GEO 2007-2009 WORK PLAN

TOWARD CONVERGENCE

27 March 2008

Table of Contents

1 DISASTERS: REDUCING LOSS OF LIFE AND PROPERTY FROM NATURAL AND HUMAN-INDUCED DISASTERS

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

GEOSS 10-Year Implementation Plan, Section 4.1.1

DI-06-02: Seismographic Networks Improvement and Coordination

This Task is led by USA and FDSN.

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

DI-06-03: Integration of InSAR Technology

This Task is led by Greece and IGOS-P.

Support the improved integration of InSAR (Interferometric Synthetic Aperture Radar) technology for disaster warning and prediction.

The Task will also address the integration of GNSS and InSAR.

DI-06-04: Tsunami Early Warning System of Systems

This Task is led by IOC and UNOSAT.

Support establishment and sustainment of the fully-operational global tsunami and mitigation system of systems in a multi-hazard approach, through (i) promoting full and open exchange of publicly-funded, unclassified data relevant to tsunami warning, forecasting, and mitigation systems and facilitating enhancement or development of mechanisms for real-time data sharing, including seismic and sea level (deep ocean and tide gauge) data; (ii) contributions to operationalization of a comprehensive observing network (in situ sea level and seismic stations and remote monitoring) and data management system, including integration of the global ocean observation system (GOOS), international seismic networks, and related global telecommunication systems, providing early detection, verification and notification of tsunami and related hazards (; and (iii) definition and promotion of standards and protocols for operating observing systems, and managing data exchange and transmission for multiple observing systems relevant to tsunami detection, early warning and mitigation.

DI-06-07: Multi-hazard Zonation and Maps

This Task is led IGOS-P and WMO.

Conduct an inventory of existing geologic and multi-hazard zonation maps, identify gaps and needs for digitization and progressively develop related products. It will include reference geographic products as the basis for production of hazard maps.

DI-06-08: Multi-hazard Approach Definition and Progressive Implementation

This Task is led by WMO.

Promote the cooperation of national and international agencies towards the definition and implementation of a multi-hazard approach to systematically address all risks.

The Task supports ISDR in the Implementation of the Hyogo Framework for action and it includes, as an important complement to the ongoing programs on the implementation of a Tsunami Early Warning System, a pilot project on the implementation of a risk management system for geohazards in the South East Asian Region. This project will be constructed in coordination and in support of existing organisations and projects (such as ASEAN, APEC, Sentinel Asia), with the participation of the Community of Practice rather active in the area.

The Task will include links with relevant international research programs, such as the one being launched by ICSU.

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

This Task is led by Canada, China and UNOOSA.

With reference to a multi-hazard approach, define and facilitate implementation of satellite constellations for risk management.

The Task will include development of dedicated Software tools (based on the basic ones developed within Task DA-07-03) to be used, in the short term, to facilitate the analysis of coverage for critical observations and, in the medium-long term, to implement the user interface with the operators for products ordering and retrieval and to perform data integration and re-processing.

The Task will also include specific activities concerning Constellation requirements definition and performance assessment, with the full involvement of Users, through participation of “champions” from the relevant Community of Practice.

The Secretariat will continue its action towards the Board of the International Charter as well as relevant CEOS members, in order to identify possible strengthening of Charter mechanisms and options for widening its scope.

DI-06-13: Implementation of a Fire Warning System at Global Level

This Task is led by Portugal and GTOS.

Initiate a globally coordinated warning system for fire, including the development of improved prediction capabilities, analysis tools and response support through sensors, information products and risk assessment models.

Interface coordination will be put in place with activities of other Social Benefit Areas taking benefit from data and products generated within this Task.

The activities will be performed in the following areas:

- review of existing warning systems
- assess ways to enhance current fire early warning systems
- define options and mechanisms for the implementation of an operational global early warning system

Activities will be coordinated with the ISDR initiative on “Wildland fire monitoring network” coordinated by the GMFC (Global Fire Monitoring Center).

DI-07-01: Risk Management for Floods

This Task is led by Tunisia.

Floods are best suited to apply the full cycle of Risk Management, from the monitoring phase up to damage assessment, passing through early warning and crisis management. The management of the flood risk is being performed by a number of Organisations all around the world at different scales, from local to national to regional. The Task will define best practices, here including decision support systems, with the goal to identify minimum required observations and associated networks (in-situ, remote sensing) and models to deal with flood management at different geographical scales. The Task will also include analysis and, where deemed applicable, further developments on weather and coastal ocean forecast and warning systems, as one of the main inputs, in particular to assess the risk during the monitoring/prevision/prevention phase. This Task includes relevant synergies with water and weather tasks and coastal ocean activities.

With reference to and in coordination with the WMO APFM (Associated Programme on Flood Management) and with similar initiative conducted under national and regional projects, the core activity will be constituted by the definition and implementation of a pilot project, centred on the development and demonstration of a Flood risk management system for the South-Central American Regions. Coastal observations and associated warnings will be part of this activity.

2 HEALTH: UNDERSTANDING ENVIRONMENTAL FACTORS AFFECTING HUMAN HEALTH AND WELL-BEING

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

GEOSS 10-Year Implementation Plan, Section 4.1.2

HE-06-03: Forecasting and Monitoring Environmental Health Hazards

This Task is led by WHO and WMO.

Facilitate the formation of international consortia and coordinate, besides advocating funding for, the implementation of major demonstration pilot-projects integrating Earth observations, health and epidemiological as well as socio-economic data.

Demonstration research projects and other relevant activities will a priori focus on Meningitis Environmental Risk Information Technologies (MERIT).

MERIT aims to extend current capabilities to more effectively combine environmental information with knowledge of epidemic meningococcal meningitis. This will have an immediate impact on public health outcomes in Africa through increasing the effectiveness of prevention and response control strategies, and ongoing surveillance of meningitis epidemics

The Task will also initiate projects to improve the processing of real-time and historical data and the development of models relating remotely sensed, in-situ, socio-economic and epidemiological data for detecting disease trends and the provision of early warning systems.

HE-07-01: Strengthen Observation and Information Systems for Health

Pilot projects will be initiated to improve in-situ environmental and health data collection for the utilisation and validation of remotely sensed data relevant to health, as well as to explore how the GEOSS will provide for the collection and distribution of information relevant to the diverse needs of the health community. To meet the target of developing an integrated global public health information network database, it will be necessary to begin the planning process to define necessary tools, interoperability standards, architecture and infrastructure, and user communities, in order to provide input into the GEO architecture and data development phase. This process will be initiated with a workshop involving all stakeholders.

HE-07-02: Environment and Health Monitoring and Modelling

Initiate projects to further develop and integrate databases of remotely sensed and in-situ environmental measurements (including baseline geochemical data such as trace-element toxicity and deficiencies) together with new observations characterizing atmospheric, soil, river, lake and coastal marine pollution, and develop models to relate these to exposure and health effects data. This Task will lead to the identification of mechanisms for alerting public health professionals on hazardous conditions identified by the monitoring of these parameters, as well as further informing epidemiological modelling studies.

HE-07-03 Multihazard Risk Reduction due to Atmospheric Aerosols

This Task is led by IGOS-P and WMO.

This activity will bring all players interested in applying an integrated aerosol observational approach (including modelling) to reducing risks with respect to multiple hazards of aerosols. The multi-hazards of aerosol pollution are health (respiratory & mortality), climate (climate forcing), weather (impacts on severe storms such as tropical cyclones), water (suppression or augmentation of rainfall by aerosols; the WMO-GAW/IUGG have just finished an assessment of aerosol impacts on precipitation), ecosystems (acid deposition, agricultural impacts), and transport (air and ground - caused by severe sand and dust storms).

This task will support the development of international systems for both sand and dust storm warning, and biomass burning monitoring. As a priority,, it will support the development of the integrated Sand and Dust Storm (SDS) Warning System (WS) for the contribution to reduction of risks from SDS.

This Task has been redefined in the 2008 Update of the GEO Work Plan 2007-2009.

3 ENERGY: IMPROVING MANAGEMENT OF ENERGY RESOURCES

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

GEOSS 10-Year Implementation Plan, Section 4.1.3

EN-06-04: Using New Observation Systems for Energy

This Task is led by IEEE, IGOS-P and WMO.

Organize a series of activities including workshops to identify and define the main elements/components of a strategic 5-10 Year Plan for the optimum exploitation of the enhanced capabilities offered by the forthcoming new generation of observing systems and forecasting modelling techniques.

EN-07-01: Management of Energy Sources

This Task is led by Germany.

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

Related activities will include: Promote collaboration between users and providers of Earth observation applications to foster the development of innovative Earth observation services in support of energy management. Develop the use of Earth observations in the development, operation and management of energy production systems.

EN-07-02: Energy Environmental Impact Monitoring

This Task is led by the Netherlands.

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

Related activities will include: Promote and develop the use of Earth observation data for impact monitoring. Support the development of modelling systems helping to quantify and anticipate changes e.g. to freshwater, biodiversity, ecosystems, atmospheric and oceanic composition, and ground elevation. Make relevant synergies with carbon sequestration and greenhouse gas monitoring activities, and with Task US-07-01.

EN-07-03: Energy Policy Planning

This Task is led by France.

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

Related activities will include: Encourage the use of Earth science models to support energy scenario assessments. Enhance availability of data and products required to better assess countries' potential for energy production. Promote interactions of data providers and decision-support-system developers. Encourage training of decision-makers at all relevant levels for interpretation of relevant data and products.

4 CLIMATE: UNDERSTANDING, ASSESSING, PREDICTING, MITIGATING, AND ADAPTING TO CLIMATE VARIABILITY AND CHANGE

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

GEOSS 10-Year Implementation Plan, Section 4.1.4

Note: The GCOS Implementation Plan and the WCRP Strategic Framework represent a commonly agreed basis for GEO actions in the Climate area.

CL-06-01: Sustained Reprocessing and Reanalysis Efforts

This Task is led by CEOS and GCOS.

Ensure the development of international mechanisms to coordinate and maintain sustained climate data reprocessing and reanalysis efforts. With regard to the reprocessing of historical datasets (to obtain consistent long-time series of satellite records), make relevant synergies with Task CL-06-02.

CL-06-02: Key Climate Data from Satellite Systems

This Task is led by USA, CEOS, GCOS and WMO.

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

CL-06-03: Key Terrestrial Observations for Climate

This Task is led by GTOS.

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

CL-06-05: GEOSS IPY Contribution

This Task is led by Portugal and WCRP.

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

CL-06-06: Global Ocean Observation System

This Task is led by GOOS.

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

Related activities will include: Improve the global coverage and data accuracy of the climate-monitoring system and coastal observing systems, as well as management and archival of the resulting

data, by 2007 and continuing. Contribute to the implementation of a global coastal network using the mechanism of GOOS Regional Alliances, by 2007 and continuing. Establish an Argo Program Office to ensure the ongoing implementation of this global array of profiling floats in the ocean.

CL-07-01: Seamless Weather and Climate Prediction System

This Task is led by WCRP and WMO.

Support the development of a WWRP-THORPEX/WCRP initiative on "International Weather, Climate and Earth-system Science", to better address uncertainties associated with climate variability and change, and related societal impacts.

Related activities will include: Promote international multi-disciplinary (physics-biology-chemistry) collaboration on the development of a high-resolution seamless weather/climate global prediction system - including coupled atmosphere-ocean data assimilation. Support the development of an international framework for the design and implementation of a unified approach toward weather, climate, Earth system, and societal-economic research.

5 WATER: IMPROVING WATER-RESOURCE MANAGEMENT THROUGH BETTER UNDERSTANDING OF THE WATER CYCLE

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

GEOSS 10-Year Implementation Plan, Section 4.1.5

WA-06-02: Forecast Models for Drought and Water Resource Management

This Task is led by Tunisia, USA, IGOS-P and WCRP.

Enhanced prediction of the global water cycle variation is a key contribution to mitigation of water-related disasters, drought and sustainable human development. Forecasting methods are to be improved for use by hydrological services throughout the world.

The hydrological data and information system infrastructure should be determined, the data from hydrological and meteorological services should be pulled together first on a global level including moisture flux from the air-sea interface, on a national level including terrestrial systems and then on river basin level. The systems should also be made interoperable to facilitate global exchange of data and information. An international symposium is proposed to be held on approaches to Earth observations, drought predictive capabilities and management responses.

WA-06-07: Integrated Earth Observation Water Resource Management

This Task is led by Tunisia and IGOS-P.

Initiate capacity building programs to develop tools for using Earth Observation data in support of water management, and to show the value of Earth observations generally in water resource management. The program will be initiated in Latin America and will then be extended to Asia and Africa. Linkages with existing efforts of GEO Members and Participating Organisations will be made.

WA-07-01: Global Water Quality Monitoring

This Task is led by Finland and IGOS-P.

Many aspects of water quality monitoring and assessment, both in-situ and remotely sensed are severely deficient. Many countries lack the technical, institutional, and financial resources to conduct proper assessments using in-situ water quality monitoring methods for terrestrial sources and in the coastal ocean. Remote-sensed operational systems of global-scale freshwater quality are non-existent. Operational observation systems need to be developed, and the resulting information systems should be made compatible and interoperable as part of the system of systems. This Task builds on the outcomes of the water quality workshops in 2006 and 2007 and first pilot projects are being planned to begin in Asia as a result of the Asia Water Resource Management Capacity Building Workshop. This Task has relevant synergies with HE-07-02.

WA-08-01: Integration of In-situ and Satellite Data for Water Cycle Monitoring

This Task is led by Japan, Portugal, GOOS, IGOS-P and WMO.

Current capabilities of water cycle observations are inadequate for monitoring long-term changes in the global water system and their feedback into the climate system. In addition, the lack and

inaccessibility of crucial data is a major constraint on decision-making for sustainable development of water resources and improvement of water management practices. To address this gap, an integrative initiative is needed, involving different types of scientific- as well as applications-oriented efforts and initiatives (e.g. WCRP/GEWEX/CEOP). It would combine different types of satellite and in-situ observations related to key variables of the water cycle (e.g. precipitation, soil moisture, snow water equivalent, surface water, ground water, streamflow, etc.), eventually with model outputs, for improved accuracy and global coverage. In addition to filling gaps in measurement capability, the initiative should advocate the interoperability of observing systems and standardization of metadata in order to promote the sharing of data and telecommunication infrastructures.

The Hydrological Applications and Run-Off Network (HARON) Project is proposed as one of the means to accomplish the operational aspect of these goals, and ultimately provide the most comprehensive water cycle information possible to the science community, water resource managers, and other decision-makers. Other ongoing initiatives related to integrated precipitation products, soil moisture and groundwater will also provide essential contributions.

This Task represents the merger of WA-06-05 and WA-07-02.

6 WEATHER: IMPROVING WEATHER INFORMATION, FORECASTING AND WARNING

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

GEOSS 10-Year Implementation Plan, Section 4.1.6

WE-06-01: Surface-based Global Observing System for Weather

This Task is led by USA and WMO.

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

WE-06-02: Space-based Global Observing System for Weather

This Task is led by WMO.

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

WE-06-03: THORPEX Interactive Global Grand Ensemble (TIGGE)

This Task is led by WMO.

Facilitate the development and maintenance of a prototype global operational multi-model ensemble prediction system (e.g. through THORPEX) incorporating easily accessible databases. Development of TIGGE, together with regional ensemble prediction systems (TIGGE-LAM) and the associated data bases, will be an important contribution to the successful implementation of a number of GEO tasks that relate to risk management, early warning systems, major hazards and associated impacts.

WE-06-05: Numerical Weather-Prediction Capacity Building

This Task is led by Greece, Spain and USA.

Co-organize a series of regional capacity building workshops with major numerical weather-prediction training centres to assist developing countries in their utilization of currently available forecasts. Build upon WMO programmes for developing countries and giving special emphasis to building capacity for the use of ensemble forecasts for extreme event forecasting.

WE-07-01: Data Assimilation and Modelling for Operational Use

This Task is led by Australia, IGOS-P and WMO.

Advocate and facilitate the development and implementation of advanced data assimilation systems that will be able to fully exploit a broad spectrum of surface-based and space-based Earth observations. In particular, there is a need for a focused effort to develop and support the assimilation of aerosols by weather forecast models that actively couple aerosols to radiation and hence address feedbacks on significant weather including heat waves, extra-tropical storms, monsoon onsets and breaks.

WE-07-02: Weather Demonstration Project for the Beijing 2008 Olympic Games

This Task is led by China and WMO.

Establishing strong and effective connection and collaboration between research, operational use, and end users is of particular importance for the success of GEOSS.

By bringing together major advanced numerical weather prediction systems, observations and end users, the Beijing 2008 Forecasting Demonstration Project (B08FDP) will dedicate to now-casting and the Beijing 2008 Research and Development Project (B08RDP) will dedicate to the mesoscale data assimilation and ensemble prediction system (including use of the WWRP-THORPEX TIGGE outputs in real time). Together with the demonstration, training workshops for transferring advanced forecasting products to developing countries and facilitating application of advanced observation technology, as well as outreach activities will be organized with co-sponsorship and coordination of GEO.

7 ECOSYSTEMS: IMPROVING THE MANAGEMENT AND PROTECTION OF TERRESTRIAL, COASTAL AND MARINE RESOURCES

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

GEOSS 10-Year Implementation Plan, Section 4.1.7

EC-06-01: Integrated Global Carbon Observation (IGCO)

This Task is led by USA and IGOS-P.

Support the Integrated Global Carbon Observation (IGCO) development of a global carbon-observing system, in particular improved global networks of in-situ CO_2 observations and absorption of CO_2 by the oceans and resulting acidification.

EC-06-02: Ecosystem Classification and Mapping

This Task is led by Paraguay and USA.

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

EC-06-07: Regional Networks for Ecosystems

This Task is led by USA, GTOS and POGO.

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

EC-07-01: Global Ecosystem Observation and Monitoring Network

This Task will coordinate and improve terrestrial (forests, urban agriculture, woodlands, grasslands, and deserts), freshwater, ice and oceans ecosystem observation, characterization and monitoring especially in terms of acquisition and use of satellite, aerial and in situ observation. This theme will address the development of a global integrated sampling frame in coordination with the GEOSS Geodesy activities. It will promote characterization, mapping and monitoring of ecosystems at local, national, regional and global scales, and systematic and formal methods for measuring land surface and vegetation attributes, especially for the protected areas systems planning, characterization, and monitoring of protected areas.

Task components include developing formal methods for collecting plot (in-situ) data, and for translating between different systems, produce a manual of fields methods for terrestrial data, and capture existing plot data into an operational information system. The Task will also promote the use of Earth observation data to detect the effects of insects, pathogens, water temperature, and elevation and chemical stresses on ecosystems.

8 AGRICULTURE: SUPPORTING SUSTAINABLE AGRICULTURE AND COMBATING DESERTIFICATION

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

GEOSS 10-Year Implementation Plan, Section 4.1.8

AG-06-01: GEOSS Agriculture Strategic Plan

This Task is led by FAO.

Initiate the creation of a 5 to 10-year strategic plan: define specific objectives for 2007 and create a plan of action for GEO in agriculture, taking account of the GEOSS 10 Year Implementation Plan Reference document targets.

AG-06-02: Data Utilization in Aquaculture

This Task is led by Canada and Spain.

Consult with scientists and experts from the fisheries, aquaculture, coastal zone management and Earth observation communities at international and regional levels to identify opportunities for enhanced utilization of Earth observations in fisheries and aquaculture.

AG-06-04: Forest Mapping and Change Monitoring

This Task is led by USA, FAO and GTOS.

Integrate international efforts on assessment and monitoring of forests and forest changes using a combination of ground and satellite information and internationally agreed standards. A Global Forest Monitoring Symposium co-hosted by the Task Lead and participating organizations will be held in April 2008.

AG-06-07: Training Modules for Agriculture

This task is led by Uganda.

Initiate the design of training modules to demonstrate the usage of Earth observation data and products for the agricultural sectors in Africa, Asia, Latin America, Central and Eastern Europe, and in Small Island States.

AG-07-01: Improving Measurements of Biomass

This Task is led by USA.

In order to enable a sustained use of Earth observation data in the area of agriculture and fisheries, it is necessary to further explore the utility of current Earth observations within the agricultural and marine biology sectors, especially in developing countries with an emphasis on improving classification and quantification of terrestrial and marine biomass.

AG-07-02: Agricultural Risk Management

This Task is led by WMO.

Develop and improve analytical tools and methods for agriculture risk assessment, particularly for crop failure, and establish common standards and formats. This should include the establishment of operational monitoring systems and extreme events such as crop water stress. In this context, the implementation of pilot-projects linking Earth system model forecasts to end-user application models (such as crop-yield models) will be facilitated in order to improve food-supply prediction from agriculture and aquaculture. The techniques developed in the proposed pilot projects shall be well-documented for broad use. The pilot projects should include appropriate documentation, risk assessment analyses, and quantitative comparisons to standard, benchmark practices.

AG-07-03: Operational Agricultural Monitoring System

This Task is led by USA.

The purpose of this Task is to support the development of an Operational Agricultural Monitoring System, enhancing the current capabilities in the areas of agricultural monitoring, famine early warning and food security.

Enhancements will be developed in the following three areas:

- Global mapping and monitoring of changes in distribution of cropland area and the associated cropping systems
- Global monitoring of agricultural production leading to accurate and timely reporting of national agricultural statistics and accurate forecasting of shortfalls in crop production and food supply and facilitating reduction of risk and increased productivity at a range of scales
- Effective early warning of famine, enabling a timely mobilization of an international response in food aid.

The Work Program is being developed under five sub tasks.

9 BIODIVERSITY: UNDERSTANDING, MONITORING AND CONSERVING BIODIVERSITY

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

GEOSS 10-Year Implementation Plan, Section 4.1.9

BI-06-03: Capturing Historical Biodiversity Data

This Task is led by GBIF.

Implement the strategic plan for capturing historical biodiversity data from natural history collections and the research community. The Global Biodiversity Information Facility, with DIVERSITAS and GTOS, conducted a workshop on "Defining user needs for a global observation system for biodiversity" on 23-25 October 2006.

BI-07-01: Biodiversity Observation Network

This Task is led by USA and DIVERSITAS International.

Develop and implement a biodiversity observation network that is spatially and topically prioritized, based on analysis of existing information, identifying unique or highly diverse ecosystems and those supporting migratory, endemic or globally threatened species, those whose biodiversity is of socio-economic importance, and which can support the 2010 CBD target. Develop a strategy for assessing biodiversity at both the species and ecosystems level. Facilitate the establishment of monitoring systems that enable frequent, repeated, globally coordinated assessment of trends and distributions of species and ecosystems of special conservation merit. Facilitate consensus on data collection protocols and the coordination of the development of interoperability among monitoring programs.

BI-07-02: Invasive Species Monitoring System

This Task is led by USA.

Invasive alien species (IAS) threaten biodiversity and exert a tremendous cost on society for IAS prevention and eradication. They endanger natural ecosystem functioning and seriously impact biodiversity and agricultural production. It is therefore necessary to characterize, monitor and predict changes in the distribution of invasive species. This task will characterize the current requirements and capacity for invasive species monitoring, identify gaps, and develop strategies for implementing cross search functionality among existing online invasive species information systems from around the globe. The task will be coordinated by members of the Global Invasive Species Information Network (GISIN), including (but not limited to) the USGS National Biological Information Infrastructure (NBII), IUCN/SSC Invasive Species Specialist Group (ISSG), the Global Biodiversity Information Facility (GBIF), the Global Invasive Species Programme, and CAB International, with collaboration from NASA, the USGS National Institute of Invasive Species Science, Discover Life, Diversitas International, and other information managers working with the invasive species science community.

10 USER ENGAGEMENT

> The needs of users, and the technical solutions to those needs, change with time. GEO will organize regular GEOSS User Fora among and within societal benefit areas or sub-areas, making use of user communities where they exist and catalyzing the formation of new ones where they do not. It will also create an appropriate mechanism for coordinating user requirements across societal benefit areas. The function of the User Fora will be to document and review user requirements, assess the extent to which they are being met, and make recommendations to GEO with the objective of improving the delivery of information appropriate to user needs.
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> *GEOSS 10-Year Implementation Plan, Section 4.2*

US-06-01: Identify Priorities and Synergies between SBAs

This Task is led by the User Interface Committee, supported by the GEO Secretariat.

Establish a GEO process for identifying critical 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 development processes.

US-06-02: Pilot Communities of Practice

This Task is led by IGOS-P and the User Interface Committee.

Initiate pilot communities of practice to identify and further refine users' needs, in particular on cross-cutting areas, building upon the initial experience of community of practice and on information provided by national, regional and project-level surveys.

The following communities of practice have been recognised by the User Interface Committee:

- Coastal Zone
- Air and Health
- Energy
- Geohazards
- Water and Health
- Forest

11 ARCHITECTURE

> The success of GEOSS will depend on data and information providers accepting and implementing a set of interoperability arrangements, including technical specifications for collecting, processing, storing, and disseminating shared data, metadata and products. GEOSS interoperability will be based on non-proprietary standards, with preference given to formal international standards. Interoperability will be focused on interfaces, defining only how system components interface with each other and thereby minimizing any impact on affected systems other than where such systems have interfaces to the shared architecture.
>
> *GEOSS 10-Year Implementation Plan, Section 5.3*

AR-06-11: Radio Frequency Protection

This Task is led by WMO.

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

AR-07-01: Enabling Deployment of a GEOSS Architecture

This Task is led by USA, IEEE and the Architecture and Data Committee.

This Task addresses the core architectural principles in GEOSS, and will provide useful guidelines and tools to GEO Members and Participating Organizations in the establishment of GEOSS. It will document GEOSS convergence and interoperability supporting the high level strategic and tactical guidelines of GEOSS implementation. The process for interoperability arrangements, consensus on linkage of GEOSS components and Spatial Data Infrastructure (SDI) will be components of this Task. To ensure the appropriate design of GEOSS reference and functional architecture in some practical use cases, System of Systems Engineering activities will be included. It will define and deploy core GEOSS registry infrastructure for GEO Members and Participating Organizations to commit component systems and register related resources to GEOSS and provide consultation to the contributed system facilitator. This task also addresses integration and user issues emerging from the initial operating capability of the System of Systems infrastructure.

AR-07-02: GEOSS Architecture Implementation Pilot

This Task is led by USA and OGC.

Lead the incorporation of contributed components consistent with the GEOSS Architecture using a GEOSS Web Portal and a GEOSS Clearinghouse search facility to access services through GEOSS Interoperability Arrangements in support of the GEOSS Societal Benefit Areas. Incorporate GEOSS contributed components into a pilot implementation of the GEOSS Architecture in coordination with Task AR-07-01. Further it will include the relevant information on existing Earth Observation Capacity Building efforts and resources. The User Interface Committee and Capacity Building Committee will support the Architecture and Data Committee in overseeing this Task**.** Provide phased delivery of components to operations task AR-07-01: with each phase consisting of: architecture

refinement based on user interactions; component interoperability testing; and SBA- focused demonstrations.

AR-07-03: Global Geodetic Reference Frames

This Task is led by IAG.

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

AR-07-04: WIS – GEOSS Operational Exemplar

This Task is led by WMO.

The purpose of this Task is to upgrade and demonstrate the WMO Information System (WIS) as one operational exemplar of the GEOSS architecture implementation process providing improvements for multiple Societal Benefit Areas.

12 DATA MANAGEMENT

In the implementation of GEOSS, increased sharing of methods for modelling and analysis needed to transform data into useful products will be advocated. The implementation of GEOSS will facilitate, within 6 years, data-management approaches that encompass a broad perspective of the observation-data life cycle, from input through processing, archiving, and dissemination, including reprocessing, analysis and visualization of large volumes and diverse types of data. The implementation of GEOSS will establish, within 6 years, international information sharing and dissemination drawing on existing capabilities through appropriate technologies, including, but not limited to, Internet-based services.

GEOSS 10-Year Implementation Plan, Section 5.1&5.2

DA-06-01: GEOSS Data Sharing Principles

This Task is led by ICSU.

Invite experts to identify steps required to further the practical application of the agreed GEOSS data sharing principles. This Task will be coordinated with the Capacity Building Committee to ensure data access for Capacity Building.

DA-06-02: GEOSS Quality Assurance Strategy

This Task is led by CEOS and IEEE.

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

DA-06-03: Ensemble-Technique Forecasting Demonstrations

This Task is led by Greece and UK.

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

DA-06-04: Data, Metadata and Products Harmonisation

This Task is led by USA and CEOS.

Facilitate the development, availability and harmonization of data, metadata, and products commonly required across diverse societal benefit areas, including base maps, land-cover data sets, and common socio-economic data. This Task should be closely coordinated with US-06-01 and involve the User Interface Committee.

DA-06-05: Guidance Document for Basic Geographic Data

This Task is led by Japan and ISCGM.

Develop a guidance document for basic geographic data (including format, precision, accuracy, etc.), taking into account relevant national, regional and global initiatives.

DA-06-09: GEOSS Best Practices Registry

This Task is led by IEEE.

Establish GEOSS Best Practices Registry by a request for proposals from GEO organizations willing to maintain/update GEOSS Best Practices Registry. The registry should also include existing cost-benefit sharing mechanisms and examples (data sharing, cooperative data acquisition, joint

development, joint flight, collaborative sciences, etc). This should also include components identified in the Capacity Building Strategy.

DA-07-01: DEM Interoperability

This Task is led by Japan and CEOS.

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

DA-07-02: Global Land Cover

This Task is led by CEOS and GTOS.

Utilizing global and regional high-resolution land cover datasets and earlier 1-km resolution land cover data sets, implement production of a high-resolution global land-cover change dataset and report. Initiate regular analysis and reporting on land cover change and promulgate the use of these products, especially in developing countries.

DA-07-03: Virtual Constellations

This Task is led by CEOS and GTOS.

The Task has the purpose to advocate rapid development of the "CEOS Constellations Concept". Observations from a virtual constellation would provide better temporal, spatial, and spectral resolution and related data management and dissemination. A series of virtual constellations are in definition by space agencies, in consultation with user communities within the CEOS framework, each being designed to address a significant implementation challenge, and each addressing key GEOSS observation gaps in the process. Prototype Constellation address:

The CEOS Constellation for Precipitation, which aims to strengthen international cooperation on space-based observations of precipitation, including realisation of the GPM mission (AR-06-10) and providing guidance to new;

The CEOS Constellation for Land-Surface Imaging, designed to ensure the relevant synergy with High Resolution Multispectral Imager Continuity;

The CEOS Constellation for Ocean Surface Topography, designed to ensure continuity of Sea Level measurement in accordance with GCOS requirements;

The CEOS Constellation for Atmospheric Chemistry, which will address many of the needs for atmospheric observations of the climate community;

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

DA-07-04: Sensor Web Enablement for In-Situ Observing Network Facilitation

This Task is led by South Africa.

The GEOSS scope includes spaceborne, airborne and ground based observing systems of the Earth's environment. While the infrastructure for acquisition, processing and distribution of spaceborne sensing has become active in the past few decades, there has been less development of ground based sensing networks. With advances in communications technology and ground-based in-situ technologies it is now feasible to consider webs of sensors on all types of platforms with rapid access for observations. This technology has been developed under the names of Sensor Webs and Sensor Networks. The Task should develop scenarios or use cases that demonstrate the value of Sensor Webs

to the GEOSS SBAs. For example, specific domains that can benefit from sensor web are possibly disasters, health (relevant synergies with HE-07-01), biodiversity, ecosystem and water. The Task should evaluate the applicable standards and coordinate with AR-07-01 suitable for Sensor Webs.

DA-07-05: Higher Level Data Product Tools

This Task is led by Germany.

Over the past years geophysical retrievals from moderate spatial resolution imaging sensors have significantly benefited ecosystem and climate monitoring. Several of these products have meanwhile reached operational character (FAPAR, LAI, water vapour column abundance, surface albedo, SST, Case-1 Ocean chlorophyll concentration etc.). In order to enhance global monitoring and prediction capabilities the combination of higher-level data from different sources (satellite sensors) is required. To achieve this it is necessary to develop tools enabling the establishment of higher-level data products (level-3/4) from either virtual constellations and/or Sensor Webs, thus yielding frequent information update through enhanced coverage, as well as the production of higher product level time series and global maps. The output of this Task shall follow the guidelines established in DA-06-05. The Task will also encourage the reprocessing of historic data (e.g. AVHRR, MODIS, MERIS, SPOT-VGT, others) to develop composite time series and temporal phenologic metrics to enable monitoring of vegetation condition and change over time and to monitor changes in phytoplankton in the oceans.

DA-07-06: Data Integration and Analysis System

This Task is led by Japan.

It is expected that there will be a large increase in the volume of Earth Observation data. In addition to distributed data archives and integration system, data management facilities will be used for diverse and large-volume Earth Observation data from inhomogeneous information sources in cooperation with existing data centres. This Task is to coordinate data management approaches that encompass a broad perspective of the observation data life cycle, from input through processing, archiving, and dissemination, including reprocessing, analysis and visualization of large volumes and diverse type of data.

13 CAPACITY BUILDING

The GEO capacity-building strategy follows the World Summit on Sustainable Development concept of a global partnership between those whose capacity needs development and those who are able to assist in the process, recognizing that activities have intertwined social, environmental, and economic impacts. The GEO capacity-building strategy will be based on best practices derived from studying successful and less-successful approaches.

GEOSS 10-Year Implementation Plan, Section 5.6

CB-06-04: GEONETCast

This Task is led by USA, EUMETSAT and WMO.

GEONETCast, a near real-time data dissemination system -- in support of the GEO societal benefit areas – by which environmental /in situ/, airborne, and space-based observations, products, and services are transmitted to users through satellites.

Where infrastructure contributions are not yet in place, the strategy is to establish GEONETCast on a demonstration basis, then evolve to a fully operational global system with diverse data and product contributions to serve all GEO societal benefit areas. Capacity building needs, particularly in developing countries will be addressed.

The following CB-07-01 sub-tasks originate from priority actions recommended in the capacity building strategy.

CB-07-01a: Engaging Donors

This Task is led by Spain.

Develop and implement the Seville roadmap to engage Donors. The Seville roadmap aims to support the implementation of the GEO Capacity Building Strategy by positioning GEO as a coordinated resource mobilization mechanism and honest broker serving EO users and potential resource providers as a convenient gateway to the GEO community.

CB-07-01b: Identifying Best Practices, Gaps and Needs

This Task is led by the Netherlands.

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

CB-07-01c: Capacity building Performance Indicators

This Task is led by Spain.

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

CB-07-01d: Building National and Regional Capacity

This Task is led by UNEP.

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

A related focus for this Task, as well as US-07-02, will be improving in-country coordination among national statistical organisation, remote sensing agencies, environment, forests, wildlife and water related ministries for providing improved access to national environmental data.

CB-07-01e: Open Source Software

This Task is led by Brazil.

Encourage use of open source solutions across/along the Earth observation value chain through the development of an inventory of OSS solutions that could be used within GEO. Make this inventory and identified open source solutions available through the GEO Web portal.

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

CB-07-02: Knowledge Sharing for Improved Disaster Management and Emergency Response

This Task is led by CEOS and UNOOSA.

The Task aims to contribute to increase the flow of existing knowledge to end users that should be accessing and using such knowledge in their daily activities in the disaster management cycle and consolidate actions that support this knowledge sharing.

CB-08-01: Recognition of cross border Education and training capacity building in Earth Observation

This Task is led by Netherlands.

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

14 OUTREACH

Outreach is essential to many aspects of GEO activities. The outreach objective is to promote and increase the general awareness of the benefits of Earth observation, especially among present and future users, beneficiaries and sponsors of relevant systems. Within 2 years, GEO will produce and begin to implement an outreach plan directed towards key target audiences, including decision makers and policy makers; the general public; industry and service communities; scientific and technical communities; education entities; non-governmental organizations; public-interest advocacy groups; and international financial institutions and official development assistance agencies.

GEOSS 10-Year Implementation Plan, Section 5.7

See the GEO Outreach Plan.

ACRONYMS

AMDAR	Aircraft Meteorological Data Relay
ANTARES	A Network for the Enhancement of the Education and Scientific Research
APEC	Asia-Pacific Economic Cooperation
APFM	Associated Programme on Flood Management
ASEAN	Association of Southeast Asian Nations
AVHRR	Advanced Very High Resolution Radiometer
B08FDP	Beijing 2008 Forecasting Demonstration Project
B08RDP	Beijing 2008 Research and Development Project
CBD	Convention on Biological Diversity
CEOP	Coordinated Energy and Water Cycle Observations Project
CEOS	Committee on Earth Observation Satellites
DEM	Digital Elevation Model
EC	European Commission
EO	Earth Observations
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
FAO	Food and Agriculture Organization
FAPAR	Fraction of Absorbed Photosynthetically Active Radiation
FDSN	International Federation of Digital Seismograph Networks
GAW	Global Atmosphere Watch
GBIF	Global Biodiversity Information Facility
GCOS	Global Climate Observing System
GEO	Group on Earth Observations
GEOSS	Global Earth Observation System of Systems
GEWEX	Global Energy and Water Cycle Experiement
GIS	Geographical Information System
GISIN	Global Invasive Species Information Network
GMFC	Global Flood Monitoring Center
GNSS	Global Navigation Satellite System
GOFC-GOLD	Global Observation of Forest and Land Cover Dynamics
GOOS	Global Ocean Observing System
GOS	Global Observing System
GPM	Global Precipitation Measurement
GSN	Global Seismographic Network
GTOS	Global Terrestrial Observing System
HARON	Hydrological Applications and Run-Off Network
IAG	International Association of Geodesy
IAS	Invasive Alien Species
ICSU	International Council for Science
IEEE	Institute of Electrical and Electronics Engineers
IGCO	Integrated Global Carbon Observation
IGOS-P	Integrated Global Observing Strategy Partnership

IGWCO	Integrated Global Water Cycle Observations
ILTER	International Long Term Ecological Research network
InSAR	Interferometric Synthetic Aperture Radar
IOC	Intergovernmental Oceanographic Commission
IPY	International Polar Year
ISCGM	International Steering Committee for Global Mapping
ISDR	International Strategy for Disaster Reduction
ISSG	IUCN/SSC Invasive Species Specialist Group
ITC	International Training Centre
ITU	International Telecommunication Union
IUCAF	Scientific Committee on Frequency Allocations for Radio Astronomy and Space Science
IUCN	International Union for the Conservation of Nature and Natural Resources (World Conservation Union)
IUGG	International Union of Geodesy and Geophysics
LAI	Leaf Area Index
LAM	Limited Area Model
MERIS	Medium Resolution Imaging Spectrometer
MERIT	Menigitis Environmental Risk Information Technologies
MODIS	Moderate Resolution Imaging Spectroradiometer
NASA	National Aeronautics and Space Administration
NBII	National Biological Information Infrastructure
NEPTUNE	The North-east Pacific Time-series Undersea Network Experiments
NMHS	National Meteorological and Hydrological Service
OGC	Open Geospatial Consortium
OSS	Open Source Software
POGO	Partnership for Observation of the Global Ocean
SAR	Synthetic Aperture Radar
SBA	Societal Benefit Area
SDI	Space Data Infrastructure
SDS	Sand and Dust Storm
SPOT	Système Probatoire d'Observation Terrestre
SPOT-VGT	SPOT Vegetation
SSC	Species Survival Commission
SST	Sea Surface Temperature
THORPEX	The Observing-system Research and Predictability Experiment
TIGGE	THORPEX Interactive Global Grand Ensemble
UK	United Kingdom
UN	United Nations
UNEP	United Nations Environment Programme
UNOOSA	United Nations Office for Outer Space Affairs
UNOSAT	United Nations Operational Satellite Applications Programme
USA	United States of America

USGS	United States Geological Survey
VENUS	Victoria Experimental Network Under the Sea
WCRP	World Climate Research Programme
WHO	World Health Organization
WIS	WMO Information System
WMO	World Meteorological Organization
WWRP	World Weather Research Programme