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(submitted by the THORPEX IPO)

1. Introduction

The annually updated GEO Work Plan provides the agreed framework for implementing the GEOSS 10-Year Implementation Plan (2005-2015). It consists of a set of practical Tasks that are contributed to GEO by various Members and Participating Organizations including the WMO and WWRP-THORPEX. As GEOSS evolves over the next several years, connections should be realized between diverse observing, processing, data-assimilation, modelling, and information-dissemination systems. This should make it possible to obtain an increased range of data sets, products and services on the key aspects of the Earth system.

2. A new Work Plan for 2012-2015

The 2012-2015 Work Plan differs from its 2009-2011 predecessor in four main ways: (i) it derives directly from the Strategic Targets; (ii) it groups Tasks into three thematic parts; (iii) it features a reduced number of Tasks; and (iv) it proposes an improved Task management structure.

(i) **A Target-Driven Approach**
When GEO developed the 2009-2011 Work Plan three years ago, it adopted an activity-driven approach to structuring its work. This involved identifying existing activities and organizing them into Overarching Tasks. As the conclusion of the 10-Year Implementation Plan comes into view, the focus needs to shift to ensuring that the 2015 Strategic Targets are fully addressed. This can best be achieved through a target-driven approach that looks forward to what an operational GEOSS should look like. The 2012-2015 Work Plan has therefore been designed to meet the objectives described in the "demonstrated by" bullet points of the Strategic Targets document (see "Related GEOSS Strategic Targets" section under each Task). As a result, the titles of the 26 Tasks presented in the new Work Plan correspond to high-level outcomes identified as being necessary to meet the Targets.
A set of one or more "Components" has also been defined for completing each Task and thus addressing the Strategic Targets. These Components define priority actions and identify voluntary contributions available for implementation. They are based on the inputs of the GEO community and build directly on ongoing 2009-2011 sub-tasks and new proposals (see, under each Task, the "Related 2009-2011 Work Plan Tasks" and "New Proposals" sections).

(ii) **A Three-part Structure**
The Work Plan has been organized into three major parts to match the key objectives outlined by the GEO-VII Plenary and to provide a clear overview of GEO activities. Part 1 on "Infrastructure" features the physical cross-cutting components of an operational and sustainable GEOSS, including interoperable observing, modelling and dissemination systems. Part 2 on "Institutions and Development" describes "GEO at work" and the community's efforts to ensure that GEOSS is sustainable, relevant and widely used; it focuses on reinforcing data sharing, resource mobilization, capacity development, user engagement and science and technology integration. Part 3 on "Information for Societal Benefits" focuses on the information, tools and end-to-end systems that should be available through GEOSS to support decision-making across the nine Societal Benefit Areas.

(iii) **A Streamlined Number of Tasks**
Consistent with the target-driven approach described above, as well as comments received from the GEO community, the 2012-2015 Work Plan proposes a streamlined number of Tasks. Each of the 26 Tasks (as compared with 44 in the current Plan) is to be implemented through a limited number of Components, each supported by Leads (GEO Members and Organizations), one Point of Contact (representing one of the Leads) and contributors (further Members and Organizations). Note that

individuals representing Task Leads would receive from the GEO Secretariat a non-binding letter acknowledging their role and confirming that they are officially recognized by GEO. With the new Work Plan, Points of Contact would regularly report on progress to the GEO community through interactive web pages.
Task Sheets would be updated at least twice a year and serve as a basis for reporting on Work Plan implementation progress to the GEO Plenary and Executive Committee. Reporting would also rely on a Work Plan Symposium bringing together the whole Work Plan community and providing opportunities to assess progress, foster partnerships and cross-fertilization, and identify gaps and required actions.

(iv) **Improved Work Plan Management**

"Infrastructure" Implementation Board (IB)
This Board would be given the mandate to (i) monitor progress towards the Architecture and Data Management Strategic Targets; (ii) advise on the implementation of the Infrastructure Tasks; and (iii) actively coordinate activities within and across Infrastructure Tasks, while also establishing crosscutting links to the "Institutions and Development" and "Information for Societal Benefits" parts of the Work Plan..

"Institutions and Development" Implementation Groups
Four Implementation Groups would oversee the "Institutions and Development" Tasks: one on "Data Sharing" (Task ID-01), one on "Capacity Building" (Task ID-02), one on Science and Technology (Task ID-03), and one on User Engagement (Task ID-04). One Implementation Group could also potentially be created on "Gap Analysis" (pending a GEO Plenary decision and the willingness of Members and Organizations to take the lead of Task ID-06). Task ID-05 on "Catalyzing Resources for GEOSS Implementation" would be jointly overseen by the "Capacity Building" and "Science and Technology" Groups.

"Societal Benefits" Implementation Board (SB)
The "Societal Benefits" Board would be given the mandate to (i) monitor progress towards the Strategic Targets of the nine Societal Benefit Areas; and (ii) actively coordinate activities across "Societal Benefits" Tasks, also establishing cross-cutting links to the "Infrastructure" and "Institutions and Development" parts of the Work Plan; and (iii) providing advice on Task implementation, as appropriate.

3. The GEO Strategic Targets – 2015

The **purpose** of GEOSS as agreed at the 2005 Ministerial meeting is;

> *To achieve comprehensive, coordinated and sustained observations of the Earth system, in order to improve monitoring of the state of the Earth, increase understanding of Earth processes, and enhance prediction of the behaviour of the Earth system. GEOSS will meet the need for timely, quality long-term global information as a basis for sound decision making, and will enhance delivery of benefits to society.*

The 2015 strategic targets respond to the call of the 2008 G8 Summit in Tokyo to accelerate GEOSS efforts to meet the growing demand for Earth observations. Also, they are a further step towards addressing the challenges articulated by the 2002 World Summit on Sustainable Development, including the achievement of the Millennium Development Goals.

The Strategic Weather Target is that before 2015, GEO aims to:

Close critical gaps in meteorological, ocean and related observations, enhance observational capabilities, and improve weather information, especially for high impact events and in the developing world.

This will be achieved through the programmes and activities of the World Meteorological Organization (WMO), and building on enhanced observational capabilities, which will:

Monitor the performance and impact of global meteorological and related ocean observing systems, and facilitate the closure of critical gaps in observations and capabilities, utilizing a mix of space-based and *in-situ* observing systems as appropriate;

Make progress towards implementing the Vision for the Global Observing System 2025;

Encourage the design and implementation of optimal observational networks to better meet the needs of users for observational data;

Promote the improvement of data assimilation, modeling systems, and verification and assessment techniques;

Advance the use of observations in forecasting and warning services globally, advocate for research and development in key areas and encourage the rapid transfer of related research outcomes into operational use, especially in developing countries;

Encourage more direct, two-way interactions between users, managers of observing systems and providers of forecasts, building on enhanced observational capabilities to improve the forecast process;

Provide integrated data collection and automated dissemination of observational data and products, as well as data discovery, access and retrieval services.

This will be demonstrated by:

Identification and addressing of critical gaps in observational networks that reflect, in particular, the needs of developing countries, the need for continuity in space-based and *in-situ* observations, and the potential benefits of an interactive observing system to support user needs.

Improvements in the range and quality of services for high impact weather forecasting due to the design, future development, and operation of global observing, data assimilation, numerical modelling, and user application techniques.

More accurate, reliable and relevant weather analyses, forecasts, advisories and warnings of severe and other high impact hydrometeorological events enabled by enhanced observational capabilities.

4. WWRP-THORPEX activities within the 2012-15 Work Plan

There are several Tasks within the new Work Plan to which WWRP-THORPEX contributes

WE-01 C1 Global Multi-Model Prediction System for High-Impact Weather

Leads
WMO (WWRP/THORPEX)
Priority Actions
• Further develop TIGGE (THORPEX Interactive Global Grand Ensemble), a user-friendly database of global ensemble weather forecasts. Use web-enabled technology to foster the generation and distribution of products. Develop a future archive strategy, product generation and service provision. Finalize and implement access arrangements
• Implement the Global Interactive Forecast System (GIFS). As an initial step, produce user-driven probabilistic products (based on TIGGE forecasts) such as tropical cyclone tracks, heavy rainfall and strong wind distributions. Build upon the WMO Severe Weather Forecast Demonstration Project (SWFDP) to provide a framework for the evaluation of these prototype products, and to ensure that products address needs of operational forecasters and end-users.

Funding for TIGGE data bases in Europe - GEOWOW

A consortium of European institutions has submitted a proposal, GEOWOW (GEOSS Interoperability for Weather Ocean and Water), for funding through the European Union Framework Programme. GEOWOW proposes to:

i. Consolidate global data discovery and enable global access to, and use of, Earth Observation data and resources (computing, data handling tools, model etc.) through the GEOSS Common Infrastructure (GCI)

ii. Develop tools and protocols to promote the implementation of the GEOSS Data Sharing Principles, and the re-use and dissemination of Earth Observation data

iii. Develop operational capabilities of the GCI through applications in three areas:

a. Weather, with a focus on unified access to Earth Observations and forecasting systems for hazard and extreme meteorological events

b. Water, with a focus on hydrological applications and run-off process using in-situ and satellite data

c. Ecosystem, with a focus on the implementation of GOOS by engineering and testing access to Ocean data via the GCI.

iv. Enhance multidisciplinary interoperability

v. Analyse the benefits of GEOSS for Europe using models linking economy, environment, and society

The GEOWOW proposal, which includes a TIGGE weather element, is led by the European Space Agency (ESA). The weather element of the proposal involves further development and integration of the THORPEX Interactive Grand Global Ensemble (TIGGE) global weather forecasts data products into the GCI which will be undertaken by the European Centre for Medium-Range Weather Forecasts, the UK Met Office and Météo-France – the requested funding for the TIGGE weather element is 1.2 M€.

WE-01 C2 Easy Access to, and Use of, High-impact Weather Information

Leads
Korea (KMA), Spain (AEMET), WMO (WWRP/THORPEX), ACMAD
Priority Actions
- Support the implementation of THORPEX Africa in developing a common platform to collect, store and exchange data – not only observations and model outputs but also event documentation, particularly impacts on African society, economy and environment. This platform would also contain specific detailed case studies as well as archive ongoing High Impact Weather events across Africa with the intention of improving prediction through promoting collaboration between the research and operational communities.
- Extend the concept of Virtual Centers for high-impact weather prevention to Central America, building upon the experience of the operational Centre for Eastern South America. Deploy weather-watching networks (based on remote sensing) to better detect and forecast high- impact weather
- Facilitate technical cooperative activities for the exchange of weather prediction hardware, software, technologies, and expertise
- Develop training activities for the use of numerical weather prediction, meteorological satellite images and meteorological radar data, as a prerequisite to the implementation of early warning systems

To Be Implemented in Connection with
IN-01 (Earth Observing Systems), IN-03 (GEOSS Common Infrastructure), ID-02 (Institutional and Individual Capacity), ID-04 (Building a User-driven GEOSS), ID-05 (Catalyzing Resources for GEOSS), SB-01 (Oceans and Society), DI-01 (Disaster Risk Reduction), CL-01 (Climate Information),

WA-01 (Integrated Water Information) and AG-01 (Global Agricultural Monitoring)
Related 2009-2011 Work Plan Tasks (non exhaustive)
WE-06-03: TIGGE and the Development of a Global Interactive Forecast System for Weather WE-09-01a) Infrastructure for Numerical Weather Prediction WE-09-01b) Socio-economic Benefits in Africa from Improved Predictions of High-Impact Weather
New Proposals from the GEO Community
Virtual Centers for High-impact Weather Prevention and Weather Watching Networks (Spain)
For details, see ftp://ftp.earthobservations.org/TEMP/2012-2015_WorkPlan_V1/
Resources Available for Implementation (tentative and preliminary)
- Weather forecasts, archiving centers, and research from 10 global weather forecasting centers: Australia (BOM), Brazil (CPTEC), Canada (CMC), China (CMA), France (MétéoFrance), Japan (JMA), Korea (KMA), UK (UKMO), USA (NCAR, NCEP) and ECMWF
- European FP7 project GEOWOW (Weather Component; to commence in Sept. 2011)
- THORPEX Africa requires additional resources. Previous initiatives for funding did not succeed. Resources required are funding for two consultants to implement (i) High Impact Weather Information System, (ii) Generate test products for (and manage) a dedicated website and funding for post-docs and graduate students (iii) to conduct predictability studies and analysis of High Impact Weather events.

CL-01 C3 Weather, Climate and Earth-System Prediction Systems
Leads
IGBP, WCRP, WMO (WWRP/THORPEX)
Priority Actions
• Foster advances on seamless prediction, sub-seasonal to seasonal prediction, and polar prediction through the implementation of dedicated international research projects
• Improve the representation of organized tropical convection in models and of its interaction with the global circulation. In particular, further support the Year of Tropical Convection (YOTC). Develop diagnostics/metrics for robust simulation of the Madden Julian Oscillation.

4. Concluding Remarks

The development of the GEOSS is moving to a more strategic phase as is clear from the structure and objectives of the new 2012-2015 Work Plan and the the effort devoted to finalising the stratgeic targets for 2015. The draft (version 1) of the 2012-2015 Work Plan can be downloaded from http://www.grouponearthobservations.org

The contributions form the WWRP-THORPEX area of responsibilty (and the WMO more generally) form very important elements of the new GEO Work Plan and GEOSS. This is a two way supportive relationship in which the GEO framework can help WWRP-THORPEX deliver its objectives in these areas by linking activities, providing visibilty at ministerial level and identifying resource mobilisation opportunities.