

# Working Group Study Team (WGST) Report

Final Report for the CEOS Plenary

October 1, 2019

## Introduction

In April 2019, at the CEOS SIT-34 meeting in Miami, Florida, CEOS representatives were asked to consider a proposal by the SIT Chair for a new CEOS working group to address multiple interests from external stakeholders in accessing CEOS Agency Earth Observation (EO) data. Following the SIT-34 meeting, a Working Group Study Team (WGST) was formed to assess interest in, and feasibility of, establishing this new CEOS working group.

As CEOS actively works to multiply the uses and global users of space-based EO data and information, CEOS has also identified new opportunities for its use. In addition, a broader spectrum of users are bringing increasing numbers of requests to CEOS for data and information products to address their specific project needs. These developments for CEOS, now in its third decade, represent positive growth and new opportunities. The growing awareness, interest, and requests for CEOS Agency EO data also pose interesting challenges for CEOS to the extent that it will need to prioritize and act upon when, where, and how it will effectively address them.

In the assessment of the WGST, there is a need to evaluate the volume and frequency of external requests and to consider future options to meet the growing demand. It should be noted that growing demand is, in fact, a successful outcome of sustained international efforts to inform the world of the value, relevance, availability, and utility of space-based EO data for societal benefit. During this study, the WGST discussed the level and types of responsiveness of CEOS to external stakeholders, such as user communities or boundary organizations serving user communities.

To assess the interest and feasibility of a new working group, the WGST examined several topics (in the form of actions) from the SIT Chair proposal related to stakeholder engagement and requests. This document summarizes several specific issues related to the "scope and scale" of user community requests, whether they were the result of independent requests or the outcome of sustained CEOS business development efforts. In the end, this document proposes two specific implementation options, their pros (positive) and cons (negative), and a final recommendation to CEOS leadership.

**Action #1: Address requests already received and those deemed likely to emerge in the next two years, including requests made to CEOS by GEO in the 2020-2022 GEO Work Programme**

## Categories of External Requests

- To date there are two broad categories of requests that CEOS has had to reconcile: 1) those directly associated with activities enumerated in the **GEO Work Programme** (Flagships, Initiatives, Community Activities); and 2) those for which CEOS has established working relations with **global policy frameworks** at the international level - most notably in the areas of climate (UNFCCC/SBSTA/GCOS) and disasters (Sendai Framework). In the case of GFOI, it is a mix; GFOI is a GEO Flagship initiative and CEOS interacts directly with the policy framework at the international level (e.g. the reporting on work in support of REDD+/LULUCF to SBSTA).

- There is a third category which may gain more prominence in the future, namely, work in support of the Development Finance Institutions (e.g. World Bank, Asia Development Bank) and other global development groups (e.g., the Global Partnership for Sustainable Development Data). In recent years during the SIT chairmanship of ESA, the CEOS organization discussed the matter of how to address this category of requests, and specifically interactions with finance institutions. Given the varying national and policy frameworks within which governments engage with and in these institutions, the prevailing view in CEOS was to allow CEOS Agencies the flexibility to engage individually and within their respective national policy frameworks. There was consensus that CEOS Agencies should continue to seek opportunities to raise awareness in these institutions of the value, relevance, availability, and utility of space-based EO to inform decision making and to advance societal benefit in key areas, including but not limited to disasters, land resource management, sustainable agriculture, and sustainable development.

### Requirements Definition

- A fundamental characteristic of the positive capacity of CEOS to efficiently respond to external requests lies in the very clear distinction between the identified needs and the concrete definition of specific requirements. There have been numerous identifications of needs, but sometimes these identifications have not gone far enough in distilling these needs into requirements for observations and products. Examples where CEOS has encountered difficulties and where we have had to make these “translations” on our own (which is not ideal) are for the GEO Carbon and GEO Water Strategies.
- This requirement setting process should be, as much as possible, independent of the CEOS Agencies themselves, and ideally, technology agnostic. However, in practice, past experience has shown that some engagement of CEOS agencies with the user community, in defining these requirements, is advantageous to both sides and creates efficiencies in their definition. This has been successfully demonstrated with GEOGLAM, GFOI, Disasters, and Climate. Another notable example, where CEOS will have to invest efforts in the next few years to establish this iterative dialogue with a user community, is GHG monitoring. We can only be successful with GHG monitoring if we build a strong working relationship with the traditional inventory providers.
- Furthermore, it should be understood that the definition of requirements is an ongoing activity and an iterative process based on dialogue with the user community. An example is the support of climate data records for which GCOS is now in the fourth iteration of a five-year process, with incrementally refined requirements for the ECVs. Additionally, GEOGLAM has started the process of a second cycle in the definition of requirements for the broad agriculture sector. The CEOS Sustainable Development Goals (SDG) Ad Hoc Team has also started a process of collecting specific data requirements (at least for three indicators). In all cases, this activity requires significant CEOS engagement and capacity and an ongoing iterative process to define specific requirements that are also actionable by CEOS.
- A related topic is the recently broadened interest in identifying Essential Variables (E\*Vs). This has its benefits, for example, to focus efforts within a specific domain, coalesce resources which can also assist in program definition and provide a basis for dialogue in the international policy context. But, it should be clear that this is not simply a question of providing a list of identified variables. As described above, there should be a whole process behind this and it should not be technology driven but should involve a sincere and incremental dialogue with the relevant user community. Furthermore, we should ensure that this recent “proliferation” of E\*Vs does not compromise or

dilute the existing and well-established variables and their advisory mechanisms in the science community (e.g. for climate).

## **GEO Work Programme Summary**

Many GEO initiatives and activities are already addressed or have synergies with activities in CEOS entities (e.g. Working Groups, Virtual Constellations, Ad Hoc Teams). It should also be noted that some of the GEO initiatives and activities listed below are "proposed" in the new GEO Work Programme and are not yet approved. The initiatives and activities addressed or synergistic with CEOS work include:

### GEO Flagships and Initiatives

Data Access for Risk Management (GEO-DARMA]

Earth Observations for the Sustainable Development Goals (EO4SDG)

GEO Global Agricultural Monitoring (GEOGLAM)

Geohazard Supersites and Natural Laboratories (GSNL)

Global Forest Observations Initiative (GFOI)

Oceans and Society: Blue Planet (GEO BLUE PLANET)

Land Degradation Neutrality (LDN) \* *anticipated addition to the GEO Work Programme*

### GEO Community Activities

Earth Observation and Copernicus in Support of Sendai Monitoring (EO4SENDAI)

GEO Satellite Based Climate Data Records Production and Service (GEO CDR)

Global Agricultural Drought Monitoring (GLOBAL AGRI-DROUGHT)

Global Flood Risk Monitoring (GLOBAL FLOOD RISK)

In addition to the GEO initiatives and activities noted above, there are also several initiatives and activities that may become future requests of CEOS and may result in the need for dedicated support or the creation of a new CEOS "group" (see list below). Most of these initiatives and activities specifically mention CEOS in their task description but in many cases there is insufficient detail in the GEO Work Programme regarding specific requirements and how these might translate into the scope of work requested of the CEOS organization. The reason is that the GEO Work Programme includes only the high-level descriptions of each GEO task; detailed requirements can be found in the Implementation Plan of each activity, and in many cases a dialog with the relevant GEO task teams might be necessary to consolidate those requirements. It should be noted that half of these fall in the category of "water" which is not currently accommodated by a direct CEOS group, but has been actively discussed in past CEOS meetings.

### GEO Flagships and Initiatives

Aquawatch

GEO Biodiversity Observation Network (GEO BON)

GEO Essential Variables (GEO-EV)

GEO Global Water Sustainability (GEOGLOWS)

GEO Wetlands

Global Wildfire Information System (GWIS)

## GEO Community Activities

Arctic GEOSS

Global Land Cover

Global Mangrove Monitoring (GLOBAL MANGROVE)

### **Action #2: Document the types of requests that CEOS is likely to receive from user communities (raw data, analysis ready data, technical support, data technologies, etc.)**

In addition to more formal external requests from GEO, Global Policy Frameworks, or Development Institutions, CEOS also receives requests that are more closely linked to the users. The majority of those requests do not originate from the user communities, but are facilitated by other external groups. For example, CEOS was approached at the 2017 GEO exhibition booth by the Global Partnership for Sustainable Development Data (GPSDD) to support the Africa Regional Data Cube and CEOS representatives have been approached by country-level statistical agencies to help address the United Nations Sustainable Development Goals (UN-SDGs). These requests typically result in the need for analysis-ready satellite data and associated pre-processing of such data, support for new data technologies (e.g. cloud computing, data cubes), and technical support to resolve data access issues. In addition, users request restricted high resolution data for testing and validation purposes which may not come directly from CEOS Agencies, but may be facilitated thru CEOS Agency connections to commercial data providers.

The communication of requests comes in various forms. In the case of GFOI, CEOS received clear requests for space-based data identifying specific frequency and coverage. Hence, CEOS formed an ad-hoc team to deliver timely response to what is a sustained multi-year request for the GEOSS. The ad-hoc team has continued working to ensure delivery over the long term. Recently, GFOI sent a new request to CEOS evolving the original request to be more ambitious, and including satellite-based global biomass provisions, analysis ready satellite data, and cloud-based data platforms. The request arrived to the CEOS SIT Chair and was subsequently accepted. This is one example of a systematic response in CEOS.

### **Action #3: Address the preparedness of user communities to translate that tailored support into delivered impact**

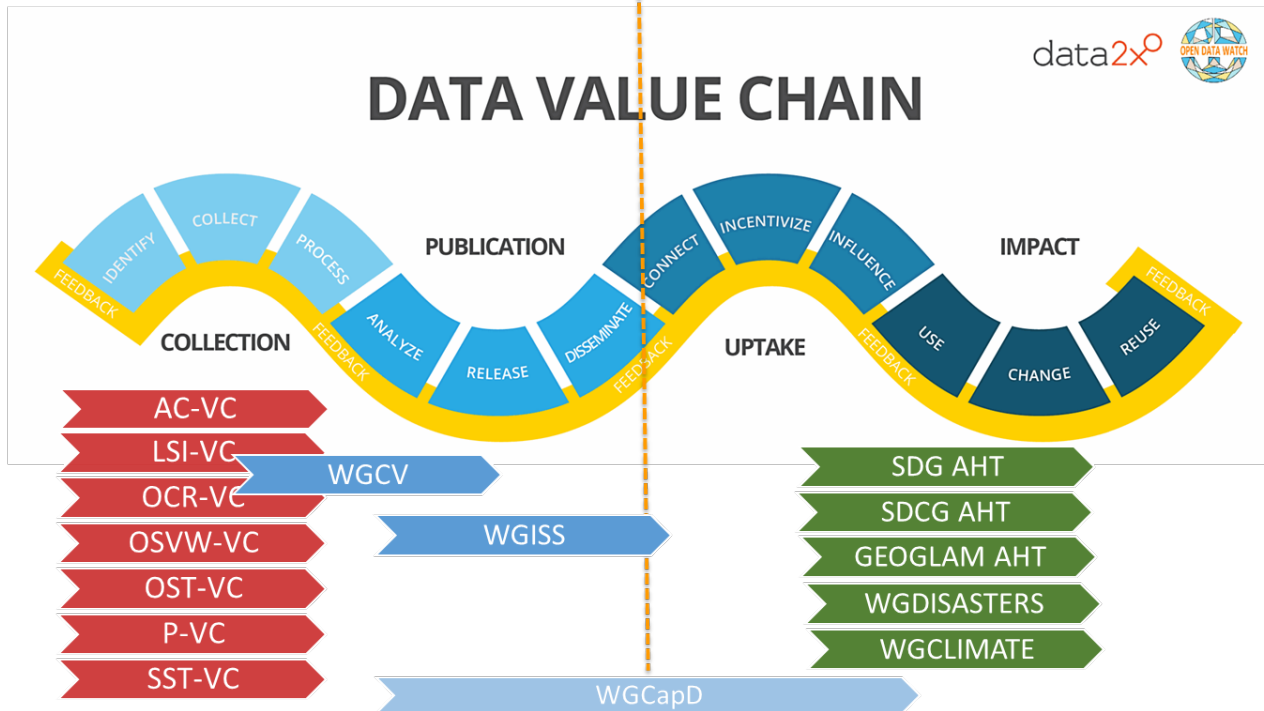
Many of the external requests made to CEOS will involve data preparation and delivery as well as expert technical support to enhance the use of that data for end users. This data preparation and support may require significant funding and personnel. In order to justify this investment, CEOS Agencies need to clarify requirements and intended outputs through dialogue before committing to support. Therefore, it is critical that CEOS engage with the appropriate users in the value chain to maximize the potential use and impact of the satellite data. This engagement could occur through existing CEOS groups or require a new CEOS group.

Virtual Constellations &  
 “Core business” Working Groups

“Thematic” Working Groups &  
 Ad-hoc teams

Observations/measurements

Actionable Information



The figure above attempts to position the various CEOS entities on the “Data Value Chain” from data acquisition to data use. The intention is to make visible the fact that the different CEOS entities do not necessarily have the same function but can be clustered into three broad groups (red, blue and green) which address different parts of the Data Value Chain. The CEOS entities in red are focused on coordination of the sensors and satellites and preparation of the primary data products, primarily the Virtual Constellations (VC). The CEOS entities in blue provide agency “core-business” functions that ensure data acquired from similar satellites operated by different agencies are intercomparable (Working Group on Calibration and Validation, WGCV) and discoverable (Working Group on Information Systems and Services, WGISS). Capacity building (Working Group on Capacity Building and Data Democracy, WGCapD) is also included in this category. Further downstream, the CEOS entities in green, including Working Groups (WG) and Ad-Hoc teams (AHT), are focused on interaction with the user community. However, it must be noted that some of the VCs act all along the value chain (e.g. Sea Surface Temperature, SST-VC). It is believed the connections to various parts of the chain come through these VCs, WGs and AHTs. Communication between these entities will support feedback across the value chain to improve how CEOS provides data and maximizes its impact. In addition, there is a “feedback loop” between all of the value chain components (in yellow) that allows for adjustment for any single element. For example, changes in the end user goals may require changes in CEOS data collection and processing, or changes in technologies may change how user communities connect to data or how CEOS collects and processes the data.

To date, several existing CEOS entities (e.g. Joint CEOS-CGMS Working Group on Climate, Working Group on Disasters, Ad Hoc Space Data Coordination Group for GFOI, Ad Hoc Group for GEOGLAM) have been successful in working with external stakeholders, assessing requirements for satellite datasets, tools and services and making connections to intermediate or end users to validate that these CEOS outputs address the needs of both ends of the value chain ... global policy and users. CEOS has been most effective in addressing needs of the end-to-end value chain when it has established positive working relationships with intermediate/expert user communities of the primary satellite products who can further translate these into tailored products and services for the end user communities.

### **What problems and issues will CEOS face in its organizational response to data user community requests?**

It is likely that CEOS will need to address future requests from external groups for data and information products, though the exact number and timing of those requests is unknown. It is believed that these requests may require significant resources from CEOS to understand and assess the user requirements and develop a plan of action for response. To date, these requests have been addressed in an "ad hoc" manner through CEOS Agencies, existing CEOS groups, and the establishment of temporary Ad Hoc Teams. In addition, support from GEO has been limited due to temporary resources (secondments to the GEO Secretariat) and insufficient and sustained expertise in remote sensing. CEOS Principals have several mechanisms to work with GEO on this shared priority and make recommendations for mutually supporting action: the annual CEOS Statement to the GEO Plenary; and meetings with and letters to the GEO Secretariat Director. To remain responsive to Earth observation users' needs globally (Ref: CEOS Strategic Guidance Document, Section 3: Goals), the CEOS organization can proactively develop concrete plans for handling the growing number of external requests.

### **What are the proposed options to formally address new user community requests and their required resources, advantages and disadvantages?**

#### **Option #1:** Create a new Working Group (name TBD)

Resources - Requires four-year agency commitments to leadership and sustained CEOS Agency support.

Advantages - Provides a single, identifiable CEOS entity to address new external requests. Such focus would provide external groups a clear path for discussion and resolution.

Disadvantages - There may be insufficient work for a new Working Group if the number of external requests is low. This may not justify the need for long-term leadership and dedicated financial support. In addition, such a group may require broad representation of competencies within CEOS (e.g. SEO, VC, WG). Participation may be limited as many people are already committed to other CEOS entities on an ongoing basis and through leadership rotations, especially in the case of the CEOS working groups.

#### **Option #2:** Use existing CEOS leadership and technical group channels (e.g. CEOS Chair, SIT Chair, SEC, CEO, SEO, VC, WG) to address new external requests.

Resources – Existing levels plus some additional effort, depending on the scope of the request

Advantages – There is no need for additional CEOS infrastructure as existing entities would bear the burden to assess external requests. If selected, CEOS should consider formalizing, and possibly codifying, the process to streamline and improve the CEOS response to such external requests.

Disadvantages - Assuming an increase in the number of external requests, there may not be sufficient resources (people, time, funding) to adequately respond. In addition, external organizations would not have a single focal point for interaction, as they might contact CEOS Agencies, SEC, CEO, SIT Chair or CEOS Chair leaders.

Each option would benefit from an assessment of external requests, interaction with the user community to understand requirements, and developing solutions from the CEOS organization to provide sustained support to the user community. Such solutions may lead to a new Ad Hoc Team, Working Group or Virtual Constellation. To arrive at the “best fit” solution(s) for the near and long term, CEOS should utilize existing processes defined in both the CEOS New Initiatives Process Paper and the CEOS Working Group Process Paper for its deliberation. These documents ask foundational questions and provide criteria to be met that are the basis on which agencies can assess potential commitment of time, expertise, and resources associated with each option.

### **What is the recommendation of the WGST to the CEOS organization?**

After several telecons and group discussions, the WGST selected Option #2 - Use existing CEOS leadership and technical groups (e.g. CEOS Chair, SIT Chair, SEC, CEO, SEO, VC, WG) to address new external data user community requests. The WGST believes that existing CEOS leadership and technical groups can adequately respond to future external requests. If approved by CEOS leadership at the 2019 CEOS Plenary, it is recommended that the CEOS organization formalize the process to streamline and improve the CEOS response to such external requests.

In the past, the push for a new Working Group (Option #1) was always led by an individual or Agency willing to put forth resources and strongly advocate for the new group. This was not the case among the WGST participants as there was no support to pursue this option. The WGST believes that the need for additional resources to sustain a Working Group was not justified to adequately respond to external requests.

As a result of discussions and resulting actions from the CEOS SIT Technical Workshop in September 2019, the WGST shall terminate its work with the delivery of this report to the 2019 CEOS Plenary. It was proposed that a new task be added to the CEOS 2020-2022 Work Plan (led by the SEO) to establish a Task Team to develop an "External Request Process Paper". The first draft will be released by the CEOS SIT-35 meeting in April 2020; the second draft at CEOS SIT Technical Workshop in September 2020; and the final version (for endorsement) at the 2020 CEOS Plenary in October 2020. It is recommended that this Task Team include members from the SEO (Brian Killough), CEO (if recruited), SIT Chair Team (CSIRO/GA - Jonathan Ross), SIT Vice Chair Team (ESA - Ivan Petiteville), EC (Mark Dowell), and a representative of the 2020 CEOS Chair Team (ISRO - TBD). Separately, another Task Team will be proposed for consideration at the 2019 CEOS Plenary to conduct an assessment of the potential user community needs and external demand for CEOS observations to help CEOS understand the potential workload to CEOS from these external requests.

## ANNEX

As mentioned earlier, there are varying degrees of maturity and/or preparedness of the user communities behind specific new requests. CEOS should have a means of assessing this at an early stage of engagement with a new user community. It should be clear that we are not suggesting that CEOS should only engage with communities that are mature or have a high level of preparedness, but it is obvious that this has implications for the type and quantity of resources that CEOS Agencies will have to make available and therefore should be ascertained at an early stage.

In order to improve the effectiveness of CEOS to respond to new requests from user communities, it is suggested that a series of standardized procedures be established. Note, these are quite different from the existing procedure for establishing new Ad Hoc Groups.

An example of such procedures would be a checklist to assess the preparedness of the user community to engage with CEOS and EO data and products in general. Below are the types of questions that could contribute to such a checklist:

- 1) Is the User Community (UC) making the request of CEOS already making active use of EO data?
- 2) Has the UC expressed needs or is it able to express quantitative requirement for the spatial and temporal resolution of products?
- 3) Does the UC have specific requirements for the latency of the products that are received, and is it capable of estimating what impact different latency of delivery will have on its application?
- 4) Does the UC have specific quantitative requirements on the accuracy of delivered data and products, and is it able to make use of uncertainty information, in its application, if this is provided?
- 5) Does the UC have a complete overview of the value chain of which it is at one end, and CEOS is at the other? Does it have existing working relations with necessary intermediaries (e.g. modeling community, application developers in its field)?
- 6) Does the UC have necessary access to complementary data from other sources (in-situ, socio-economic etc.) and understand how it would integrate this with a EO data in addressing its application?
- 7) What are the IT skills within the specific UC; is it comfortable in dealing with large raster datasets?
- 8) Does the UC have an understanding of its needs for information systems, portal, tools, interfaces to make best use of the data? Is it able to sustain this infrastructure itself in the long run?
- 9) Does the UC understand the broader needs of its constituents for Capacity Building and training? Is it able to sustain that training itself in the future?
- 10) Is the UC capable in assessing the outcome of CEOS' support, through demonstrable long-term impact on its application or policy area?