms to translate needs of health to EO requirements	Y	<p>HE-06-03 Forecast Health Hazards</p> <p>CB-07-01 Engaging Donors; Identifying Best Practices, Gaps and Needs; Capacity building Performance Indicators; Building National and Regional Capacity; Open Source Software.</p>	Improving Timely Warning and Detection of Meningitis Outbreaks and Intervention Strategies
Promote development of integrated public health information network DB	R	<p>HE-07-01 Strengthen Observation and Information Systems for Health</p> <p>HE-07-02 Environment and Health Monitoring and Modelling</p>	Air Quality and Human Health
Facilitate development of data products and systems to integrate EODB with health	Y	<p>HE-06-03 Forecast Health Hazards</p> <p>HE-07-02 Environment and Health Monitoring and Modelling</p> <p>US-07-02 Millennium Development Goals</p> <p>CB-07-01 Engaging Donors; Identifying Best Practices, Gaps and Needs; Capacity building Performance Indicators; Building National and Regional Capacity; Open Source Software.</p>	<p>Improving Timely Warning and Detection of Meningitis Outbreaks and Intervention Strategies</p> <p>Air Quality and Human Health</p>
Advocate enhancements to international networks and systems needed to support Earth observation data sharing in areas of human health.	Y	<p>HE-06-03 Forecast Health Hazards</p> <p>HE-07-01 Strengthen Observation and Information Systems for Health</p> <p>AR-07-01 Enabling Deployment of a GEOSS Architecture</p> <p>CB-07-01 Engaging Donors; Identifying Best Practices, Gaps and Needs; Capacity building Performance Indicators; Building National and Regional Capacity; Open Source Software.</p>	Improving Timely Warning and Detection of Meningitis Outbreaks and Intervention Strategies

Produce a comprehensive gaps analysis of existing capacity building programmes and aggressively promote initiatives for improved coordination.	R	HE-07-01 Strengthen Observation and Information Systems for Health	
Advocate increase in collaborative research programmes between developed and developing countries	Y	HE-06-03 Forecast Health Hazards HE-07-03 Integrated Atmospheric Pollution Monitoring, Modelling and Forecasting	Improving Timely Warning and Detection of Meningitis Outbreaks and Intervention Strategies WMO Sand and Dust Storm Warning System (SDSWS) in support of diseases prevention and improvements in human health
Facilitate the ability to overlay on epidemiology maps the variety of relevant inventoried and processed data	R	HE-07-01 Strengthen Observation and Information Systems for Health HE-07-03 Integrated Atmospheric Pollution Monitoring, Modelling and Forecasting	WMO Sand and Dust Storm Warning System (SDSWS) in support of diseases prevention and improvements in human health
Facilitate reductions in the lag time in the temporal collection and assimilation of human health data and the “real-time” synoptic data	R	HE-07-01 Strengthen Observation and Information Systems for Health	
Facilitate provision of historical RS data	R	HE-07-01 Strengthen Observation and Information Systems for Health HE-07-02 Environment and Health Monitoring and Modelling	Air Quality and Human Health
Facilitate identification of technical needs in terms of instrumentation and data products	R	HE-07-01 Strengthen Observation and Information Systems for Health CB-07-01 Engaging Donors; Identifying Best Practices, Gaps and Needs; Capacity building Performance Indicators; Building National and Regional Capacity; Open Source Software.	

Facilitate identification of “paradigm environments”	R		
Facilitate development of models to relate EO data to health	Y	HE-06-03 Forecast Health Hazards HE-07-03 Integrated Atmospheric Pollution Monitoring, Modelling and Forecasting	Improving Timely Warning and Detection of Meningitis Outbreaks and Intervention Strategies WMO Sand and Dust Storm Warning System (SDSWS) in support of diseases prevention and improvements in human health
ENERGY			
Exchange and use of data/products, forecast information through specific initiatives	G	EN-06-04 Using New Observation Systems for Energy EN-07-01 Management of Energy Sources EN-07-02 Energy Environmental Impact Monitoring EN-07-03 Energy Policy Planning US-06-02 Pilot Communities of Practice US-07-01 Nowcasting and Forecasting User Applications	Energy Community of Practice ENVISOLAR – Space based environmental information for solar energy industries Solar Data for Developing Countries Solar and Wind Energy Data – Survey of User’s Requirements Bioenergy Resource Assessment
Develop strategic plan to use new-generation observation systems	G	EN-06-04 Using New Observation Systems for Energy EN-07-01 Management of Energy Sources EN-07-02 Energy Environmental Impact Monitoring EN-07-03 Energy Policy Planning US-06-02 Pilot Communities of Practice US-07-01 Nowcasting and Forecasting User Applications	Energy Community of Practice ENVISOLAR – Space based environmental information for solar energy industries Solar Data for Developing Countries Solar and Wind Energy Data – Survey of User’s Requirements Bioenergy Resource Assessment
CLIMATE			
Support GCOS Surface and Upper Air Networks,, GAW observatories, initial GOOS, etc.	G	WE-06-01 Surface-based Global Observing System for Weather WE-06-02 Space-based Global Observing System for Weather	EuroCryoClim - European contribution to a global cryospheric climate monitoring system Global Monitoring of Greenhouse Gases

		<p>CL-06-03 Key Terrestrial Observations for Climate CL-06-05 GEOSS IPY Contribution CL-06-06 Global Ocean Observation System WA-06-05 In-situ Water Cycle Monitoring WA-08-01 Integration of In-situ and Satellite Data for Water Cycle Monitoring AG-06-04 Forest Mapping and Change Monitoring AG-07-01 Improving Measurements of Biomass</p> <p>DA-07-01 DEM Interoperability DA-07-02 Global Land Cover</p>	<p>Global Precipitation Climatology Centre (GPCC) Improving projections of sea-level rise and variability Network for the Detection of Mesopause Change (NDMC) Ocean Surface Topography Ozone Depletion and Recovery and Climate Change Parasol, Calipso and the A-Train The Cryosphere Observing System: Legacy of the International Polar Year 2007-2008 The GCOS Upper-Air Reference Network, GRUAN State of the Climate– A GEO Achievement Ocean Observations, Modelling, Data & Information (INCOIS)</p>
<p>Support implementation of actions called for in GCOS Implementation Plan and relevant IGOS-P Theme Reports</p>	<p>G</p>	<p>CL-06-01 Sustained Reprocessing and Reanalysis Efforts CL-06-02 Key Climate Data from Satellite Systems CL-06-03 Key Terrestrial Observations for Climate CL-06-04 GEOSS IPY Contribution CL-06-06 Global Ocean Observation System WE-06-01 Surface-based Global Observing System for Weather WE-06-02 Space-based Global Observing System for Weather</p> <p>WA-06-05 In-situ Water Cycle Monitoring WA-08-01 Integration of In-situ and Satellite Data for Water Cycle Monitoring AG-06-04 Forest Mapping and Change Monitoring AG-07-01 Improving Measurements of Biomass</p>	<p>APEC Climate Center for Information Services (APCC) ClimDevAfrica Initiative EuroCryoClim - European contribution to a global cryospheric climate monitoring system Global Monitoring of Greenhouse Gases Global Precipitation Climatology Centre (GPCC) Improving projections of sea-level rise and variability Network for the Detection of Mesopause Change (NDMC) Ocean Surface Topography Ozone Depletion and Recovery and Climate Change Parasol, Calipso and the A-Train The Cryosphere Observing System: Legacy of the International Polar Year 2007-2008 The GCOS Upper-Air Reference Network, GRUAN State of the Climate– A GEO Achievement</p>

		<p>DA-07-01 DEM Interoperability</p> <p>DA-07-02 Global Land Cover</p>	<p>Ocean Observations, Modelling, Data & Information (INCOIS)</p>
<p>Improve the reporting of observations to international data and analysis centres in terms of data volumes, quality and timeliness.</p>	G	<p>CL-06-03 Key Terrestrial Observations for Climate</p> <p>WE-06-03 THORPEX Interactive Global Grand Ensemble (TIGGE)</p> <p>CL-07-01 Seamless Weather and Climate Prediction System</p>	<p>Ensembles of Global Weather Forecasts (TIGGE)</p> <p>APEC Climate Center for Information Services (APCC)</p> <p>Global Precipitation Climatology Centre (GPCC)</p> <p>Ocean Observations, Modelling, Data & Information (INCOIS)</p> <p>The Cryosphere Observing System: Legacy of the International Polar Year 2007-2008</p> <p>Revolution in Weather,Climate & Earth-system Prediction</p>
<p>Improve the capability of international data centres for data archiving and distribution of data and products.</p>	G	<p>CL-06-03 Key Terrestrial Observations for Climate</p> <p>WE-06-03 THORPEX Interactive Global Grand Ensemble (TIGGE)</p> <p>CL-07-01 Seamless Weather and Climate Prediction System</p> <p>CL-06-01 Sustained Reprocessing and Reanalysis Efforts</p>	<p>Ensembles of Global Weather Forecasts (TIGGE)</p> <p>APEC Climate Center for Information Services (APCC)</p> <p>EuroCryoClim - European contribution to a global cryospheric climate monitoring system</p> <p>Global Precipitation Climatology Centre (GPCC)</p> <p>Revolution in Weather,Climate & Earth-system Prediction</p> <p>The Cryosphere Observing System: Legacy of the International Polar Year 2007-2008</p> <p>State of the Climate– A GEO Achievement</p> <p>Ocean Observations, Modelling, Data & Information (INCOIS)</p>
<p>Establish international collaboration. mechanism (observational organizations, researchers, users)</p>	G	<p>CL-06-02 Key Climate Data from Satellite Systems</p> <p>US-06-01 Identify Priorities and Synergies between SBAs</p> <p>WE-06-03 THORPEX Interactive Global Grand Ensemble (TIGGE)</p> <p>CL-07-01 Seamless Weather and Climate Prediction System</p>	<p>Revolution in Weather,Climate & Earth-system Prediction</p> <p>Ensembles of Global Weather Forecasts (TIGGE)</p> <p>APEC Climate Center for Information Services (APCC)</p> <p>ClimDevAfrica Initiative</p> <p>EuroCryoClim - European contribution to a global</p>

		<p>CL-06-03 Key Terrestrial Observations for Climate CL-06-01 Sustained Reprocessing and Reanalysis Efforts CL-06-06 Global Ocean Observation System</p>	<p>cryospheric climate monitoring system Global Monitoring of Greenhouse Gases Global Precipitation Climatology Centre (GPCC) Improving projections of sea-level rise and variability Network for the Detection of Mesopause Change (NDMC) Ocean Surface Topography Ozone Depletion and Recovery and Climate Change Parasol, Calipso and the A-Train The Cryosphere Observing System: Legacy of the International Polar Year 2007-2008 The GCOS Upper-Air Reference Network, GRUAN State of the Climate– A GEO Achievement Ocean Observations, Modelling, Data & Information (INCOIS)</p>
<p>Identify the needs and solutions necessary to implement the global observing systems for climate in all regions and countries based on the recommendation of GCOS Implementation Plan and specific regional action plans.</p>	<p>G</p>	<p>CL-06-02 Key Climate Data from Satellite Systems CL-06-01 Sustained Reprocessing and Reanalysis Efforts CL-06-05 GEOSS IPY Contribution US-07-03 Environmental Risk Management CB-07-01 Engaging Donors; Identifying Best Practices, Gaps and Needs; Capacity building Performance Indicators; Building National and Regional Capacity; Open Source Software.</p>	<p>ClimDevAfrica Initiative APEC Climate Center for Information Services (APCC) EuroCryoClim - European contribution to a global cryospheric climate monitoring system Global Monitoring of Greenhouse Gases Global Precipitation Climatology Centre (GPCC) Improving projections of sea-level rise and variability Network for the Detection of Mesopause Change (NDMC) Ocean Surface Topography</p>
<p>Initiate an intergovernmental mechanism in the terrestrial domain</p>	<p>G</p>	<p>CL-06-03 Key Terrestrial Observations for Climate CL-06-05 GEOSS IPY Contribution</p>	<p>ClimDevAfrica Initiative EuroCryoClim - European contribution to a global cryospheric climate monitoring system</p>

			The Cryosphere Observing System: Legacy of the International Polar Year 2007-2008
Support JCOMM to coordinate the implementation of and prepare regulatory and guidance information for an operational in situ ocean observing system	Y	<p>CL-06-04 GEOSS IPY Contribution</p> <p>CL-06-06 Global Ocean Observation System</p> <p>US-06-02 Pilot Communities of Practice</p> <p>CL-06-05 GEOSS IPY Contribution</p>	<p>Improving projections of sea-level rise and variability</p> <p>Ocean Surface Topography</p> <p>Ocean Observations, Modelling, Data & Information (INCOIS)</p> <p>EuroCryoClim - European contribution to a global cryospheric climate monitoring system</p> <p>The Cryosphere Observing System: Legacy of the International Polar Year 2007-2008</p>
Emphasize to satellite agencies the importance of satellites for long-term climate monitoring	G	<p>CL-06-02 Key Climate Data from Satellite Systems</p> <p>WA-07-02 Satellite Water Quantity Measurements and Integration with In-situ Data</p>	<p>APEC Climate Center for Information Services (APCC)</p> <p>EuroCryoClim - European contribution to a global cryospheric climate monitoring system</p> <p>Global Monitoring of Greenhouse Gases</p> <p>Global Precipitation Climatology Centre (GPCC)</p> <p>Improving projections of sea-level rise and variability</p> <p>Ocean Surface Topography</p> <p>Ozone Depletion and Recovery and Climate Change</p> <p>Parasol, Calipso and the A-Train</p> <p>The Cryosphere Observing System: Legacy of the International Polar Year 2007-2008</p> <p>State of the Climate– A GEO Achievement</p> <p>Ocean Observations, Modelling, Data & Information (INCOIS)</p>
Focus on research to support the development of observational capabilities for ECVs	G	<p>CL-06-02 Key Climate Data from Satellite Systems</p> <p>CL-06-03 Key Terrestrial Observations for Climate</p>	<p>Ozone Depletion and Recovery and Climate Change</p> <p>Global Monitoring of Greenhouse Gases</p>

		<p>CL-06-05 GEOSS IPY Contribution</p> <p>CL-06-06 Global Ocean Observation System</p> <p>WE-06-01 Surface-based Global Observing System for Weather</p> <p>WE-06-02 Space-based Global Observing System for Weather</p> <p>WA-07-02 Satellite Water Quantity Measurements and Integration with In-situ Data</p>	<p>Global Precipitation Climatology Centre (GPCC)</p> <p>Improving projections of sea-level rise and variability</p> <p>Network for the Detection of Mesopause Change (NDMC)</p> <p>Ocean Surface Topography</p> <p>Ozone Depletion and Recovery and Climate Change</p> <p>Parasol, Calipso and the A-Train</p> <p>The Cryosphere Observing System: Legacy of the International Polar Year 2007-2008</p> <p>The GCOS Upper-Air Reference Network, GRUAN</p> <p>State of the Climate– A GEO Achievement</p> <p>Ocean Observations, Modelling, Data & Information (INCOIS)</p>
Coordinate climate sectors and broad user groups to clarify and specify requirements for socioeconomic benefit areas	G	<p>US-06-01 Identify Priorities and Synergies between SBAs</p> <p>CL-07-01 Seamless Weather and Climate Prediction System</p> <p>WE-06-03 THORPEX Interactive Global Grand Ensemble (TIGGE)</p>	<p>APEC Climate Center for Information Services (APCC)</p> <p>ClimDevAfrica Initiative</p> <p>Revolution in Weather, Climate & Earth-system Prediction</p> <p>State of the Climate– A GEO Achievement</p> <p>Ensembles of Global Weather Forecasts (TIGGE)</p> <p>Ocean Observations, Modelling, Data & Information (INCOIS)</p> <p>Meningitis Warning System in Africa</p> <p>WCRP and Droughts</p>
Enforce paleoclimate research by combining natural science data and socio-economic information	R		
Promote the improvement of	Y	CL-06-01 Sustained Reprocessing and Reanalysis Efforts	Global Monitoring of Greenhouse Gases

emission databases for aerosols, greenhouse gases and their precursors		CL-06-02 Key Climate Data from Satellite Systems CL-06-03 Key Terrestrial Observations for Climate	Parasol, Calipso and the A-Train Sand and Dust storm monitoring
WATER			
Improve existing in-situ observing systems	G	WA-06-05 In-situ Water Cycle Monitoring	Global Runoff Data Centre (GRDC)
Plan sophisticated, integrated in-situ obs.net.	Y	WA-06-02 Forecast Models for Drought and Water Resource Management WA-06-05 In-situ Water Cycle Monitoring	
Facilitate international data sharing and exchange agreements for water data	G	WA-06-05 In-situ Water Cycle Monitoring	Asia Water Cycle Initiative (AWCI) Global Runoff Data Centre (GRDC)
Implementation Plan for WC data integration system	G	WA-07-02 Satellite Water Quantity Measurements and Integration with In-situ Data	Asia Water Cycle Initiative (AWCI)
3 hourly global precipitation	Y	DA-07-03 Virtual Constellations WA-07-02 Satellite Water Quantity Measurements and Integration with In-situ Data	Megha-Tropiques, GPM and the Precipitation virtual constellation
Integrate precipitation and soil moisture products	Y		
Studies space-based observations of surface water quality	G	WA-07-01 Global Water Quality Monitoring	WISE – Water Information System for Europe
Satellite altimetry to the measurement of streamflow and surface water storage	Y	WA-07-02 Satellite Water Quantity Measurements and Integration with In-situ Data	
Facilitate establish international coordination function for observing data int. and dissemination	G	WA-06-05 In-situ Water Cycle Monitoring	Asia Water Cycle Initiative (AWCI)

Framework for ensemble hydrological prediction	Y	WA-06-02 Forecast Models for Drought and Water Resource Management US-06-02 Pilot Communities of Practice	
Water resources management in developing countries	G	WA-06-06 WA-06-07 Integrated Earth Observation Water Resource Management	Asia Water Cycle Initiative (AWCI)
Organise workshops and special studies for documenting the cultural barriers	G	CB-07-01 Engaging Donors; Identifying Best Practices, Gaps and Needs; Capacity building Performance Indicators; Building National and Regional Capacity; Open Source Software.	
Advocate eliminating barriers to the free and open exchange of data and software to enable full access by water managers in developing countries.	G	WA-06-06 Promote best practices in integrated water management (completed in 2006)	
WEATHER			
Invest in critical data gaps and Improve predictive model	G		TIGGE achievements
Support for plans to assist developing countries to utilize the forecasts	G	WE-06-03 THORPEX Interactive Global Grand Ensemble (TIGGE) WE-06-05 Numerical Weather-Prediction Capacity Building WE-07-02 Weather Demonstration Project for Beijing 2008 Olympics	Beijing 2008 Olympics TIGGE achievements KMA Capacity Building
Education and training of developing country personnel in the effective use of currently available weather information	G	WE-06-01 Surface-based Global Observing System for Weather WE-07-02 Weather Demonstration Project for Beijing 2008 Olympics	Beijing 2008 Olympics KMA Capacity Building
Support for existing weather capacity building programmes and initiatives	G	WE-06-01 Surface-based Global Observing System for Weather WE-06-02 Space-based Global Observing System for Weather WE-06-03 THORPEX Interactive Global Grand Ensemble (TIGGE)	Beijing 2008 Olympics TIGGE achievements KMA Capacity Building

		WE-06-05 Numerical Weather-Prediction Capacity Building WE-07-02 Weather Demonstration Project for Beijing 2008 Olympics	
Support WMO plan for EUCOS expansion feasibility	G	WE-06-01 Surface-based Global Observing System for Weather	
ECOSYSTEMS			
Harmonization of methods for observing the GEOSS set of ecosystem variables	G	EC-07-01 Global Ecosystem Observation and Monitoring Network EC-06-02 Ecosystem Classification AR-07-02 GEOSS Architecture Implementation Pilot	Invasive Species Monitoring
Implement IGCO, etc.	Y	EC-06-01 Integrated Global Carbon Observation (IGCO)	
Globally agreed classification scheme	G	EC-06-02 Ecosystem Classification EC-07-01 Global Ecosystem Observation and Monitoring Network BI-06-01 Ecosystem Task Force (completed 2006)	Improved global land over observations and assessment
Continuity of moderate to high resolution EO sat.	G	DA-07-02 Global Land Cover	Improved global land over observations and assessment
Eliminate regional disparity	Y	EC-07-01 Global Ecosystem Observation and Monitoring Network	
Networking observing institutes	G	EC-06-02 Ecosystem Classification EC-07-01 Global Ecosystem Observation and Monitoring Network BI-06-03 Capturing Historical Biodiversity Data AR-07-02 GEOSS Architecture Implementation Pilot	Interoperability Process Pilot Project (IP3): Biodiversity/Climate Change; Biodiversity Observation Network;
Develop scale up tool	Y	EC-07-01 Global Ecosystem Observation and Monitoring Network	

Rescue historical info	G	EC-07-01 Global Ecosystem Observation and Monitoring Network	Interoperability Process Pilot Project (IP3): Biodiversity/Climate Change
Validate SAR and hyperspectral images	Y	EC-07-01 Global Ecosystem Observation and Monitoring Network	
Development of new sensors and platforms	G	EC-07-01 Global Ecosystem Observation and Monitoring Network	Census of Marine Life
AGRICULTURE			
Definition of user needs for agriculture, rangelands, forestry and fisheries	G	AG-06-01 GEOSS Agriculture Strategic Plan AG-06-04 Forest Mapping and Change Monitoring EC-07-01 Global Ecosystem Observation and Monitoring Network DA-07-02 Global Land Cover	Improved global land over observations and assessment
Land cover map of 1:1M	G	DA-07-02 Global Land Cover	Improved global land over observations and assessment Satellite Land Cover Mapping of Canada's Forests
Facilitate regional training in land cover classification and the assimilation of existing data sets in Africa, Asia and Latin America	Y	AG-06-07 Training Modules for Agriculture DA-06-04 Data, Metadata and Products Harmonisation DA-07-02 Global Land Cover EC-07-01 Global Ecosystem Observation and Monitoring Network	Improved global land over observations and assessment
Use of agriculture, forestry, fishery production statistics to pixel level	G	AG-06-04 Forest Mapping and Change Monitoring	ChlorOGIN Building a Chlorophyll Ocean Global Integrated Network Census Of Marine Life
Use of geo-sat data in food insecure regions	G	AG-06-01 GEOSS Agriculture Strategic Plan	
Continuity of high resolution	G	DA-07-03 Virtual Constellations	

ops/radar sat (5-30m)		DA-07-02 Global Land Cover	
Global irrigated agriculture map	R	DA-07-02 Global Land Cover	
On-time monitoring and info system for significant events	G	EC-07-01 Global Ecosystem Observation and Monitoring Network	
Development of courses to demonstrate the usage of Earth observation data and products in developing countries	Y	AG-06-07 Training Modules for Agriculture	
BIODIVERSITY			
Distributed obs.net. interoperable through GBIF	G	BI-07-01 Biodiversity Observation Network	Biodiversity Observation Network
Develop observing strategy to support 2010CBD targets	G	BI-06-02 User Requirements for a Biodiversity Observation Network BI-07-01 Biodiversity Observation Network	Biodiversity Observation Network
Capture 10M new observing	G	BI-06-03 Capturing Historical Biodiversity Data	Interoperability Process Pilot Project (IP3): Biodiversity/Climate Change
Support data sys integration	G	AR-07-02 GEOSS Architecture Implementation Pilot	Interoperability Process Pilot Project (IP3): Biodiversity/Climate Change
Produce an analysis of the gaps and needs in capacity building initiatives	G	BI-06-03 Capturing Historical Biodiversity Data BI-07-01 Biodiversity Observation Network	Biodiversity Observation Network
Strategy for citizen-based biodiversity observing system	G	AR-07-02 GEOSS Architecture Implementation Pilot	Interoperability Process Pilot Project (IP3): Biodiversity/Climate Change
COMMONALITY			
Share best practice for product customized for specific SBA	G	DA-06-09: GEOSS Best Practices Registry	

		US-06-02 Pilot Communities of Practice	
Strategic and tactical guidance documents	G	AR-07-01 Enabling Deployment of a GEOSS Architecture	GEOSS Guidance Documents
Interoperability among data sets	G	HE-07-03 Integrated Atmospheric Pollution Monitoring, Modelling and Forecasting DA-06-04 Data, Metadata and Products Harmonisation US-06-02 Pilot Communities of Practice DA-07-03 Virtual Constellations AR-07-01 Enabling Deployment of a GEOSS Architecture AR-07-02 GEOSS Architecture Implementation Pilot	The GEO Web-Portal and GEOSS Clearinghouse – services demonstrated through the Architecture Implementation Pilot GEOSS Standards and Interoperability Forum (SIF) GEOSS Standards and Interoperability Registry GEOSS Interoperability Process Pilot Project Interoperability – Expediting access to GEOSS components and services INSPIRE
Facilitate the development of basic geographic framework data.	G	DA-06-05 Guidance Document for Basic Geographic Data AR-07-02 GEOSS Architecture Implementation Pilot	The GEO Web-Portal and GEOSS Clearinghouse – services demonstrated through the Architecture Implementation Pilot INSPIRE
ARCHITECTURE			
Formal commitment	G	AR-07-01 Enabling Deployment of a GEOSS Architecture	GEOSS Guidance Documents GEOSS Standards and Interoperability Forum (SIF) GEOSS Standards and Interoperability Registry GEOSS Interoperability Process Pilot Project Interoperability – Expediting access to GEOSS components and services
Distributed catalogue of GEOSS participants and component	G	AR-07-02 GEOSS Architecture Implementation Pilot	The GEO Web-Portal and GEOSS Clearinghouse – services demonstrated through the Architecture Implementation Pilot Interoperability – Expediting access to GEOSS components and services

			GEOSS Standards and Interoperability Registry INSPIRE
Process for reaching interoperability	G	AR-07-01 Enabling Deployment of a GEOSS Architecture	GEOSS Guidance Documents GEOSS Standards and Interoperability Forum (SIF) Interoperability – Expediting access to GEOSS components and services GEOSS Standards and Interoperability Registry GEOSS Interoperability Process Pilot Project INSPIRE
Use of SDI components for geodetic reference frames, common geographic data	G	AR-07-01 Enabling Deployment of a GEOSS Architecture AAR-07-03 Global Geodetic Reference Frame	Global Geodetic Reference Frame
Baseline sites for global in-situ networks	G	WA-06-05 In-situ Water Cycle Monitoring EC-07-01 Global Ecosystem Observation and Monitoring Network DA-07-04 Sensor Web Enablement for In-Situ Observing Network Facilitation	ARGO
Cost&Benefit sharing mechanism	G	DA-06-09: GEOSS Best Practices Registry	
Framework for continuity of observations and initiating new observations	G	AR-07-02 GEOSS Architecture Implementation Pilot DA-07-03 Virtual Constellations DA-07-04 Sensor Web Enablement for In-Situ Observing Network Facilitation	CBERS Data for Africa Virtual Satellite Constellations Establishment of a U.S. National Land Imaging Program GMES Improved global land cover observations and assessment
Analysis of sys for data transfer & dissemination by GEOSS members	G	AR-07-01 Enabling Deployment of a GEOSS Architecture AR-07-02 GEOSS Architecture Implementation Pilot	The GEO Web-Portal and GEOSS Clearinghouse –services demonstrated through the Architecture Implementation Pilot GEOSS Standards and Interoperability Forum (SIF) GEOSS Standards and Interoperability Registry

			GEOSS Interoperability Process Pilot Project Interoperability – Expediting access to GEOSS components and services
Common understanding on future global data dissemination capability	G	AR-07-02 GEOSS Architecture Implementation Pilot CB-06-04 GEONETCast	The GEO Web-Portal and GEOSS Clearinghouse – services demonstrated through the Architecture Implementation Pilot GEONETCast
DATA AND USERS			
Mechanism for coordinating user needs within SBAs	G	EC-07-01 Global Ecosystem Observation and Monitoring Network BI-07-01 Biodiversity Observation Network DA-06-01 GEOSS Data Sharing Principles AR-07-02 GEOSS Architecture Implementation Pilot US-06-01 Identify Priorities and Synergies between SBAs US-06-02 Pilot Communities of Practice	Energy Community of Practice Revolution in Weather, Climate & Earth-system Prediction Ensembles of Global Weather Forecasts (TIGGE) ClimDevAfrica Initiative
Common data, metadata, products across SBAs	G	US-06-01 Identify Priorities and Synergies between SBAs AR-07-02 GEOSS Architecture Implementation Pilot DA-06-04 Data, Metadata and Products Harmonisation DA-07-02 Global Land Cover	The GEO Web-Portal and GEOSS Clearinghouse - services demonstrated through the Architecture Implementation Pilot Development of a framework for space-based data quality assurance
Protection of radio freq.	G	AR-06-11 Radio Frequency Protection	
CAPACITY BUILDING			
Comprehensive review and gap analysis	Y	CB-06-03 Review of existing education and training initiatives (completed in 2006) CB-07-01 Engaging Donors; Identifying Best Practices, Gaps and Needs; Capacity building Performance Indicators; Building National and Regional Capacity; Open Source Software.	Multi year GEO Global Workshop Series for GEOSS Users

Methodologies to monitor and evaluate CB initiatives for EO	Y	CB-07-01 Engaging Donors; Identifying Best Practices, Gaps and Needs; Capacity building Performance Indicators; Building National and Regional Capacity; Open Source Software.	
Strengthen education, research and commu	Y	CB-06-03 Review of existing education and training initiatives (completed in 2006) CB-07-01 Engaging Donors; Identifying Best Practices, Gaps and Needs; Capacity building Performance Indicators; Building National and Regional Capacity; Open Source Software.	KMA workshop on NWP
Establish baseline sites for global in-situ and RS networks	G	AR-07-02 GEOSS Architecture Implementation Pilot CB-07-01 Engaging Donors; Identifying Best Practices, Gaps and Needs; Capacity building Performance Indicators; Building National and Regional Capacity; Open Source Software.	Puma AMESD; GRUN; ARGOS
Network of experts	G	CB-07-01 Engaging Donors; Identifying Best Practices, Gaps and Needs; Capacity building Performance Indicators; Building National and Regional Capacity; Open Source Software. EC-06-07 Regional Networks for Ecosystems. EN-07-03 Energy Policy Planning.	Cholrogin, GEO WEB Portal; Memningitis warning system; solar Data for DC;ClimDev
Encourage CB in SBAs	Y	CB-07-01 Engaging Donors; Identifying Best Practices, Gaps and Needs; Capacity building Performance Indicators; Building National and Regional Capacity; Open Source Software.	
Facilitate access to data and models particularly for developing countries	G	CB-07-01 Engaging Donors; Identifying Best Practices, Gaps and Needs; Capacity building Performance Indicators; Building National and Regional Capacity; Open Source Software. AR-07-02 GEOSS Architecture Implementation Pilot US-06-02 Pilot Communities of Practice	GEONETCAST; SERVIR, CBERS
Recommend priorities for CB	G	CB-07-01 Engaging Donors; Identifying Best Practices, Gaps and Needs; Capacity building Performance Indicators; Building National and Regional Capacity; Open Source Software.	

ANNEX III – PROGRESS TOWARDS 6-YEAR TARGETS

6-year Target (short description)	Status	Related Tasks	Related Early Achievements (as submitted to Cape Town Ministerial)
DISASTERS			
Facilitate widespread use of LiDAR and InSAR technologies for topography in areas of low relief	Y	DI-06-03 Integration of InSAR Technology	
Continuity and interoperability of all satellite systems providing global positioning	R	DI-06-03 Integration of InSAR Technology	Improved use of satellites for risk management
Advocate that the international satellite community, coordinated through the CEOS, plan for assured continuity of critical sensing capabilities	G	DI-06-09 Use of Satellites for Risk Management	
Enhancements of the automatic processing and evaluation of satellite imagery	Y	DI-06-04 Implementation of a Tsunami Early Warning System at Global Level DI-06-08 Multi-hazard Approach Definition and Progressive Implementation DI-06-13 Implementation of a Fire Warning System at Global Level DI-07-01 Risk Management for Floods	

More rapid SAR processing for interferometry	Y	DI-06-03 Integration of InSAR Technology	
Systematic expansion of the inventory of geologic and hazards zonation maps and expansion of Geographic Information Systems (GIS)	G	DI-06-07 Multihazard Zonation and Maps DI-06-08 Multi-hazard Approach Definition and Progressive Implementation	
Development and sharing of critical airborne sensors and capabilities	R	DI-06-09 Use of Satellites for Risk Management	
Development of models to better support disaster response	Y	DI-06-04 Implementation of a Tsunami Early Warning System at Global Level DI-06-08 Multi-hazard Approach Definition and Progressive Implementation DI-06-13 Implementation of a Fire Warning System at Global Level DI-07-01 Risk Management for Floods	
Establish a process for monitoring of capacity-building efforts in disaster management	G	CB-07-01 Engaging Donors; Identifying Best Practices, Gaps and Needs; Capacity building Performance Indicators; Building National and Regional Capacity; Open Source Software.	
Access to data from seismic and infrasound networks operated by the Preparatory Commission for the Comprehensive Nuclear Test-Ban Treaty Organization (CTBTO)	Y	CB-07-01 Engaging Donors; Identifying Best Practices, Gaps and Needs; Capacity building Performance Indicators; Building National and Regional Capacity; Open Source Software. DI-06-02 Seismographic Networks Improvement and Coordination	
Access to real-time data analyzing technology and real-time access to critical data for all hazards	Y	DI-06-04 Implementation of a Tsunami Early Warning System at Global Level DI-06-08 Multi-hazard Approach Definition and Progressive Implementation	

		DI-06-13 Implementation of a Fire Warning System at Global Level DI-07-01 Risk Management for Floods	
Real-time monitoring of submarine seismic and volcanic activities and tsunami propagation	Y	DI-06-02 Seismographic Networks Improvement and Coordination DI-06-04 Implementation of a Tsunami Early Warning System at Global Level	German/Indonesian Tsunami Early Warning System
HEALTH			
Produce an inventory of available Earth remote sensing and ground-based databases that can be associated with known health problems	R		
Further development of remotely sensed maps describing the global system for sources, transport and sinks/deposition of gasses and aerosols, and systems characterizing atmospheric, soil, river and coastal pollution	R	HE-07-01 Strengthen Observation and Information Systems for Health	
Human health community input to the technical specification of new major environmental observation capabilities	Y	HE-07-02 Environment and Health Monitoring and Modelling HE-07-03 Integrated Atmospheric Pollution Monitoring, Modelling and Forecasting	WMO Sand and Dust Storm Warning System (SDSWS) in support of diseases prevention and improvements in human health
Development of sets of environment and infrastructural determinants of health	R		

Development of the tools and processes needed to address health concerns and develop a useful regional network of experts and information databases	Y	HE-07-01 Strengthen Observation and Information Systems for Health HE-07-03 Integrated Atmospheric Pollution Monitoring, Modelling and Forecasting CB-07-01 Engaging Donors; Identifying Best Practices, Gaps and Needs; Capacity building Performance Indicators; Building National and Regional Capacity; Open Source Software.	WMO Sand and Dust Storm Warning System (SDSWS) in support of diseases prevention and improvements in human health
Establishment of a coordinating group focused on health organizations as users of Earth Observation data and information	R		
Development of indicators of human health	R		
Development of monitoring methods and systems to detect early evidence of health-related changes and to further inform epidemiological modeling studies	Y	HE-06-03 Forecast Health Hazards HE-07-01 Strengthen Observation and Information Systems for Health HE-07-02 Environment and Health Monitoring and Modelling	Improving Timely Warning and Detection of Meningitis Outbreaks and Intervention Strategies Air Quality and Human Health
Coordinated approaches to the integration of environmental monitoring parameters	Y	HE-06-03 Forecast Health Hazards HE-07-01 Strengthen Observation and Information Systems for Health	Improving Timely Warning and Detection of Meningitis Outbreaks and Intervention Strategies
Development of mechanisms for alerting public health professionals to hazardous conditions	Y	HE-06-03 Forecast Health Hazards HE-07-02 Environment and Health Monitoring and Modelling	Improving Timely Warning and Detection of Meningitis Outbreaks and Intervention Strategies
Availability of wide-area health parameters derived from satellite data	Y	HE-07-03 Integrated Atmospheric Pollution Monitoring, Modelling and Forecasting	WMO Sand and Dust Storm Warning System (SDSWS) in support of diseases prevention and improvements in human health

Development of geochemical baseline data and maps, such as trace element toxicity and deficiencies	Y	HE-07-02 Environment and Health Monitoring and Modelling	Air Quality and Human Health
ENERGY			
Produce an evaluation of the Plan's progress with regard to energy and revise strategy as needed.	G	EN-06-04 Using New Observation Systems for Energy	Energy Community of Practice
Facilitate the exchange of data and products for efficient energy management	G	EN-06-04 Using New Observation Systems for Energy EN-07-01 Management of Energy Sources EN-07-02 Energy Environmental Impact Monitoring EN-07-03 Energy Policy Planning US-07-01 Nowcasting and Forecasting User Applications	Energy Community of Practice ENVISOLAR – Space-based environmental information for solar energy industrie Solar Data for Developing Countries Solar and Wind Energy Data – Survey of User's Requirements Bioenergy Resource Assessment
Facilitate the use of improved weather and climate products for the development of new energy tailored products and services	Y	EN-06-04 Using New Observation Systems for Energy EN-07-01 Management of Energy Sources EN-07-03 Energy Policy Planning US-07-01 Nowcasting and Forecasting User Applications	Energy Community of Practice ENVISOLAR – Space based environmental information for solar energy industries Solar Data for Developing Countries Solar and Wind Energy Data – Survey of User's Requirements Bioenergy Resource Assessment
CLIMATE			
Enhance the collaboration mechanism between observation organizations and research communities with users of climate information	G	CL-06-02 Key Climate Data from Satellite Systems US-06-01 Identify Priorities and Synergies between SBAs CL-07-01 Seamless Weather and Climate Prediction System	Improving projections of sea-level rise and variability The Cryosphere Observing System: Legacy of the International Polar Year 2007-2008 State of the Climate– A GEO Achievement

		<p>CL-06-01 Sustained Reprocessing and Reanalysis Efforts</p> <p>WE-06-03 THORPEX Interactive Global Grand Ensemble (TIGGE)</p>	<p>Ensembles of Global Weather Forecasts (TIGGE)</p> <p>Ocean Observations, Modelling, Data & Information (INCOIS)</p> <p>APEC Climate Center for Information Services (APCC)</p> <p>Revolution in Weather, Climate & Earth-system Prediction</p> <p>WCRP and Droughts</p> <p>ClimDevAfrica Initiative</p>
Support implementation of actions called for in the GCOS Implementation Plan and the relevant IGOS-P Theme Reports	G	<p>CL-06-01 Sustained Reprocessing and Reanalysis Efforts</p> <p>CL-06-02 Key Climate Data from Satellite Systems</p> <p>CL-06-03 Key Terrestrial Observations for Climate</p> <p>CL-06-05 GEOSS IPY Contribution</p> <p>CL-06-06 Global Ocean Observation System</p> <p>WE-06-01 Surface-based Global Observing System for Weather</p> <p>CL-06-01 Sustained Reprocessing and Reanalysis Efforts</p> <p>CL-06-02 Key Climate Data from Satellite Systems</p>	<p>APEC Climate Center for Information Services (APCC)</p> <p>ClimDevAfrica Initiative</p> <p>EuroCryoClim - European contribution to a global cryospheric climate monitoring system</p> <p>Global Monitoring of Greenhouse Gases</p> <p>Global Precipitation Climatology Centre (GPCC)</p> <p>Improving projections of sea-level rise and variability</p> <p>Network for the Detection of Mesopause Change (NDMC)</p> <p>Ocean Surface Topography</p> <p>Ozone Depletion and Recovery and Climate Change</p> <p>Parasol, Calipso and the A-Train</p> <p>The Cryosphere Observing System: Legacy of the International Polar Year 2007-2008</p> <p>The GCOS Upper-Air Reference Network, GRUAN</p> <p>State of the Climate– A GEO Achievement</p> <p>Ocean Observations, Modelling, Data & Information (INCOIS)</p>
Promote the establishment of data archive centres for all ECVs	G	<p>WE-06-03 THORPEX Interactive Global Grand Ensemble (TIGGE)</p>	<p>Global Precipitation Climatology Centre (GPCC)</p> <p>The Cryosphere Observing System: Legacy of the International Polar Year 2007-2008</p>

		CL-07-01 Seamless Weather and Climate Prediction System	<p>Ocean Observations, Modelling, Data & Information (INCOIS)</p> <p>Ensembles of Global Weather Forecasts (TIGGE)</p> <p>APEC Climate Center for Information Services (APCC)</p> <p>Revolution in Weather, Climate & Earth-system Prediction</p> <p>ClimDevAfrica Initiative</p>
Promote institutional commitments to provide integrated global analyses of all ECVs	G	CL-06-01 Sustained Reprocessing and Reanalysis Efforts	<p>The Cryosphere Observing System: Legacy of the International Polar Year 2007-2008</p> <p>State of the Climate– A GEO Achievement</p> <p>Ocean Observations, Modelling, Data & Information (INCOIS)</p> <p>Ensembles of Global Weather Forecasts (TIGGE)</p> <p>APEC Climate Center for Information Services (APCC)</p> <p>Global Precipitation Climatology Centre (GPCC)</p> <p>Revolution in Weather, Climate & Earth-system Prediction</p>
Develop data integration facilities for exchanging data, products and information between climate sectors and socio-economic benefit areas	G	<p>US-06-01 Identify Priorities and Synergies between SBAs</p> <p>CL-07-01 Seamless Weather and Climate Prediction System</p>	<p>The GEO Web-Portal and GEOSS Clearinghouse - services demonstrated through the Architecture Implementation Pilot Global Precipitation Climatology Centre (GPCC)</p> <p>Ocean Observations, Modelling, Data & Information (INCOIS)</p> <p>Ensembles of Global Weather Forecasts (TIGGE)</p> <p>APEC Climate Center for Information Services (APCC)</p> <p>Revolution in Weather, Climate & Earth-system Prediction</p>

<p>Emphasize detection of current and historical climate changes and their impacts linked with other societal benefit areas</p>	<p>Y</p>	<p>CL-06-01 Sustained Reprocessing and Reanalysis Efforts CL-06-02 Key Climate Data from Satellite Systems CL-06-03 Key Terrestrial Observations for Climate CL-06-05 GEOSS IPY Contribution CL-06-06 Global Ocean Observation System CL-07-01 Seamless Weather and Climate Prediction System WE-06-03 THORPEX Interactive Global Grand Ensemble (TIGGE) EC-07-01 Global Ecosystem Observation and Monitoring Network</p>	<p>WCRP and Droughts Revolution in Weather, Climate & Earth-system Prediction Ocean Observations, Modelling, Data & Information (INCOIS) Global Precipitation Climatology Centre (GPCC) Improving projections of sea-level rise and variability Network for the Detection of Mesopause Change (NDMC) The GCOS Upper-Air Reference Network, GRUAN Ocean Surface Topography Ozone Depletion and Recovery and Climate Change Parasol, Calipso and the A-Train The Cryosphere Observing System: Legacy of the International Polar Year 2007-2008 State of the Climate– A GEO Achievement Ensembles of Global Weather Forecasts (TIGGE) APEC Climate Center for Information Services (APCC) EuroCryoClim - European contribution to a global cryospheric climate monitoring system</p>
<p>Develop and operate new in situ and/or space-based observation instruments for the observation of ECVs.</p>	<p>Y</p>	<p>CL-06-02 Key Climate Data from Satellite Systems CL-06-03 Key Terrestrial Observations for Climate CL-06-05 GEOSS International Polar Year contribution CL-06-06 Global Ocean Observation System WE-06-01 Surface-based Global Observing System for Weather WE-06-02 Space-based Global Observing System for Weather WA-07-02 Satellite Water Quantity Measurements and Integration with In-situ Data</p>	<p>Global Monitoring of Greenhouse Gases Global Precipitation Climatology Centre (GPCC) Improving projections of sea-level rise and variability Ocean Surface Topography Parasol, Calipso and the A-Train The Cryosphere Observing System: Legacy of the International Polar Year 2007-2008 The GCOS Upper-Air Reference Network, GRUAN State of the Climate– A GEO Achievement Ocean Observations, Modelling, Data & Information (INCOIS)</p>

WATER			
Produce a number of new products for precipitation, soil moisture, evaporation, evapotranspiration and other water cycle variables	Y	WA-06-05 In-situ Water Cycle Monitoring WA-07-02 Satellite Water Quantity Measurements and Integration with In-situ Data	Global Precipitation Climatology Centre (GPCC) Megha-Tropiques, GPM and the Precipitation virtual constellation
Provide validation of the accuracy of new water cycle data products	Y		
Improvement of accuracy and higher spatial-temporal resolutions, and with special attention to snow water equivalent and streamflow	Y	WA-07-02 Satellite Water Quantity Measurements and Integration with In-situ Data	
Facilitate international and fully networked operational data exchange capabilities	Y	WA-06-05 In-situ Water Cycle Monitoring	
Testing of a fully integrated prototype data system, with data assimilation, analysis and visualization capabilities for the water cycle	Y	WA-06-02 Forecast Models for Drought and Water Resource Management	
Advocate a study of the water resource variables	Y	WA-06-05 In-situ Water Cycle Monitoring WA-07-02 Satellite Water Quantity Measurements and Integration with In-situ Data	
Advocate a system for the routine collection of water level data	Y	WA-06-05 In-situ Water Cycle Monitoring WA-07-02 Satellite Water Quantity Measurements and Integration with In-situ Data	
Advocate precision gravity field missions for global water storage monitoring	Y	WA-07-02 Satellite Water Quantity Measurements and Integration with In-situ Data AR-07-03 Global Geodetic Reference Frames	

Produce a plan for institutionalizing surface water and energy flux measurements	R		
In situ observation networks with high (and low) elevation sites along mountain transects	Y	WA-06-05 In-situ Water Cycle Monitoring	
The global network of sophisticatedly and temporally integrated in situ observation sites for water cycle observations	Y	WA-06-05 In-situ Water Cycle Monitoring	
Produce integrated water cycle data sets (including predictions) on a continental scale	Y	WA-06-05 In-situ Water Cycle Monitoring	
Evaluation of the data and product requirements for use in applications for water-related health issues	Y	WA-07-01 Global Water Quality Monitoring US-06-02 Pilot Communities of Practice	
Produce a plan for monitoring drinking water quality	Y	WA-07-01 Global Water Quality Monitoring	WISE – Water Information System for Europe
Development of effective sensors and missions for precipitation (GPM), surface and subsurface water stores	Y	WA-07-01 Global Water Quality Monitoring AR-06-10 DA-07-03 Virtual Constellations	
Reanalysis of products for use in determining trends in water cycle variables	Y	WA-06-02 Forecast Models for Drought and Water Resource Management	
Produce a plan for capacity building to support water management	Y	WA-06-07 Integrated Earth Observation Water Resource Management CB-07-01	

WEATHER			
Improve data observations and models to produce reliable forecasts of severe weather	G	WE-06-01 Surface-based Global Observing System for Weather WE-06-02 Space-based Global Observing System for Weather WE-06-03 THORPEX Interactive Global Grand Ensemble (TIGGE) WE-06-05 Numerical Weather-Prediction Capacity Building	Beijing 2008 Olympics TIGGE achievements KMA Capacity Building
Establishment of new regional centers, to allow reliable warnings of impending severe events	G	WE-06-05 Numerical Weather-Prediction Capacity Building	TIGGE achievements KMA Capacity Building
Establish better coordinated regional in situ observation networks on the basis of the EUCOS model	G	WE-06-01 Surface-based Global Observing System for Weather	
ECOSYSTEMS			
Execution of a global (terrestrial, inland water, coastal, and oceanic) ecosystem mapping initiative at a resolution of 500 m	G	EC-07-01 Global Ecosystem Observation and Monitoring Network	
Implementation of a global nitrogen observing system	R		
Coordination and expansion of a network of land, ocean and coastal reference stations for monitoring ecosystem	Y		
Establishment of a global, sufficient and representative in situ and airborne network	Y	EC-07-01 Global Ecosystem Observation and Monitoring Network AR-07-02 GEOSS Architecture Implementation Pilot	
Production of baseline maps for the globe, with adequate resolution and known uncertainty, of selected ecosystem properties	G	EC-07-01 Global Ecosystem Observation and Monitoring Network AR-07-02 GEOSS Architecture Implementation Pilot EC-06-02 Ecosystem Classification	

AGRICULTURE			
Development and improvement of the analytical tools and methods for agriculture risk assessment	G	AG-07-02 Agricultural Risk Management	
Completion of the World soil and terrain database (SoTer) at a resolution of 1:1 million	G	AG-07-03 Operational Agricultural Monitoring System	The POSTEL Land Surface Thematic Center
Completion of land degradation and desertification assessment in drylands (LADA)	Y	EC-07-01 Global Ecosystem Observation and Monitoring Network	
Provision of regularly validated global land cover product at 1:500,000	G	DA-07-02 Global Land Cover	Improved global land cover observation and assessment
Satellite data in monitoring and maintaining a global farming systems database	G	AG-07-01 Improving Measurements of Biomass AG-07-03 Operational Agricultural Monitoring System	
Operational linkage of Earth Observation data to geospatially referenced production and use statistics	Y	AG-07-01 Improving Measurements of Biomass AG-07-03 Operational Agricultural Monitoring System	Census Of Marine Life
Continuity of high-resolution imagery for monitoring logging concessions in areas with high biodiversity concentrations	Y	EC-07-01 Global Ecosystem Observation and Monitoring Network BI-07-01 Biodiversity Observation Network	Biodiversity Observation Network
Operational on-time monitoring and information systems introduced for significant and extreme events	G	AG-07-02 Agricultural Risk Management	The North American Drought Monitor, A GEO Achievement and the Beginning of a Global Drought Early Warning System

BIODIVERSITY			
Timely data and information for local, national, regional and international policy makers, scientists and natural resource managers through the distributed observation network.	G	EC-07-01 Global Ecosystem Observation and Monitoring Network AR-07-02 GEOSS Architecture Implementation Pilot	Biodiversity Observation Network
Establishment of monitoring systems for policy-interest and endangered species	G	EC-07-01 Global Ecosystem Observation and Monitoring Network BI-07-01 Biodiversity Observation Network AR-07-02 GEOSS Architecture Implementation Pilot	Biodiversity Observation Network
Operational deployment of a system to provide near-real-time data on detection, establishment and spread of problematic invasive organisms	G	BI-07-02 Invasive Species Monitoring	Invasive Species Monitoring
Systematic monitoring of biodiversity in all ecosystems	G	EC-07-01 Global Ecosystem Observation and Monitoring Network BI-07-01 Biodiversity Observation Network BI-07-02 Invasive Species Monitoring AR-07-02 GEOSS Architecture Implementation Pilot	Biodiversity Observation Network; Invasive Species Monitoring; Interoperability Process Pilot Project (IP3); Biodiversity/Climate Change
Addition of twelve million new spatially and temporally explicit observation records yearly	G	BI-07-01 Biodiversity Observation Network BI-07-03 Specimen Data	Interoperability Process Pilot Project (IP3); Biodiversity/Climate Change
Delivery of capacity building programmes on data use and interpretation	G	CB-07-01 Engaging Donors; Identifying Best Practices, Gaps and Needs; Capacity building Performance Indicators; Building National and Regional Capacity; Open Source Software.	

COMMONALITY			
Joint evaluation of prototypes that connect multiple systems, and support making operational any research demonstrations of such collaboration and interoperability	G	AR-07-01 Enabling Deployment of a GEOSS Architecture AR-07-02 GEOSS Architecture Implementation Pilot DI-06-04 Implementation of a Tsunami Early Warning System at Global Level DI-06-08 Multi-hazard Approach Definition and Progressive Implementation DI-06-13 Implementation of a Fire Warning System at Global Level DI-07-01 Risk Management for Floods US-06-01 Identify Priorities and Synergies between SBAs	The GEO Web-Portal and GEOSS Clearinghouse - services demonstrated through the Architecture Implementation Pilot GEOSS Standards and Interoperability Forum (SIF) GEOSS Standards and Interoperability Registry GEOSS Interoperability Process Pilot Project Interoperability – Expediting access to GEOSS components and services INSPIRE GEO Grid
Periodic demonstrations of the overall progress toward the highest level of collaboration and interoperability achieved	G	AR-07-01 Enabling Deployment of a GEOSS Architecture AR-07-02 GEOSS Architecture Implementation Pilot	The GEO Web-Portal and GEOSS Clearinghouse - services demonstrated through the Architecture Implementation Pilot GEOSS Interoperability Process Pilot Project INSPIRE
DATA USER			
Data management approaches that encompass a broad perspective of the observation data life cycle	G	DA-07-06 Data Integration and Analysis System	The GEO Web-Portal and GEOSS Clearinghouse - services demonstrated through the Architecture Implementation Pilot Development of a framework for space-based data quality assurance Ensembles of Global Weather Forecasts (TIGGE) Revolution in Weather, Climate & Earth-system Prediction Ocean Observations, Modelling, Data & Information (INCOIS) APEC Climate Center for Information Services (APCC)
International information sharing capabilities through appropriate technologies, including, but not limited to, Internet-based services	G	AR-07-02 GEOSS Architecture Implementation Pilot CB-06-04 GEONETCast	The GEO Web-Portal and GEOSS Clearinghouse - services demonstrated through the Architecture Implementation Pilot GEONETCast

CAPACITY BUILDING			
Funding of multinational projects to leverage the end-to-end value of observations	Y	CB-07-01 Engaging Donors; Identifying Best Practices, Gaps and Needs; Capacity building Performance Indicators; Building National and Regional Capacity; Open Source Software.	
Produce monitoring and evaluation mechanisms aimed at determining the efficacy of GEO capacity building efforts	Y	CB-07-01 Engaging Donors; Identifying Best Practices, Gaps and Needs; Capacity building Performance Indicators; Building National and Regional Capacity; Open Source Software.	
Education and training to provide a global base of technical expertise	Y	CB-06-03 Review of existing education and training initiatives (completed in 2006) CB-07-01 Engaging Donors; Identifying Best Practices, Gaps and Needs; Capacity building Performance Indicators; Building National and Regional Capacity; Open Source Software.	KMA workshop on NWP; Chlorogin
Develop recommended priorities for new or augmented efforts in capacity building	G	CB-07-01 Engaging Donors; Identifying Best Practices, Gaps and Needs; Capacity building Performance Indicators; Building National and Regional Capacity; Open Source Software.	