

Development of a GEOSS Gap Analysis Strategy

1 BACKGROUND:

At the 19th Geo Executive Committee Meeting, a discussion on the outcomes and recommendations of the GEOSS Mid-term Evaluation, and a proposal put forward by STC to suggest the development of an Earth Observation Capacity Assessment process led to a recognition by the Executive Committee that the GEO community needed an overall strategy for analysis of observational and structural gaps. It was further identified during the 19th Executive Committee meeting that the GEOSS Strategic Targets document (as adopted by GEO-VI Plenary) commits GEO to undertaking: “comprehensive gap analysis and gap filling, integrated across all SBAs as a cornerstone of GEOSS implementation. “

The Strategic Targets document further envisions that GEO will:

- Elucidate practical methods for filling critical gaps in, inter alia, observation specifications and parameters, geographical areas, and observation and information accessibility;
- Identify opportunities and measures to minimize gaps in data, metadata, and products;
- Set and address priorities for filling gaps.

The recognition by Executive Committee that a clear strategy was needed to achieve this aim led to the creation of the following action:

Action 19.11 – The STC, the M&E WG, the Secretariat, and other interested members of the GEO Community to draft an initial outline of a process that can eventually lead to a coherent overall mechanism being put in place for required GEO/GEOSS gap analyses

The STC (through Stuart Minchin) and the M&E Working group (through Yana Gevorgyan) have led the process undertaken to date by inviting GEO Committees and CoPs to contribute to the membership of a small action team to develop the process to respond to the direction from the Executive Committee. (current contributors to the action team are listed in Appendix A.)

2 THE CURRENT GAP ANALYSIS LANDSCAPE WITHIN GEOSS

The action team has identified the following ongoing activities that contain elements of a need assessment (including gap analysis) currently underway or proposed/planned within the GEO community. These are:

Activity	Discipline	Serving community	Addresses GEOSS Strategic Targets?	Status
CEOS assessment of continuity needs and mission gaps	Cross-disciplinary	Space: mostly systems operators and data providers	No ?	Ongoing
GCOS essential variables	Climate	Climate research	No ?	Ongoing

US-09-01a:Critical Earth Observation Priorities	Cross-disciplinary	Users are various levels	No ?	Ongoing
STC-SBA reviews	Cross-disciplinary	S&T component	Yes	Ongoing
CB-09-04a: Capacity Building Needs and Gap Assessment	Cross-disciplinary	Capacity Building	No ?	Ongoing
GEOBON Gap Assessment	Biodiversity	Science and Practitioners (?)	No ?	Underway
Structural Gap Assessment of GEO Work Plan: to begin with Work Plan Symposium	Cross-disciplinary	Larger GEO	Yes	Underway
STC: Earth Observation Capacity Assessment (EOCA)	Cross-disciplinary	GEO community	No	Proposed
Re-Validation of observations requirements in the 10-Year Implementation Plan	Cross-disciplinary	GEO community	No	Suggested
User Requirements Registry	Cross-disciplinary	Open to all communities	Yes	Underway

It is clear that there is much existing activity, particularly within individual domains and SBAs aimed at identifying gaps, and there is obviously a need for GEO to take a strategic approach to planning GEOSS-wide assessments.

3 CONCEPTS AND ISSUES DISCUSSED (TO DATE) BY ACTION TEAM:

The action team has spent some time exploring the existing approaches to gap analysis both within and outside of GEO and has exposed and articulated a number of key issues that must be considered when designing a Gap Analysis strategy.

3.1 Definition of gaps

An assessment of gaps can be undertaken on a range of different issues.

Gaps may be:

- *Geographic*: Observation systems or data set has good coverage in one geographic region or country but not in others;

- *Observational*: Observation technologies or systems are not available or have not been sufficiently developed for key analyses or issues of global importance;
- *Structural*: Structural gaps are internal to GEOSS, for example. missing tasks required to meet the strategic targets, or tasks or products not meeting expectations from other components of GEOSS (this may be common when analysis is done across SBAs);
- *Qualitative/quantitative*: Product exists but at insufficient timeliness, frequency or quality for use in key products or utility for other GEOSS components;
- *Capacity*: Products are available but there is insufficient technical capacity or capability to make use of such products.

3.2 Timing: How often could assessments happen?

The different types of gap assessment and styles of assessment (top-down vs. bottom-up, user - vs. expert-driven) may logically lead to different time frames. A bottom-up user driven assessment may need to be conducted every 3 years in sync with Work Plan updates whereas an external “expert panel” style assessment such as proposed by the Earth Observation Capacity Assessment (EOCA) might only be needed once every 5 years.

3.3 Gaps or duplication?

A corollary to any gap analysis is the identification of potential duplication. Indeed the coordination undertaken by CEOS of some of the space based observations has led to more coordination and less duplication of space based sensors. This is a clear example of added-value in GEOSS as the identification of overlap or duplication may free up resources to allow the filling of gaps elsewhere.

3.4 Gap analysis or opportunity assessment?

The term “gap analysis” can carry negative connotations. It raises the expectation that something has not been done that should have been and focuses on the negative aspect of GEOSS (i.e. what is missing). Renaming the gap analysis strategy to something like “the GEOSS opportunity assessment” is more than a cosmetic change: it orients the whole process to identifying where members and participating organisations or potential members/POs could invest to add value to GEOSS and leverage the existing strengths of GEO to accomplish more together.

3.5 Prioritisation of gaps?

Any gap analysis process inherently contains some value judgments about the worth or importance of those gaps. There are many potential approaches to prioritization of critical gaps, and there will inevitably be differences in priorities between members and participating organisations within the GEO community. Thus, there will be a need for GEO to agree on a set of (perhaps simple) prioritization principles (or GEOSS Common Values) if a GEOSS-wide gap analysis is to do more than simply list gaps (i.e. in order to highlight the most critical gaps). An example of a prioritization principle is that used in US-09-01a Task “Critical Earth Observation Priorities” which asked users for the most critical observations. This report then highlighted or prioritized *democratically* by tabulating the critical observations identified by the largest number of user communities. Other potential principles for prioritization could relate to such issues as: degree of contribution to meeting Millennium Development Goals, degree of consistency with GEOSS Data Sharing Principles, continuity of measurements rating higher than new measurement types, value for money, etc.

4 PROPOSED APPROACH TO GEOSS GAP ANALYSIS STRATEGY:

The action team proposes to the Executive Committee that the following 5 activities would need planning by the GEO community in order to achieve the “*comprehensive, prioritized analysis of gaps*”

integrated across all societal benefit areas”, as articulated in the strategic targets document and the 10-Year Implementation Plan. It should be noted that some of these activities may already exist or be underway within the GEO community, but many are not.

- SBA- or Domain-focused gap analysis (existing, with some gaps);
- Structural gap analysis (proposed);
- Observational gap analysis (partly existing/proposed);
- Periodic meta-analysis of gaps (proposed);
- Development of GEOSS Prioritization Principles (proposed).

4.1 Domain-focused Gap Analysis

There is already significant activity and resources invested in gap analysis reports on a domain or SBA level within the GEO community and indeed this style of gap analysis is the default approach within GEO at this stage. Valuable and comprehensive assessments such as the Global Climate Observing System (GCOS) process for defining Essential Climate Variables (ECVs), the Committee on Earth Observation Satellites (CEOS) assessments and the currently underway GEO-BON assessment are targeted and important contributions to gap analysis in GEO. These styles of assessment will need to continue within the GEO community and indeed are necessary to feed into the following 3 styles of cross-domain assessment. Were GEO to only undertake this style of assessment however, the GEO community would be underplaying its strengths. The cross-domain and cross-SBA nature of GEO puts the GEO community a unique position to add value to this style of gap assessment by taking a broader perspective on gaps and priorities across SBA and domain boundaries. **Timing:** The timing of specific SBA or domain assessments will depend heavily on the requirements of each. The broader GEO community should not dictate this, but perhaps could point out SBAs or domains where no such assessment has occurred or where existing and planned assessments are incomplete. **Resources:** Most of these assessments have been resourced within SBA or domain groups, however new resources might be needed where new domain or SBA assessments are identified as needed. It is recognized it may be easier to find resources for this style of assessment due to the close alignment with relevant communities or domain groups within GEO.

4.2 Structural Gap Analysis:

As identified in the GEOSS Mid-term Evaluation report, there is a requirement for a routine structural gaps assessment regarding whether the GEO Work Plan, structures, committees, tasks and activities are internally consistent and will lead to the achievement of the GEOSS strategic targets. Some level of gap analysis of this kind will be conducted as part of the evaluations conducted under the GEO Monitoring and Evaluation Framework. However, relying solely on these evaluations will likely be insufficient. Analyses of structural gaps are but a small part of the evaluations and each SBA will only be examined once prior to the final evaluation. In addition, the expertise of the task leads and other subject-matter experts would enhance the quality of the analysis. **Timing:** The timing of such an assessment could perhaps occur one year prior to the renewal of the Work Plan, to allow findings of this assessment to be incorporated into each new Work Plan as they are prepared. Note: the timing of such assessments may have different synchronisation to the meta-analysis discussed below, depending on Work Plan renewal and Ministerial Summit calendars. **Resources:** Apart from the existing evaluation process, the structural gap analyses could be conducted by the Secretariat, task leads, communities of practice or external experts and could make good use of the annual Work Plan Symposium as a mechanism for achieving initial structural review.

4.3 Observational Gap Analysis

The GEOSS Strategic Targets document highlights the critical requirement of a structured process for observational gap analysis covering observation specifications and parameters, geographical areas, and observation and information accessibility and quality, and determining processes for setting and addressing priorities for filling gaps. The STC's EOCA proposal and UIC's US-09-01a: Critical Earth Observation Priorities report are both attempting to directly address this need. The difference between EOCA and US-09-01a is mostly methodological: where the UIC task has been aimed at elucidating needs from the user community, the STC proposes a more formal expert review panel approach to assess observational gaps and opportunities across the GEO Societal Benefit Areas. There is value in both these approaches and the GEO community could even consider merging these approaches into a more structured observational gap assessment combining a user-driven and expert panel approach.

The recent IPCC/GEO joint workshop highlighted the value of such a gap assessment in providing a clear articulation of the gaps in observation and information systems and the opportunities for addressing them. It also recognized the value add of GEO being able to conduct such assessments across Societal Benefit Areas rather than focused on particular domains. It was thought such an assessment could inspire more structured and prioritized efforts by governments to fill spatial, temporal or measurement gaps in time for future IPCC assessments. The IPCC/GEO joint workshop also highlighted the benefit of having such a gap assessment published in the peer reviewed literature.

Timing: This style of assessment might not need to be repeated too often and may in fact fit better with a 5 yearly schedule (i.e. done twice a decade). **Resources:** This process would require some specific and dedicated resources to assemble and support an expert review panel and to repeat end user needs assessment such as was carried out in US-09-01a. This report could be published in the peer reviewed literature and would form a cornerstone document for earth observation program planning for governments and participating organizations.

4.4 Periodic Meta-Analysis Identified Gaps:

In order for any needs assessment or gap analysis to be useful and acted upon by the GEO community, it will be important that a comprehensive articulation of gaps occurs in a form and at a time that fits with GEO planning processes. For this reason, the working group feels there is value in a routine, periodic meta-analysis or consolidation and summary of the gaps identified in the three activities outlined above, in order to present the Plenary with a consolidated view of priority needs/gaps/opportunities in sync with the triennial Ministerial meetings. Ideally this meta-analysis would be completed for the Plenary prior to the Ministerial, to allow members and participating organizations a year to prepare opportunities to fill gaps for announcement by ministers. **Timing:** The timing of the triennial GEO Ministerial summits would require a meta-analysis to be completed every 3 years. **Resources:** This process could be completed by a relatively small team from inside the GEO community, but would require some dedicated resources as the process of distilling other gap analyses and reports would be a significant reviewing and authoring task.

4.5 Development of GEOSS Prioritization Principles

As discussed in the Concepts and Issues section of this document, there is an important requirement to undertake a process to define common GEOSS Prioritization Principles or GEOSS Common Values to inform relative prioritization of gaps within a GEOSS Gap Analysis Strategy. These principles, similar to the GEOSS Data Sharing Principles, would not over-ride Member or Participating organizations' own prioritization processes, but would articulate the shared principles whereby an agreed GEO prioritization may occur. **Timing:** This would be a one-off process but would require agreement and endorsement by Plenary. **Resources:** a small team, perhaps the same that undertakes the Meta-analysis suggested above, could coordinate this process.

5 PROPOSED TIMELINE:

- 21st Executive Committee to give guidance on the scope and approach;
- Draft methodology discussed at co-located GEO Committee meetings;
- Proposed detailed methodology and resources requirements developed by action team in time for 22nd Executive Committee;
- Detailed strategy presented to the Plenary for approval;
- Implementation of strategy post-Plenary (subject to resources);
- Final results presented to GEO-X/Ministerial Summit;
- Results used to guide the post-2015 GEOSS implementation.

6 RECOMMENDATIONS:

- **That the Executive Committee notes the progress of the action team in drafting an initial outline of a process that can eventually lead to a coherent overall mechanism being put in place for the required GEO/GEOSS gap analyses; and**
- **That the Executive Committee requests that the action team develop detailed methodology and resourcing plans for the 5 proposed activities making up the GEOSS Gap Analysis Strategy for consideration at the 22nd Executive Committee meeting.**

APPENDIX A

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