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Report of the Architecture and Data Committee

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INTRODUCTION AND SUMMARY

The purpose of the ADC is to support GEO in all architecture and data management aspects of the design, coordination, and implementation of the Global Earth Observation System-of-Systems (GEOSS) as described in the GEO Rules of Procedure. ADC has an oversight and coordination role on all the architecture Tasks and many data management Tasks related to infrastructure in the 2009-2011 GEO Work Plan. This oversight provides a unique opportunity to address the connectivity of data, services, and applications being offered to GEOSS through individual Tasks assigned to ADC as well as relevant Tasks assigned to other Committees and Societal Benefit Areas (SBAs). In addition, ADC has overview of tasks associated with horizontal integration of measurement capabilities such as virtual constellations and sensor web enablement. Participation of Co-Chairs and members of other GEO Committees at the ADC meetings allows for coordination with a number of Tasks in the 2009-2011 Work Plan.

Substantial progress has been made in the critical areas of architecture and data management, allowing for the transition of an Initial Operating Capability (IOC) of the core capabilities of GEOSS to an acceptance phase for sustained operations. This GEOSS Common Infrastructure (GCI) includes registries for offered Earth Observation (EO) resources and information products, standards, and search capability through Web Portals and a data Clearinghouse. The important refinement of the data sharing principles continues by the work and recommendations being developed by the recently established Data Sharing Task Force. In addition, a registry of best practices has been established to improve interoperability. A data harmonization task has begun to identify key 'base' global data sets, their information content, accessibility, and format. Surveys have been conducted of major data repositories with the objective of coordinating data archiving and dissemination. The GEONETCast Task is coordinating the deployment of three data broadcast systems for Asia, Africa and Europe, and the Americas to disseminate EO data to low-cost satellite receivers. Critical issues, such as protection of radio frequency, which impact and may limit observations, are being addressed in the ADC. The committee is pleased to report on its progress in these and other areas in this report to the GEO VI Plenary 2009.

In 2010, the ADC will complete transition of the GCI IOC phase into routine operations through an acceptance testing phase. The ADC anticipates further refinement of the GEOSS architecture implementation through a third Architecture Implementation Pilot, and the regular engagement of the Standards and Interoperability Forum to facilitate interoperability. Major areas of data management will be addressed including quality for earth observation, the considerations for GEOSS data principles, the fostering of sensor and modelling networks and the support of SBA initiatives. In the paragraphs below, the ADC outlines the successes and the major challenges of initializing and maturing the GEOSS architecture. Actions taken to provide a more robust structure and processes are given and plans for 2010 are summarized.

1 ADC ORGANIZATION AND STRUCTURE

1.1 Objectives

The objectives of the ADC as approved by GEO Plenary are to:

Enable GEO, based upon user requirements and building on existing systems and initiatives, to define the components of GEOSS, and to converge or harmonize observation methods, and to promote the use of standards and references, intercalibration, and data assimilation.

Enable GEO to define and update interoperability arrangements to which GEO Members and Participating Organizations agree to adhere, including technical specifications for collecting, processing, storing, and disseminating shared data, metadata and products.

Enable GEO to facilitate data management, information management, and common services, and help promote data sharing principles for the full and open sharing and exchange of data and information, recognizing relevant international instruments and national policies and legislation.

1.2 Organization and Structure

The Architecture and Data Committee has 7 Co-Chairs (Alessandro Annoni - European Commission; Barbara Ryan - WMO; Ivan DeLoatch - USA; Ivan Petiteville - CEOS ; Jay Pearlman – IEEE; Jia Shen Zhang – China; and Ryosuke Shibasaki - Japan) , and 135 individual members. ADC activities are supported by Mike Tanner, Rob Koopman and Koki Iwao of the GEO Secretariat. The Committee was assigned to oversee the work of 22 of the tasks and subtasks of the GEO 2009-2011 Work Plan. The tasks were organized so that each Co-Chair served in the role of Sherpa (advisor) to oversee approximately 4 Tasks. In 2009, the ADC held three face-to-face meetings (Kyoto, Japan, Stresa, Italy, and Melbourne, Australia) and the Co-Chairs held monthly teleconferences. In addition, Co-Chair meetings were held in conjunction with the full committee meetings.

2 THE GEOSS COMMON INFRASTRUCTURE

In 2009, ADC continuously focused its efforts on three Tasks that were considered "foundational" from a GEOSS architecture perspective: Task AR-09-01a – Enabling Deployment of GEOSS Architecture; Task AR-09-01b – GEOSS Architecture Implementation Pilot andTask AR-09-01c – GEOSS Best Practices Registry. These tasks aim to refine the GEOSS architecture and to create the associated infrastructure in order to establish an initial operating capability for GEOSS Common Infrastructure (GCI). This included the implementation and refinement of a registry for data, services, and applications offered by GEO Members and Participating Organizations, a Best Practices Wiki, and a registry for official and community standards recognized by GEOSS to promote interoperability. A "Clearinghouse" is provided to support an all-of-GEOSS search capability, and GEO Web Portals have been deployed to offer user interface to access the breadth of resources nominated through the registries and Clearinghouse - see figure below. GEOSS is a system of systems which facilitates access to information (maintained by contributing members) from all over the world from a single access point. The Portal(s) and Clearinghouse(s) were further prototyped this year under Task AR-09-01b whereas Task AR-09-01a concentrated on operational registries, standards and interoperability arrangements and guidance (tactical and strategic) for a subset of societal benefit areas. In addition, a prototype of a User Requirements Registry, coordinated with Task US-09-01 is being deployed to help identify coverage and gaps between offered EO capabilities and domain-specific user requirements. The Best Practice Wiki was originally developed under Task DA-06-09.
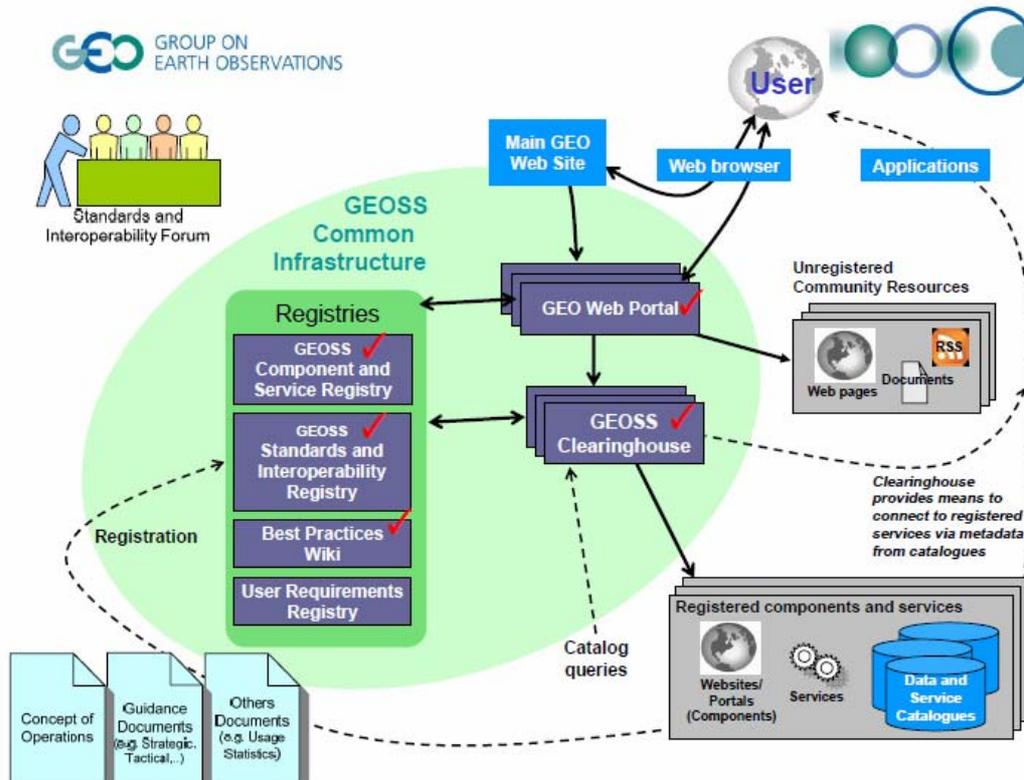
In June 2008, the GEOSS Common Infrastructure (GCI) initiated an Initial Operating Capability (IOC) period during which GEO Members and Participating Organizations began the official contribution of EO resources to GEOSS through online mechanisms. During the 2009 IOC phase, additional resources were registered with GEOSS, quality review and testing of the offered resources was undertaken, and updates to the GCI core components were made to improve their integrated support of GEOSS. The IOC Task Force, convened in 2008, this year produced a Consolidated Requirements Document for all GCI components and a draft recommendations report that identify recommendations and issues for the operation of GCI and GEOSS.

In 2009, the ADC also focused on facilitating the use of standards (interoperability arrangements) by processing nominations of standards and practices into the registry and providing support services through the Standards and Interoperability Forum (SIF). For more active coordination globally, regional SIFs for America (both north and south), Europe, Asia and Africa have been established and are participating in scheduled teleconferences.

For augmentation of the GCI IOC, the second phase of the GEOSS Architecture Implementation Pilot (AIP 2) was conducted in 2009 to register and test persistent standards-based Web services and applications of value to specific GEO Societal Benefit Areas and demonstrate their accessibility through the GCI. Six scenarios illustrating user applications of GEOSS were developed and demonstrated for renewable energy siting, wildfire and smoke effects on human health, pika distribution, Arctic food chain modeling, polar ecosystems change detection, and flood warning and disaster response planning. The results of these efforts documented in a series of engineering reports, will be used to provide examples for additional similar SBA activities, and to assess the maturity of the GCI concepts and practice.

3   STATUS OF OTHER GEO TASKS ASSIGNED TO THE ADC

The ADC continues to see progress in a large number of the Tasks under its purview. Highlights for 2009 are provided here. More details of the Task progress are provided in the appendix to this report and in a separate document from the GEO Secretariat.

- Outreach to the technical and user communities has occurred in a number of task areas through workshops and creation of communities of practice to define requirements both in societal benefit areas and cross-cutting activities (multiple tasks);

- Completion of the GEO reference document "Importance of radio spectrum for GEOSS and related frequency protection requirements" to include a detailed list of frequencies that will be used in GEOSS, including for telecommunications means (GEONETcast). GEOSS is faced with a number of economical lobbies, supported by National radio administrations (NRA). All GEO members should advocate and relay GEO requirements to their NRA, in particular in view of the forthcoming WRC-07 (AR-06-11);

- A white paper and implementation guidelines have been produced for GEOSS data sharing principles that was circulated to entire GEO community for wider review and comments (DA-06-01),

- A "Quality Assurance Framework for Earth Observation (QA4EO) Guidelines" document has been produced the CEOS Working Group on Calibration/Validation (WGCV). A "User Guide" has been produced to facilitate implementation of the QA4EO guidelines. A workshop chaired by GEO and co-organized by CEOS and GSICS has been held in Turkey (Sep. 2009). Numerous activities like Ground Calibration/Validation campaigns, set up of multi-satellites missions ground calibration sites, enhancement of the Cal/Val portal, etc ., have been undertaken in 2009. (DA-09-01a);

- A GEOSS interoperability guideline document for DEM was developed. Japan and US joint collaboration for Global DEM by ASTER data is on-going but data access issues need to be resolved as well as some problems related to the quality of the DEM data (DA-09-03d);

- These six Virtual Constellations focus on the following domains: Atmospheric Composition, Ocean Surface Topography, Precipitation, Land Surface Imaging, Ocean Colour Radiometry and Ocean Surface Vector Winds. The provision of satellite products for "Forest Carbon Tracking" (task CL-09-03b) and the contribution to studies regarding Sea Level Rise are some of the numerous contributions of the CEOS Virtual Constellations to GEO in 2009.   (AR-09-02a);

- A Sensor Web workshop in Geneva and the FP7 funded project will form several Use Case contributions include Wildfire - Alert and monitoring (Senegal), Floods - Early warning (FEWS), alert & monitoring (Mozambique) and Air quality (Cameroon) (AR-09-02c);

- Development of a draft conceptual paper on a system alliance and the 1st workshop on GEOSS data integration, analysis and their application by the end of the 2nd quarter 09. Now that the initial Operational Capability is in place, efforts are now being focussed on capacity building and user engagement. An outreach to present GEONETCast at numbers of workshop was made in 2009. (AR-09-04a and CB-09-02g).

4   CROSS-CUTTING ACTIVITIES

The ADC has provided T3, IOC TF, M&E, workshop and major meeting support, and was involved in Committee collaboration activities such as user testing, etc.

5   ADC ISSUES AND RECOMMENDATIONS

The previous sections highlighted some of the main achievements within ADC. There are, as well, some issues still to be addressed. Some of these are specifically related to individual tasks as indicated in the task reports. The issues that are common are addressed here.

With the conclusion of the GCI IOC phase, acceptance testing and transition to sustained operations phase is planned for early 2010. To support this, in response to points made in the IOC-TF Recommendations document, clear decisions are required in terms of resource allocations, commitments, persistence, and governance in the context of the voluntary nature of GEO participatory commitments and finally resources to enable sustained operations. The IOC Task Force has offered recommendations from a technical and systems-oriented perspective that the ADC supports. (See GCI-IOC Task Force Recommendations).

Population of the GEOSS registries must be intensively encouraged. It is imperative that the number of components and services registered be significantly increased, as this will assure sufficient content for stimulating recurring user interest and for testing the Clearinghouse and Portal solutions. The public visibility and outreach for the GCI and its operational capabilities must be broader and more pervasive. Also, based on suggestions from the user community, the registration, terminology, and search processes in the GCI Registries and Portals have been simplified and the Component and Services Registry is now fully coordinated with the Standards and Interoperability Registry.

Support to implementation of the GEOSS Data Sharing Principles is important to ensure the availability and use of registered resources. It is important to underscore the fact that GEOSS is composed of voluntarily contributed systems and data, which are governed by pre-existing laws and policies. The Principles will gain acceptance and importance through good-faith voluntary adherence, which may also be accompanied by legal and policy changes at the national or international levels.

Reflection on **Public & Private partnerships opportunities** is needed if we want to accelerate the development of GEOSS. GEO needs the ways and means to realize the opportunities more effectively.

6   PLANS FOR 2010

In the sections above, the ADC outlined 2009 successes and the main issues and the challenges of further developing the GEOSS architecture. In 2010, the ADC will continue to support efforts that will move toward a sustained operational capability. The ADC anticipates further refinement of the GEOSS architecture implementation through the enhancement of the GCI, the Architecture Implementation Pilots and the routine operation of the Standards and Interoperability Forum (to facilitate interoperability). The ADC will focus more on the area of an observation type vocabulary from existing authoritative sources, registration of cross-cutting observations, data management and datasets, and in the areas needed for the next generation of GEOSS. These will be closely coordinated with the other GEO committees.

In outlining the 2009-2011 Work Plan, the ADC will oversee the Tasks dedicated to building a transverse GEOSS Common Infrastructure, Interoperability Systems for GEOSS, organizing data management and implementing the GEOSS Data Sharing Principles and related data management processes.

In setting these objectives, there are many details that must be addressed, both by the ADC and by the broader GEO. ADC will continue working closely with the UIC, the CBC, and the STC, particularly as the operational system draws the committee into interactions with users.

To address the long term implementation of GEOSS, the revision of GEOSS 10 Year Implementation Targets was conducted by the Target Task Team (T3), and included the Architecture and Data Management 6 and 10 Years Targets. ADC strongly suggests that the analyses of gaps between the Targets and Work Plan continue for the consistency and accountability of GEOSS implementations.