

# Architecture and Data Committee Report to the GEO Plenary 2006

As Accepted at GEO-III

## 1 INTRODUCTION

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<sup>1</sup>. The ADC has an oversight coordinating role on all of the architecture Tasks, most of the data management tasks, and tasks that are integrally related to the architecture (such as radio frequency protection) in the 2006 GEO Work Plan. This oversight role provided a unique opportunity to examine the connectivity among components of GEOSS being developed through the individual tasks assigned to ADC as well as relevant tasks assigned to other Committees. Presentations by co-chairs of the other GEO Committees at the ADC meetings allowed for some coordination with the remaining tasks in the 2006 Work Plan. The ADC Co-chairs created an ad-hoc group to provide advice on how the work of several architecture and data management Tasks could be linked in a systematic way.

Substantial progress has been made in the critical areas of architecture and data management. In 2007, the ADC will focus on transitioning those 2006 tasks into the 2007-2009 program. ADC anticipates that demonstration and initial operating capability will become available in 2007. Prior to its implementation, ADC will closely coordinate with the other GEOSS committees and draw on members and participating organizations that will be proposing systems and components for GEOSS. In the paragraphs below, the ADC outlines the main issues and challenges of initializing the GEOSS architecture. Actions taken to provide a more robust structure and process are given and plans for 2007 are summarized.

## 2 ADC ORGANISATION & STRUCTURE

### 2.1 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.

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<sup>1</sup> "GEO Rules of Procedure" adopted 15 December 2005 ( <http://www.earthobservations.org/docs/TOR-ADC.pdf> )

- 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 will help to promote data sharing principles in support of the GEO Plenary for the full and open sharing and exchange of data and information, recognizing relevant international instruments and national policies and legislation.

## 2.2 ORGANIZATION AND STRUCTURE

The ADC has 115 members with 5 Co-Chairs (Prof. Toshio Koike-Japan; Dr. Ivan Deloatch-USA; Mr. Ivan Petiteville-CEOS; Dr. Jay Pearlman-IEEE and Donald Hinsman-WMO), and is supported by Mr. Osamu Ochiai and Dr. Michael Rast of the GEO Secretariat. The ADC was assigned to coordinate the work of 33 of the tasks contained in the GEO 2006 Work Plan. The tasks were divided so that each Co Chair served in a support role ("Sherpa") for approximately 7 Tasks and provided a contact point to the leads (Points of Contact) for each task. Coordination within ADC across the span of the "Sherpas" was accomplished through email, teleconferences and full meetings (see section 4).

## 3 ACCOMPLISHMENTS IN 2006

The activities in 2006 were initiated in March with: the assignment of tasks to ADC, the first ADC meeting review of tasks, and the creation of Points of Contacts and working teams. The response to the call for participation was strong and a solid basis for moving forward was established. At the March ADC meeting of the Co-Chairs, it was recognized that there were priorities among the 33 assigned tasks as the architecture needed to be defined and concepts developed early in the GEO program. Based on the Ten Year Implementation Plan requirements, the ADC identified several "foundational" Tasks involving capabilities needed early in the GEO program e.g. the GEOSS Clearinghouse, the GEOSS Web portal, the interoperability arrangements process, the process for GEO Members and Participating Organizations to contribute GEOSS components and the developments of user cases to test the selected approach. A Request for Information (RFI) was issued for the Clearinghouse and demonstrations are planned. An interoperability arrangements process is in review, drawing on experts and standards development organizations. A proposed process for contributing GEOSS components is also in review. A demonstrator of the GEOSS Web Portal will be implemented during the last quarter of 2006.

Among other tasks overseen by the ADC, it is noted that GEONETCast made significant progress demonstrating a concept for "real time" global information dissemination. Also, there is some engagement on radio frequency protection issues and various Tasks focused in societal benefits areas were supported.

ADC is pleased to report that 2006 was a good year and set forth a foundation for GEOSS in responding to user and societal needs.

## 4 ADC MEETINGS & TELECON

### Summary

The ADC Co-chairs have held regular and frequent meetings and teleconferences in 2006. In addition, the whole ADC met twice and the ADC Co-Chairs participated with the co-chairs of the other GEO Committees in the 1st Co-Chairs coordination meeting organized by the GEO Secretariat. E-mails and other electronic means (such as WEBEX) were effective and used extensively within the Committee and in particular between the Co Chairs

- **Meetings**

- Joint ADC Co-Chairs and Full ADC meetings
  1. Paris, March 2-3, 2006
  2. Seattle, July 20-21, 2006
- GEO Co-Chairs Coordination meeting (Geneva, August 30, 2006)

- **Teleconferences**

- 11 teleconferences since January 2006

- **E-mails**

- More than 430 e-mails exchanged in last 6 months between GEO Secretariat and ADC members (Co-chairs, POCs, Lead and Contributing Agencies)

### **1<sup>st</sup> ADC meeting**

The first ADC meeting was mainly dedicated to a full committee review of the 33 GEO 2006 Task Sheets allocated to the ADC, identification of both the Lead and Contributing Organizations and designation of the Point of Contact for each task. The 33 Tasks included 32 Tasks defined in the 2006 GEO Work Plan approved at GEO-II, plus the GEONetcast Task presented at GEO II and assigned to ADC. The meeting gathered 44 participants representing GEO Members and Participating Organizations.

### **2<sup>nd</sup> ADC meeting**

The second meeting was a mid-term review of the task progress. The meeting first heard summaries from the Capacity Building Committee, User Interface Committee, and the Science and Technology Committee on their developments. The question of inter-committee interfaces was addressed and it was agreed that more interaction was desired. The GEONETCast presented the evolution of the concept proposed by the Task Team and progress to date including a capability demonstration. EuroGEOnet and Sentinel Asia expressed their interest in GEOSS participation and described their system capabilities. All briefings were received well by ADC members.

A comprehensive review of existing tasks was done. Some tasks exhibited excellent progress and others were marginally progressing or not started. For the latter, the ADC discussed termination, combination with other tasks, or additional support to the task team. Depending on the nature of the task and the team commitments, one of the three options was selected (details are provided in the meeting minutes). The efficacy of the task support process (Sherpa) was reviewed and it was decided to continue with this approach. The development of the 2007-2009 GEO Work Plan was discussed and there was consensus that a number of the tasks should be consolidated. Along this line, a number of the ADC tasks were identified as high priority "foundational" tasks. These related to specific aspects of architecture implementation such as the clearinghouse, portal and the registries. The ADC Co-chairs also suggested that these Tasks could be linked in a systematic way and thus they created an ad hoc group to explore that idea. In conjunction with the full ADC committee meeting, the ADC Co-Chairs met to discuss the following issues:

- Process for members, participating organizations and others to propose tasks to ADC.
- Standards and Interoperability Forum (SIF) - Status
- GEO 2006 WP Status

- Grouping of ADC tasks
- Project management
- System engineering
- Coordination with other committees
- Sherpa – redistribution of tasks and roles
- Conferences, Workshops and outreach
- Demonstrations
- Recommendations for 2007-2009
- Task versus Requirements matrix

Several recommendations were made which are covered in this report in other sections. Results of these discussions are also recorded in the minutes of the Co-Chair meeting.

### **1<sup>st</sup> GEO Co-Chairs Coordination meeting**

The major topics discussed during the coordination meeting were:

- Relationship between the Secretariat, the Committees, the Executive Committee and the Plenary
- Role of the Task POCs versus the Task Members
- Need for closer coordination across all tasks
- Need to involve more the Users Community during the GEOSS implementation
- Need to identify the few tasks that require the highest degree of cross-committee coordination
- Overall GEOSS Project Coordination by the GEO Secretariat.
- Presentation of GEO 2007-2009 Work Plan

## **5 STATUS OF THE GEO TASKS ALLOCATED TO ADC**

### **5.1 OVERALL TASK STATUS**

A preliminary assessment shows significant progress for some tasks while some others have started very slowly. Some basic elements of GEOSS architecture are quite advanced or nearing completion e.g.

- Process for contributing GEOSS Components
- Process for interoperability arrangements
- GEOSS Web Portal
- GEOSS Clearinghouse
- GEONETCast

Overall status of the 33 Tasks executed under the responsibility of the ADC:

- 13 Tasks closed (merged or terminated if inactive)
- 20 Tasks to be continued

## 5.2 MAIN TASK ISSUES AND RECOMMENDATIONS

The following issues are directly related to the execution of tasks. They have been presented at the ADC meeting # 2 (Seattle, July 2006) and corrective actions have been initiated either by the GEO Secretariat or the ADC.

### Tasks inter-dependencies

Each task is executed independently of the other tasks with not sufficient coordination:

- In originally defining tasks, there is an apparent decorrelation between all tasks while in reality, some tasks outputs are required as inputs to other tasks
- There is also a risk of a potential mismatch between interfaces (protocol, data type, recommended standards,..) managed within more than one task

There is a need for:

- a proper identification of the dependencies between tasks,
- a closer coordination between some tasks in particular the architecture tasks (AR-xx-xx)
- a GEO Overall Interface Control Document. Identification of:
  - The data types exchanged between the major GEOSS elements
  - The protocols used for the data flow management

In coordination with the task points of contact, the ADC is establishing a process for defining and monitoring the links between core tasks. Coordination between core tasks was done through telecons and this will be further encouraged in 2007. Some of these issues will not be significant in 2007 because of changes recommended in the task structures in the 2007-09 Plan.

### Uneven progress between tasks

Tasks are executed at different paces. Some tasks are progressing according to the original schedules but some others including some critical tasks are progressing too slowly. There might be potential impacts and delays on other tasks to which those slow progressing tasks are linked to (see previous point).

There is no contractual means to force the highest priority "foundational" tasks to be executed timely, or indeed, at all. It is important for the GEO community and the GEO Committees to identify critical tasks and to raise the awareness of the impact of delay or failures in executing these critical tasks.

This identification was done at the second ADC meeting and has focused the activities in these high priority "foundational" tasks. The process has been successful.

### Task team coordination

Some tasks are characterized by an insufficient task internal coordination between Lead and Contributing organizations under POC responsibility.

Information on the responsibilities and duties of the POC was reinforced during the year.

### Tasks Reporting process

The Task quarterly reporting has improved significantly from the June 2006 Report to the September 2006 Report. Yet, it sometimes happens still that no report or a badly coordinated report may be received from some Task Points of Contact or the quarterly report may arrive after the deadline.

This situation was reviewed during the Co-Chair meetings and it was emphasized that the Sherpa process should be an effective way to encourage consistent reporting. In fact, experience shows that frequent reminders sent by the GEO Secretariat to the Tasks POCs are necessary in addition to proper information on the reporting process.

## **6 CHALLENGES AND LESSONS LEARNED ENCOUNTERED BY ADC**

### **Overall project coordination**

The implementation of the GEOSS is a complex process with many interdependent Tasks being executed in parallel. As for any major project, a minimum of project coordination by the ADC is needed either to address some of the challenges described in the present report or to take the proper mitigation actions.

There is no current mechanism in place to assess the impacts of delays in the executions of some critical tasks. The grouping and streamlining of Tasks in the proposed 2007-2009 work plan should help, and a system engineering Task in the 2007-2009 GEO Work Plan would help to further address these issues.

The assessment of the progress on some tasks is not always easy as there is currently no close monitoring of list of deliverables and of schedule progress with respect to original plans. A GEO overall project coordination process should be established.

### **Capture of users requirements**

The first draft of the GEO 2007-2009 Work Plan was missing tasks with respect to the GEO 10-Year Implementation Plan Reference Document targets. This has been corrected in the second version. Future versions of the GEO Work Plans should contain requirements generated when taking into account:

- the targets of the GEO 10-Year Implementation Plan Reference Document
- the comments from the GEO Members and Participating Organizations
- the requirements collected from the Communities of Practice by the Committees in particular the User Interface Committee and the Capacity Building Committee.
- Lessons learned during the execution of the previous GEO Work Plan

Cross-reference tables showing the proper translation of various inputs into GEO Work Plan requirements should be used systematically. The GEOSS focus on nominated system components imparts a significant provider or supply perspective. To fully support the needs of Societal Benefit Areas, more focus should to be given in future Tasks on capturing user requirements in the design and deployment of GEOSS.

### **System Engineering**

System engineering will be a challenge for GEOSS given the agreed upon framework, 10-Year Implementation Plan and Reference Document. While certain system engineering methods may be of limited use in GEOSS given its agreed architecture, the resources available, and the high number of components, the use of systems engineering techniques in some aspects of the GEOSS architecture was identified as an issue that needed to be addressed.

Activities for the System of Systems will further elaborate the basic description contained in the endorsed reference materials. Those activities will refine the System of Systems Architecture and provide clarity of interface definitions (for example, to facilitate the registration and utilisation of services). By virtue of the federated nature of the GEOSS architecture, its heterogeneous components are independently operated and designed and yet must appear to function as one system for particular applications. In such particular application subsets of the overall GEOSS, system engineering techniques might be quite useful. The System

of System engineering adhoc team should address the system engineering aspects that are not yet handled by the existing tasks.

### **Cross Committees coordination.**

Though the GEO 2006 tasks have been distributed among the four GEO committees, several task interdependencies have been identified across GEO Committees. The proper execution of such tasks requires a better understanding, communication, and coordination between the various GEO Committees. The information to be exchanged may be of different nature e.g. recommendations on architecture standards, feedback from user communities ... In any case, the engagement of the user communities is essential for all tasks.

## **7 ADC SPECIAL ACTIVITIES**

As 2006 has progressed and the ADC has gained experience in its charter of defining the architecture and interacting with the task teams, there was a need identified for additional functions and activities to complete the activities assigned by GEO.

First, the ADC recognized the need for metrics and milestones to track progress in development and implementation. Some of the issues are given in Section 5 above. The decision was made to examine appropriate methodologies for monitoring progress. The final recommendation was to initiate a preliminary project coordination process including some critical functions such as:

- Description of the logic for the tasks execution (priority, inputs/outputs, schedule, ..)
- Identification of tasks interdependencies and tasks criticalities (establishment of a priority list)
- Generation and maintenance of a Project plan including schedules

Second, the ADC identified seven critical tasks considered foundational from the GEOSS architecture perspective (e.g. registries, clearinghouse, portal). These tasks have progressed and are proposed to be consolidated in the 2007-2009 GEO Work Plan. Increased coordination will be required as the GEO "System of Systems" is further elaborated. The ADC Co-chairs created an adhoc group that help fill any gaps and to explore what systems engineering techniques might be helpful.

Third, early in the year, the ADC addressed the importance of standards for interoperability (as identified in the GEOSS Plan) and recognized that even with the adoption of existing standards, there was a need to provide an interface with system providers and users to support identification and updates of standards from the technical and user communities. Also, it is anticipated that some new standards will be necessary which will require interface with technical experts. A Standards and Interoperability Forum has been identified that could serve GEOSS in this capacity and its functionality has been described and analyzed. Its further evolution is underway through ADC task AR-06-01.

Fourth, the ADC has encouraged the creation of demonstrations and pilot studies to assess the state of interoperability and test the architecture construct against user cases. Cases in biodiversity, ecosystems, seismology, climate and weather were proposed to be used in 2007 for interoperability assessments. This first set is diverse enough to provide a challenge for interoperability.

## **8 ADC PATH FORWARD**

"The concept of 'Toward Convergence' as advocated by the GEO 2007-09 Work Plan applies particularly to the work of the ADC and its tasks. In 2007, based on the 2006 experience, tasks will be restructured on both a time line and an evolutionary scale that acknowledges the interdependence among tasks. A more detailed



'reference architecture' will be needed in order to better articulate the role of and relationship between the components of GEOSS and to identify the interfaces that a component needs in order to fulfill a particular function within GEOSS. The 'reference architecture' would help define the interoperability arrangements and standards and the provision of component and interoperability registries. The development of this reference architecture will be critical to allow for the further convergence of the components.

GEOSS is based on existing systems but additional pieces are needed, as described in the 10-Year Implementation Plan and Reference Document. Pieces such as the clearinghouse and various registries of components, services, and standards (interoperability arrangements) where system designers can find the details they need to make component systems interoperate, will need to be in place by the end of 2007.

In setting this goal, there are many details that must be addressed, both by the ADC and by the broader GEO. These include descriptions of interoperability standards that will be made applicable to the existing components contributing to GEOSS and their data sharing policies, processes to facilitate interoperability of contributed GEOSS components, and network-accessible service interfaces for access and information distribution. With support from GEO, ADC expects to fully address these issues during 2007 through 2009.