



GROUP ON  
EARTH OBSERVATIONS

## GEO-IV

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Report from Architecture and Data Committee

Document 8

This document is submitted to GEO-IV for acceptance.



## **REPORT FROM ARCHITECTURE AND DATA COMMITTEE**

### **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 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 2007-2009 GEO Work Plan. This oversight provides a unique opportunity to address the connectivity among components of GEOSS being developed under individual tasks assigned to ADC as well as relevant Tasks assigned to other Committees. In addition, ADC has overview of tasks associated with horizontal integration of measurement capabilities such as virtual constellation and sensor web enablement. Presentations by Co-Chairs of the other GEO Committees at the ADC meetings allowed for coordination with the remaining Tasks in the 2007- 2009 Work Plan.

Substantial progress has been made in the critical areas of architecture and data management.

This includes deployment of initial components for the initial GEOSS operations such as the infrastructure to register contributing components and services, registries for standards and the development of prototypes clearinghouses and portals to facilitate search for and access to systems contributing to GEOSS. In addition, the ADC overviewed data dissemination infrastructure development such as the GEONETCast formulation. 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 Plenary 2007.

In 2008, the ADC will focus on transitioning the 2007 initial operating capability into routine operations. The ADC anticipates further refinement of the GEOSS architecture implementation through the Architecture Implementation Pilot, the routine operation of the Standards and Interoperability Forum (to facilitate interoperability) and further additions of GEOSS operational infrastructure (e.g., registries for best practices and for user requirements). 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 2008 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**

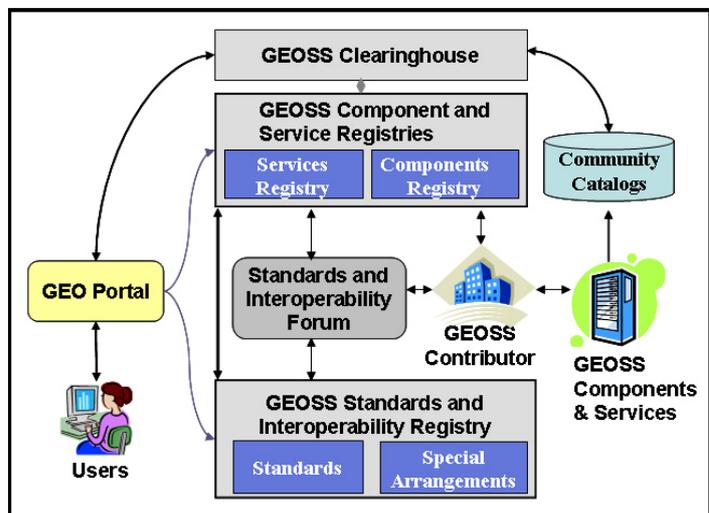
The Architecture and Data Committee has 6 Co-Chairs (Alessandro Annoni - European Commission; Ryosuke Shibasaki - Japan; Ivan Deloatch - USA; Ivan Petiteville - CEOS ; Jay Pearlman – IEEE; and Donald Hinsman - WMO) , and is supported by Osamu Ochiai and Michael Rast of the GEO Secretariat. The Committee was assigned to oversee the work of 22 of the tasks of the GEO 2007-2009 Work Plan. The tasks were divided so that each Co-Chair served in the role of Sherpa (advisor) to oversee approximately 4 Tasks. In 2007, the ADC held three face-to-face meetings (Geneva, Tokyo and Washington DC) and the Co-Chairs held monthly teleconferences. In addition, Co-Chair meetings were held in conjunction with the full committee meetings.

**2 ACCOMPLISHMENTS IN 2007**

In 2007, ADC focused its efforts on two Tasks that were considered “foundational” from a GEOSS architecture perspective: Task AR-07-01 – Enabling Deployment of GEOSS Architecture; and Task AR-07-02 – GEOSS Architecture Implementation Pilot. These tasks aim to refine the GEOSS architecture and to create the associated infrastructure in order to establish an initial operating capability for GEOSS. This included the implementation of registries for components and standards (GEOSS registries), a web-based application to access GEOSS components (GEO Portal) and the equivalent of a library card catalogue to find information (GEOSS 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 and Clearinghouse were developed under Task AR-07-02 whereas Task AR-07-01 concentrated on registries, standards and interoperability arrangements and guidance (tactical and strategic).

In 2007 the ADC also recognized that there was a need to facilitate the use of interoperability arrangements by providing support services through a the Standards and Interoperability Forum (SIF) that works with contributors in clarifying issues related to interoperability arrangements and address gaps in existing standards. The SIF was organized and became operational in late 2007.

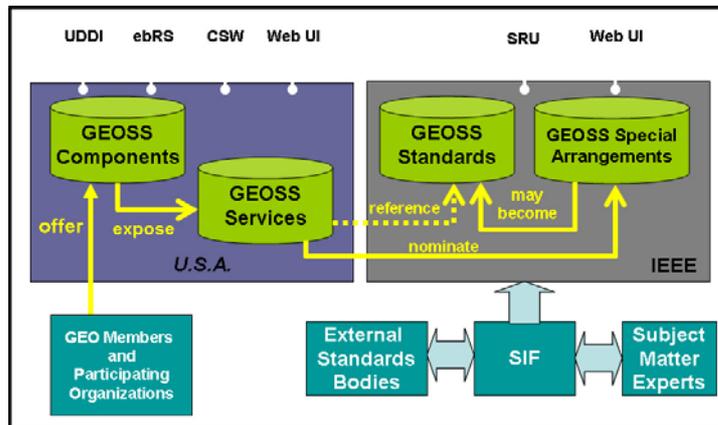
Prior to the architecture implementation, the ADC pointed to the need to test and evaluate the architecture through specific pilots and as well using test cases involving produces derived from multiple societal benefit areas (SBAs). The Call for Participation to the GEOSS Architecture Pilot resulted in 35 responses representing over 100 organizations with participants expressing high interest and momentum in supporting GEOSS vision. Within this pilot, prototypes portals and clearinghouses were evaluated and, in addition, a series of GEOSS scenarios for exercising the architecture were developed. In Parallel an interoperability pilot project (Interoperability Process Pilot Project) was started in 2006 and has been a valuable demonstration and validation step for the interoperability implementation in 2007. The results of both these efforts have been used to assess the maturity of the implementation and to identify areas for improvement.



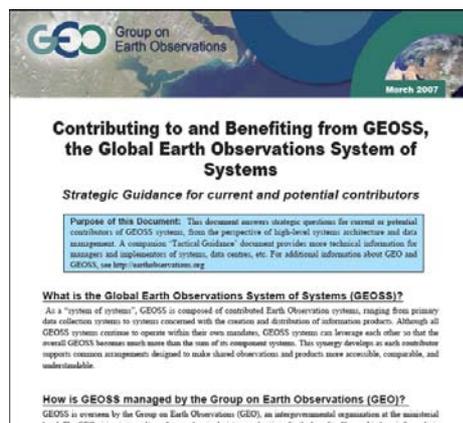
**2.1 Achievements under Task AR-07-01 - Enabling GEOSS Architecture**

The flow of the information within GEOSS must be straightforward so that new users and contributors can easily access and benefit from the system of systems (see Figure 2 below). ADC addressed this issue in detail, both from a structural viewpoint and in developing documents for contributors. The documents include a high level explanation of the GEOSS operations (Strategic Guidance Document – see Figure 3 below) and a practical handbook for the technical contribution process (Tactical Guidance Document). Both of these have been published and are available. Thus, some of the significant advancements in this Task AR-07-01 are:

- Strategic and Tactical Guidance Documents on Interoperability have been completed.
- Component and Service Registry is operational.
- Standards and Special Arrangements Registry is operational.
- Standards and Interoperability Forum is operating.
- Interoperability Process Pilot Projects on track to validate the Registries, Clearinghouse and Web Portal processes.



**Fig 2:** GEOSS registries and related information flow



**Fig. 3:** Strategic Guidance Document

**2.2 Achievements under Task AR-07-02 – Architecture Implementation Pilot**

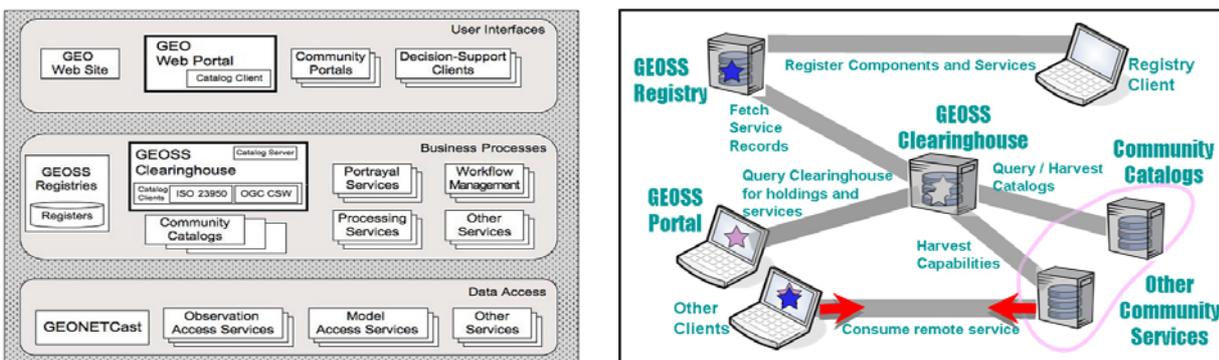
This task is one of two core architecture tasks and its objectives are to lead the incorporation of contributed components consistent with the GEOSS Architecture using a GEOSS Web Portal(s) and a

GEOSS Clearinghouse search facility to access services through GEOSS Interoperability Arrangements. Four working groups were formed to carry out the key elements of this task: Architecture WG; Clearinghouse WG; GEO Web Portal WG; and FedEO Pilot WG. These working groups focused on refining elements of the architecture and their interaction in three areas – user interfaces, business processes (technical support for the architecture infrastructure) and data access (see Figure 4)

In addition, scenario working groups were created to provide test cases for the architecture constructs. For 2007, there were seven of these in three areas: biodiversity, response to severe events and disasters and climate change. The demonstrations developed under the scenarios were provided to users and developers in a series of international workshops entitled: “The User and the GEOSS Architecture. Substantial progress was achieved under this task. Some of the highlights are:

- Call for Participation for portal and clearinghouse architecture components along with recommendations for the architecture resulted in 35 responses representing over 100 organizations
- Three GEOSS Web Portal candidates have participated in a technical evaluation.
- Three Clearinghouse components have participated in a technical evaluation.
- Interoperability of the portals, clearinghouse, registries, and tens of other services were demonstrated.
- Ten videos demonstrating the portals, clearinghouse, and six SBA scenarios were prepared.
- These videos will be demonstrated at the Summit and are online at [www.ogcnetwork/AIPdemos](http://www.ogcnetwork/AIPdemos).

The Architecture Implementation Pilot (AIP) has a broad international participation that could only have occurred using GEO mechanisms. The participants in AIP have a high interest and momentum in supporting the GEOSS vision.



**Fig 4:** Task AR-07-02 focused on the GEO Web Portal, the GEOSS Clearinghouse and interfacing with information and data components and services

### 2.3 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. This is a significant improvement compared with the challenges expressed in last year’s report and reflects moving beyond the GEOSS startup process. Highlights for 2007 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).
- A white paper has been produced on Implementation Guidelines for GEOSS data sharing principles that was briefed to ADC and will be circulated for wider review and comments (DA-06-01).
- A Design was developed for a distributed infrastructure for sensor networks and the sensor web with the sensor web as a base layer for GEOSS services and components (DA-07-04).
- GEONETCast is moving toward an Initial Operational Capability. This includes a Design Document agreed by infrastructure provider, agreements on exchange of data between the regional systems under discussion and technical interoperability mechanism is being worked between EUMETCast, FengyunCast and GEONETCast-Americas (CB-06-04).
- A draft Call for Participation to build the Registry has been developed by IEEE and presented to the ADC (DA-06-09)
- Draft Guidelines for the convergence and harmonization of geographic observation methods have been developed. (DA-06-05)
- For Radio Frequency Protection, efforts are directed toward the establishment of a reference frequency band list; and economical and societal impacts of potential Earth Observation data loss (AR-06-11).
- WMO Cg-XV agreed to establish WMO integrated Global Observing Systems (WIGOS) – integrates all WMO observing (surface and space-based) systems. In addition, Implementation of first operational GISC (Global Information Service Centre) is planned for 2008, with other operational GISCs by 2009 (WE-06-01).
- Four Virtual Constellations have been proposed: Precipitation; Land-surface Imaging; Ocean-surface Topography; and Atmospheric Composition. The activities to be accomplished have been defined in detail by each associated Constellation Team and by the System Engineering Office and their execution has started. In addition a Constellations framework document is being drafted to improve the Constellations implementation process (TASK DA-07-03)
- A preliminary system design for supporting Water Cycle application of GEOSS with a pilot study focusing on Vietnam. (DA-07-06)

### 3 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.

ADC is quickly moving from pilots to operations and from development to maintenance. With the implementation of the initial operating capability, the importance of an up-to-date user-oriented Tactical and Strategic guidance for contributors must be emphasized. These documents are nearing publication but the process to maintain and update these documents as well the broader issue of maintenance and operation of the first GEOSS components (registries, clearinghouse, portal ...) has not been defined. This issue must be urgently addressed. In fact, **Transfer to operation** means clear decisions in terms of resources allocation, commitments, persistency and governance that might be not supported sufficiently using best efforts principle.

The **role of the ADC in an operational regime** needs to be clarified. Some questions to be addressed are: Who will provide support to interested contributors during the registration and operation (help desk)? Who will maintain and integrate all GEOSS infrastructural recommendations developed by the

various tasks? How will the performance of GEOSS services be measured? Do we have an adequate system of tracking issues and user feedback? All these issues are important in a System of Systems concept because they have a potential impact on refinement of the GEOSS architectures and core services.

**The involvement of Users** and as well a better formulation and documentation of User requirements remain critical issues. Some progress has been made to involve UIC and as well some of work in UIC looks very promising from an ADC perspective (e.g. the request of UIC to ADC to upgrade the GEOSS architecture in order to add a registry to document user requirements that will be populated by UIC). However, a more accelerated program with further intercommittee coordination and better joint development is highly recommended (e.g. a joint ADC/UIC work team to work on the definition of functionalities of the user requirement registry), as well as to improve collaboration in some tasks (e.g. user requirements for the GEO portal).

**Cross-coordination** with other Committees improved in 2007 due to the creation of the Committees of co-chairs (C4) and as well of some Task Forces to address specific issues. At the last ADC meeting, the following needs were identified : i) joint forum to discuss/analyze strategic elements, ii) Input from other committees for a coherent/comprehensive Work Plan, iii) Ensure that ADC activities are well understood by other committees and GEOSS users, more generally, iv) definition of common priorities, v) cross-committee action lists with reference to some specific cross-committees tasks; vi) the C4 meetings are not yet effective working meetings for day to day issues; a routine schedule with telephone meetings should be considered. The ADC will continue to invite Co-chairs of other Committees to ADC meetings and the C4 group will continue to be used to help enhance coordination.

#### 4 PLANS FOR 2008

In the sections above, the ADC outlined 2007 successes and the main issues and the challenges of initializing and maturing the GEOSS architecture. In 2008, the ADC will continue to move toward a full operational capability. The ADC anticipates further refinement of the GEOSS architecture implementation through the Architecture Implementation Pilot, the routine operation of the Standards and Interoperability Forum (to facilitate interoperability) and further additions to the GEOSS operational infrastructure (e.g., registries for best practices and for user requirements). The ADC will focus more on the area of cross-cutting observations, in evolution of sensor networks and virtual constellations, and in the areas needed for the next generation of GEOSS. These will be closely coordinated with the other GEO committees. In outlining the 2008 program, the ADC has identified four major thrusts, consistent with our charter:

- Operations - moving from prototypes to operations modes for the portal, clearinghouse and registries.
- Interoperability – focus on standards, metadata, data harmonization, quality assurance, and data sharing principles
- Horizontal Development – for observations, data management, and registries with impact to multiple societal benefit areas or multiple systems.
- Capability Maintenance – for radio frequency protection and global geodetic Reference Frames

In setting these objectives, there are many details that must be addressed, both by the ADC and by the broader GEO. ADC will work closely within GEO to continue improving coordination with the UIC, the CBC, and the STC, particularly as the operational system draws the committee into interactions with users. With support from GEO, ADC expects to fully address these issues during in 2008 and 2009.

## **APPENDIX 1**

### **TASK AG-07-03 - Operational Agricultural Monitoring Systems**

- Workshop was held at FAO in July 2007.
- A Community of Practice was established.
- Recommendations for observing systems, data continuity, data integration, data standard and quality, and data policy and dissemination were presented.

### **TASK DA-06-01 Data Sharing Principles**

- A white paper has been produced on Implementation Guidelines for GEOSS data sharing principles.
- A workshop was held at the ADC meeting in Sept. to discuss the white paper.
- Broader distribution of the white paper to all Societal Benefit Areas within GEO communities is recommended.

### **TASK DA-06-02 -GEOSS Quality Assurance Strategy**

- A Workshop on Quality Assurance of Calibration and Validation processes held on 2-4 October.
- CEOS WGCV Cal/Val Portal has further advanced.

### **TASK DA-07-04 -Sensor Web Enablement for In-Situ Observing Network Facilitation**

- Design distributed infrastructure for sensor networks and the sensor web.
- Integration of existing and future sensor networks in GEOSS
- Set up sensor web as a base layer for GEOSS services and components.
- Workshop in 2008 spring will be envisaged to promote sensor web concept and start integration process.

### **TASK CB-06-04 GEONETCast**

- Russia Federation added MITRA to the system on Sept 6<sup>th</sup>.
- NOAA awarded GEONETCast-Americas contract for commercial satellite telecomm and other services in September.
- NOAA awarded GEONETCast-Americas web portal contract on August 20.
- Initial Operational Capability; Design Document agreed by infrastructure provider, agreements on exchange of data between the regional systems under discussion.
- Working out technical interoperability mechanism between EUMETCast, FengyunCast and GEONETCast-Americas
- Seeking the user requirement from UIC and CBC. Series of workshop are envisaged to engage the user community.
- Coordination among other ADC activities: with IGDDS, SERVIR, RANET
- Data catalog is on the web for user reference.

**TASK AR-06-11 Radio Frequency Protection**

- Adoption within European Commission's Radio Spectrum Policy Group (RSPG) of the Report and Opinion on 'A coordinated EU spectrum approach for scientific use of radio spectrum'.
- On-going Task issues are establishment of a reference frequency band list; and economical and societal impacts of potential Earth Observation data loss.

**TASK WE-06-01 Surface-based Global Observing System for Weather**

- WMO Cg-XV agreed to establish WMO integrated Global Observing Systems (WIGOS) – integrates all WMO observing (surface and space-based) systems
- WIGOS and WIS two major projects for 2008-2011; both to contribute to GEOSS

**TASK WE-06-02 Space-based Global Observing System for Weather**

- Outcome of GOS workshop in July 2007 recommended the changes for the baseline of GOS to sustain observation for GCOS Essential Climate Variables.

**TASK AR-07-04 WIS (WMO Information System) – GEOSS Operational Exemplar**

- WIS plans consolidated through 2008.
- Implementation of first operational GISC (Global Information Service Centre) by 2008, other operational GISCs by 2009.
- WMO registered 8 components (WIS, GAW, GCOS, GOOS, GTOS, WCP, WHyCOS, WWW) in the GEOSS components registry.

**TASK CL-06-06 Global Ocean Observing System**

- Joint Commission on Marine Meteorology is the coordinating body for ocean monitoring.
- Specific projects are underway lead by France, Spain and Italy

**TASK DA-06-09 GEOSS Best Practices Registry**

- IEEE developed a test case for the registry using the EOSDIS
- A draft Call for Participation to build the Registry has been developed by IEEE and presented to the ADC
- Entering Best Practices in the Registry will be done in coordination with other committee.
- Call for Participation (CFP) release will be available for response late in 2007
- Initial operation of the Registry will be in 2008.

**TASK AR-07-03 Global Geodetic Reference Frames**

- Version 0.17 of the Reference Document reviewed.
- Steady progress was reported on the preparation of GGOS 2007 Workshop, which is being organized as part of the International Geohazards Week.
- Global height reference information could be provided.

**TASK DI-06-13 Implementation of a Wildland Fire Warning System at Global Level**

- Goal is to integrate existing fire monitoring systems. Adaptation of forest fire weather index.
- 4th International Wild land Fire Conference, Seville, Spain, May 2007.
- Regional consultations in Syria and Ukraine were organized.

- An international Workshop is planned on the Requirements for a Fire Early Warning System for Africa, in conjunction with the West Africa Regional Network Meeting on Earth Observation and Environmental Change, 12-16 November 2007, University of Ghana (Legon), Accra, Ghana and another for the development of the Global Wildland Fire Early Warning System is planned for Canada in 2008

**TASK CL-06-02 Key Climate Data from Satellite Systems**

- Climate focal points and 18 Climate action Teams founded.
- Ongoing execution of the 21 actions. Uneven progress, some of the 21 priority actions may only be completed in 2008.

**TASK DA-07-03 Virtual Constellations**

- 4 Virtual Constellations proposed: Precipitation; Land-surface Imaging; Ocean-surface Topography; and Atmospheric Composition.
- Way-Forward on the Constellations framework document is being drafted to improve the Constellations implementation process
- Constellation process paper will be issued by June 2008

**TASK AG-06-04 Forest Mapping and Change Monitoring**

- Significant progress has been made on the preparatory phase. (e.g., Set-up Implementation Task force, Development methodology for extracting and pre-processing images, drafting task document)
- Dialogue with member countries to solicit the contribution and donor.
- A large number of existing Landsat Geocover images need to be re-rectified. Also, task POC raised the issue about some data and tools would be needed.

**TASK DA-07-01 DEM (Digital Elevation Model) Interoperability**

- Deliverable is GEOSS interoperability guideline document for DEM
- Japan and US joint collaboration for Global DEM by ASTER data is on-going but data policy issue needs to be solved.

**TASK DA-07-06 Data Integration and Analysis System**

- Preliminary system design has already finished for supporting Water Cycle application.
- Linkage with Asian Water Cycle Initiative (AWCI).
- The pilot study is focusing on the Vietnam area.

**TASK WA-06-05 In-situ Water Cycle Monitoring**

- New strategy developed.
- UIC Community of Practice for Water Cycle is now being formulated.

**TASK DA-06-05 Guidance document for basic geographic data**

- Draft Guidelines for the convergence and harmonization of observation methods have been developed.

**TASK DI-06-02 Seismographic Networks Improvement and Coordination**

- Significant progress of 4 reports produced and 32 presentations.