GROUP ON EARTH OBSERVATIONS

Follow-up on Expert Advisory Group on GEOSS (EAG) Report

PB-25: 7-8 Feb 2023
Geneva, Switzerland

GEO Secretariat

Paola De Salvo; Florian Franziskakis

GROUP ON EARTH OBSERVATIONS

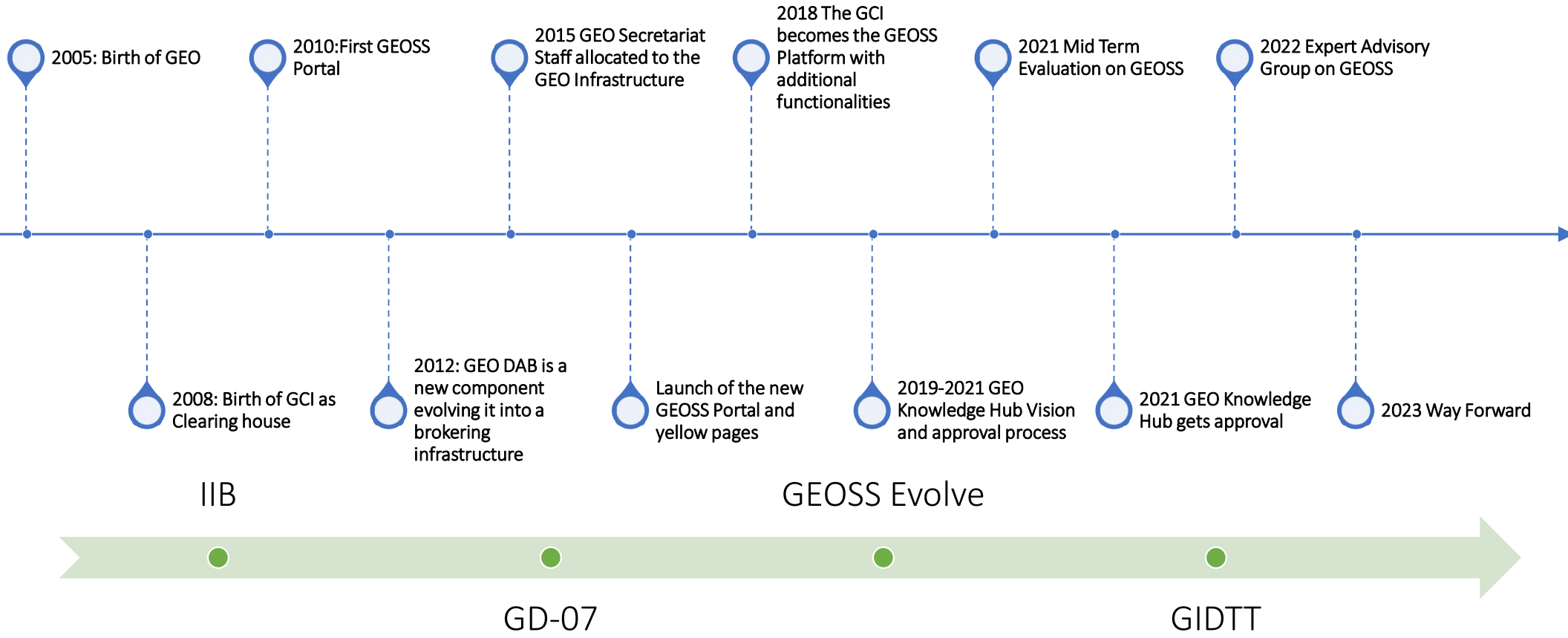
59th Executive Committee decision

- Confirmed that the Expert Advisory Group has been disbanded;
- Recognized the extended deadline for comments announced in Plenary to 25 November;
- Tasked the GEO Secretariat to conduct an analysis of all the comments and inputs from the Executive Committee and the Plenary, through a transparent synthesis process;
- Requested the GEO Secretariat propose recommendations for next steps, including an identification of appropriate expertise and resources;

- **Action 59.2**: GEO Secretariat to bring recommendations on the way forward to the Executive Committee in March 2023. **Due: ExCom-60**.

History: GEOSS Infrastructure Journey since GEO's Birth

…..Together, the GEO community is creating a Global Earth Observation System of Systems (GEOSS) to better integrate observing systems and share data by connecting existing infrastructures using common standards. There are more than 400 million open data resources in GEOSS from more than 190 national and regional providers such as NASA and ESA; international organizations such as WMO and the commercial sector such as Digital Globe.(About us (earthobservations.org))



Mid-Term Evaluation Findings and Recommendations (September 2021)

- **KEY FINDING 4**: Re-evaluating GEOSS GEO needs to reassess the concept of GEOSS, **what the main goals are,** and whether the original **concept of GEOSS remains relevant** to the organization without modifications.
- Specifically, **GEO should evaluate and decide what it wants or needs to pursue in terms of data infrastructure, producing data products, and user services, how GEOSS can integrate and execute the Knowledge Hub,** and whether GEO has the capacity to carry this out.
- GEO is presently pursuing a wide range of functions, which fall into three main areas of GEO's focus including, **serving as a convener, facilitator of access to open data, and user services**. GEO should **establish its focus going forward** in terms of which of these roles should be prioritized given that it has limited resources and capacity
- There is a balance needed between support for the upstream and downstream of the Earth observation value chain. **Clearly defining where GEO can have the most profound impact will help ensure a lack of mission or scope creep, coordination with UN and other bodies, and clarity on what GEO can deliver to its users and stakeholders.**

Summary of Mid-Term Evaluation Findings and Recommendations Related to the GEO Work Programme or the Programme Board

EAG Report 2022

The 3 Options provided by EAG

1. **Discontinue investments in the current GEOSS Platform; (NOT Supported)**
2. Pivot investments toward end-user needs;
3. Continue investments in the current platform, with enhancements.

Option2: This option includes **ending support for the existing GEOSS Platform** and **ensuring that GEO content could be discoverable and available through other existing platforms that take advantage of cloud storage, computing, and an image processing environment**. Several existing platforms include **Digital Earth Africa, Radiant Earth's ML Hub, Google Dataset search, Google Earth Engine, Microsoft's Planetary Computer, and Earth on AWS, Esri's ArcGIS Online, those provided by national space agencies, or other appropriate platforms.** To be discoverable by multiple platforms, GEO-related data will hold value by following open data standards that enable interoperability. **GEO's role would continue to be one of promoting and enabling the use of open data by its members**. For GEO to take advantage of existing platforms, it is not a requirement that they be commercially operated. If there are other viable platforms available, they should also be considered. Both GitHub and the Humanitarian Data Exchange (HDX) are models to examine, as these fully open platforms help self-identified user communities make their data, code, and technical guidance freely accessible for sharing and collaboration. Another example platform that provides access to Earth observations and derived products is the Copernicus Climate Data Store supported by the European Commission

Option 3: Continue Investing in the **GEO-Hosted GEOSS Platform and Enhance Its Functionality to Support GEO Impact Areas Description**: The GEOSS Platform includes information related to many GEO activities (and a range of other activities that are not directly supported by GEO) for every part of the world. It is valued by the providers of the platform's content, which is primarily metadata about earth observations, models, studies, and applications. . However, to conduct their research and analyses, scientists need more than just the metadata that the platform currently provides. This option recognises value in retaining the functionality of the GEOSS Platform for stakeholders, and also recognises GEO as the most suitable host. **The GEOSS Platform would be enhanced to improve data retrieval and functionality, incorporate in-situ data** and better target selected end user groups of interest, potentially **providing greater support for GEO activities, Initiatives and Flagships**. The following options consider a range of levels of development and extension of the GEOSS Platform, from less to more extensive.

Overview of key comments provided to the EAG report by GEO Members

Countries and POs participating in the EAG discussions **(total: 15 countries)**

- During Ex-Com (day 1)

Australia, China, Costa Rica, European Commission, Germany, Ghana, Greece, Japan, United States of America

- During Ex-Com (day 2)

China, European Commission, France, Greece, Germany, Peru, South Africa, United States of America

- During the Plenary (floor & written)

China, Costa Rica, European Commission, European Space Agency, Finland, France, Germany, Ghana, Greece, Peru, Switzerland, United Kingdom, United States of America

Summary of feedback by Members in Plenary

- Integration of Option2 and Option3
- Strengthen links with the EO community: data providers (in situ + satellite, included private companies), cloud providers, Data Cube community, GEO Knowledge Hub, ***(China 1, 2, Costa Rica 1, CH 1, FR 3, FR 4, Ghana 1, US 3, US 4, US 6; DE 1)***
- Focus on Regional needs *(**China 3, 4, 5, Greece 1, UK 2**)*
- Stronger Linkage with GWP activities*(**EC 5; Fr 6; US5; China 2)***
- Overall coordination/support done by GEO Secretariat.
- Renewed GIDTT mandate ***(Greece 2)***
- Drive the evolution of GEOSS by GEO Members, with stronger representation from different regions and increase engagement of national GEO's ***(EC 3, FR 1, Greece 1,2, China 3,China 4, China 5).***
- Evolution of GEO Infrastructure would fall under newly proposed Foundational Task "Data and Knowledge Management"

Visual representation of the proposed GEO infrastructure

Global Governance with Representative of all components

EAG Option 2

Alibaba Cloud

...others

CREODIAS · sobloo · mundi · ONDA · WEKEO · Google Earth Engine · Microsoft · aws

Data Cubes

DIGITAL EARTH AMERICAS

Digital Earth AFRICA

Digital Earth Pacific

BRAZIL DATA CUBE

Swiss Data Cube

Digital Earth AUSTRALIA

EURO DATA CUBE

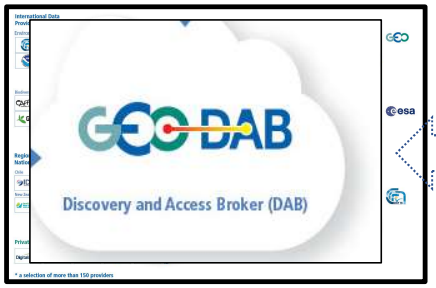
Armenian Data Cube

OPEN EARTH ALLIANCE

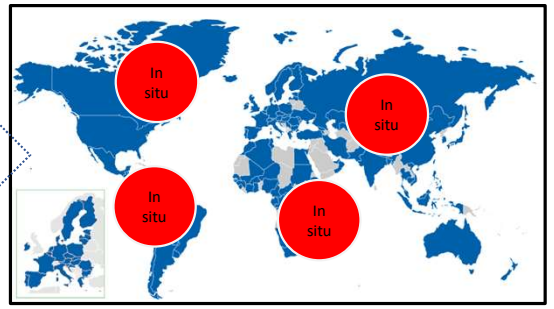
ARD

CEOS Committee on Earth Observation Satellites

+ Commercial Companies (VHR)



EO Products and Services

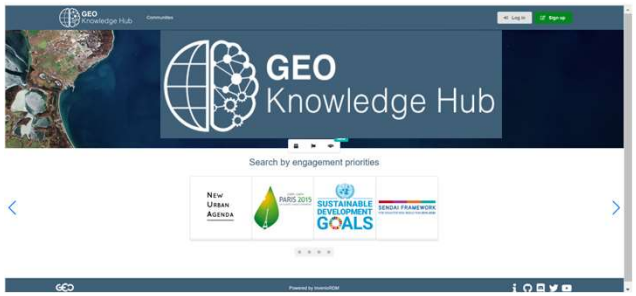


Regional /National In Situ

Improve access to Datasets; Models; Computing Capabilities **ESA1,2; EC2,3;US 4; CH 3; China 1**

EAG Option 3

Improve access to In situ (**US 3)**



Integration with GEO knowledge Hub **(Fr 6; Ghana 1; US 6; Costa Rica 6)**

Stronger linkage with GWP **(EC 5; Fr 6; US5; China 2)**

Users

Resources

What is funded already ?

Infrastructure funding: GEOSS Platform, GEO DAB; Yellow Pages

GEO Knowledge Hub: Consultant through the GEO Trust Fund + IT in AWS

Recommendation:

Contributions from all regions (multisource funding), including earmarked funds for overall coordination and delivery of the GEO Infrastructure to be governed by a representative body and managed by GEOSEC via Trust Fund

Process

March 2023:EXCOM consider GEO Secretariat process

March 2023:Call to renew GIDTT open to new representative (CEOS; OEA; Cloud Providers; GWP Activities; In situ Data providers; GEOSS Platform; GEO Knowledge Hub; Members of Post2025 under coordination of the GEO Secretariat)

May-June 2023:GIDTT evaluate the current architecture versus GEO Sec Recommendations & integrations of the EAG Options 2&3 and Members comments

June 2023:GIDTT meets at Open Data and Open Knowledge Workshop

July 2023:GIDTT presents the new GEO Infrastructure Architecture at EX Com in July 2023

August-October 2023:GIDTT present the final GEO Infrastructure Architecture at GEO Plenary 2023

ODOK workshop will constitute the opportunity to gather the newly formed GIDTT and the community around technical discussions of the GEO Infrastructure

Obasi Room	Salle B	C1 Room
Welcoming remarks, Objectives of the workshop (ALL IN OBASI ROOM)		
Session 1: Open Space-based Data + Data Cubes	**Session 2:** National GEO's + Capacity Development	**Roundtable:** GEO Open Data Licensing Roadmap
Lunch Break		
Session 3: Open In Situ Data + Essential Variables	**Session 4:** Open Knowledge Principles	**Roundtable:** GEO Open Data Licensing Roadmap (continued)
Data Working Group Meeting+ Dinner		

Obasi Room	Salle B	C1 Room
Session 5: Open EO Applications	**Hands on** - Data Cubes	Hands on ?
Lunch Break		
Session 6: Infrastructure	**Hands on** - GEO Knowledge Hub	Hands on ?

Thank you

Country	Technical /Architecture	Governance
ESA	The GEOSS Platform should not evolve to duplicate or replicate existing services and data; users can more easily discover and access existing resources (e.g. data, tools, services) provided by both public and private entities which are suitable for their needs. **(ESA1; 2).**	More work is needed to fully address all financial, economic, technical, and governance **(ESA 2).**
EC	The exploitation of the European EO assets is below its potential.**(EC 2).** Welcome the growing involvement of the private sector that is essential for providing sustained EO services in many areas. However, ensure that their engagement remains within well-defined limits **(EC3).** More emphasis on the policy aspects and advocates further Open Data, namely the implementation of the GEO Data Sharing Principles, the endorsement and dissemination of good practices, open standardization, and capacity building. **(EC4).** Focus its activities on providing support to the GEO initiatives **(EC5).**	GEO needs to remain a government-driven group **(EC3).** GEO overarching principle that everybody around the globe (scientist, policy maker, business, citizen) who aims at addressing environmental challenges should have free and open access to all essential Earth observation data.**(EC 6)**
France	Define clear definition of the **typology of users (FR2).** Connection with the GKH **(FR 3).** GEO Data Access Broker need to be on open source and become a real community development project **(FR4).** The GEO portal can become a central five star entry point to access data through API and Web services standard, interoperable and consistent with the GEO data principles and the FAIR principles. **(FR5).** Stronger linkages with GEO WP activities **(FR 6)**	Reaffirms the GEOSS concept as central for the GEO members. **(FR1)**
Ghana	GEO Portal Integration with GEO Knowledge Hub **(Ghana 1)**	
USA	Improving in-situ data support **(US3)** Improve access to Datasets; Models; Computing Capabilities **(US 4)** Stronger Linkage with GEO WP activities **(US 5)** Better understanding of GEO Knowledge Hub role and its future integration in the GEO Infrastructure **(US 6)**	Improve GEO branding via retiring the term GEOSS. **(US 1)**
CH	CH recognizes the importance of having an open, inclusive, independent, neutral infrastructure supporting the EO community. It is a fundamental element to build a strong EO community both from the data provider's and user's side. **(CH2).** In the rapidly evolving technological landscape, the role and capabilities of GEOSS should be strengthened and further developed **(CH3).**	It is clear that GEOSS is used and users have an interest in using its various capabilities. However, it is important to further tailor it to the needs of the EO community.**(CH1).**

UK	UK supports recommendations 2 and 3 of the report **(UK 1).** Very hard to maintain lists of accessible and public datasets globally. Suggest that this could be a function of national GEOs or databases pointed to by national GEOs.**(UK2).** Suggest that many satellite datasets are well served but not consistently. Therefore, the UK suggests something like option 2 but with the inclusion of a section of links to regional, national and space agency sources of data. **(UK2).** It should be a "meta data" service only and always link to the primary repository of data. Tools should be very clear including a framework for tagging data as "GEO-approved" in the metadata.**(UK 3).**	
China	The initial concept and design of GEOSS can no longer cover the emergence of new technologies**. Innovation is the way to make progress.** It is very important to supplement the top-level design of GEOSS for the support and implementation of new technologies such as big data, AI, cloud computing and IoT **(China 1).** Stronger linkage with GWP Activities **(China2).** GEOSS could provide solutions for applications in different fields, such as agriculture, forestry, urban, disaster reduction and so on, so as to further play the role of GEOSS and better highlight the value proposition of GEO **(China 6)**	GEOSS can be implemented in three dimensions: global, regional and national. **(China 3).** Regional National Dimension- Successful solutions at regional and national scales will be integrated through the GEOSS to form global solutions for the Sustainable Development Goals.**(China 4 – 5).**
Costa Rica	Stronger usage of the GEO Knowledge Hub than GEOSS Platform **(Costa Rica 1)**	
Finland	One key historic mission of GEO & GEOSS is the interoperability of systems with open and free data. We should not give up on this **(Fin. 1)**	Not remove the "GEOSS" terminology. Think about a "value tree" flow from information and data, from observing systems to SBAs and key big policies **(Fin 2)**
Germany	combination of Options 2 and 3 could be an interesting way forward.(DE1)	Considerations about the governance must be taken with caution.
Greece		Regional aspects is critical to keep in for the evolution of GEOSS. GIDTT is the Group dedicated to the Architecture (Greece 1, 2)

China

China always believes that **GEOSS** is an advanced concept of earth observation resources at different levels, including observation **means, data systems and solutions. The GEOSS platform and GEO knowledge hub are part of GEOSS, and the data platforms built by regions, member states and participating organizations are also very important components**

We Propose the following suggestions for the future development of GEOSS:1.The initial concept and design of GEOSS can no longer cover the emergence of new technologies. **Innovation is the way to make progress**. It is very important to supplement the top-level design of GEOSS for the support and implementation of **new technologies such as big data, AI, cloud computing and IoT**

The development of GEOSS should be **closely linked to and mutually supported by the development of GEO Work Programmes.** On the one hand, GEOSS provides data discovery, processing and analysis capabilities to provide real usable and useful data for GWP. On the other hand, technical problems encountered in GWP can become the development direction of GEOSS.

GEOSS can be implemented in three dimensions: global, regional and national. With regional GEO as the sub-center and national GEO as the node.

Successful solutions at regional and national scales will be integrated through the GEOSS to form global solutions for the Sustainable Development Goals.

Based on the existing infrastructure, GEOSS could provide solutions for applications in different fields, such as agriculture, forestry, urban, disaster reduction and so on, so as to further play the role of GEOSS and better highlight the value proposition of GEO.

Capacity building of developing countries should be strengthened in the construction of GEOSS to avoid the inequality of application capacity.

Costa Rica

Costa Rica clarified that in South America they were increasingly using the Knowledge Hub rather than the GEOSS Platform.

Finland

One key historic mission of GEO & GEOSS is the interoperability of systems with open and free data. We should not give up on this
We should not remove the "GEOSS" terminology. We should think about a "value tree" flow from information and data, from observing systems to SBAs and key big policies. We need to picture it better and track this "value tree".

Germany

We should also remind ourselves that GEO's core principles are about open and free data. Considerations about the governance of such as solution must be taken with caution.

Greece

Regional aspects is critical to keep in for the evolution of GEOSS.

As Italy mentioned, there is a mandate, as well as a specific group within GEO, such as the GEOSS Infrastructure Development Task Team (GIDTT), that has been working on this.

Ghana

EAG further does some analyses but ensures that the GEO portal is maintained and transformed to be **integrated with the GEO knowledge hub** and emerging other portals being implemented and developed in Africa, Asia and Latin Americas.

ESA

The GEOSS Platform should not evolve in a way to duplicate or replicate existing services and data but to **make sure that users can more easily discover and access existing resources** (e.g. data, tools, services) **provided by both public and private entities which are suitable for their needs.**

More work is needed to fully address all **financial, economic, technical, and governance** issues associated with the three options for the GEOSS Platform

An additional option based on Option 3(i.e. GEOSS Platform operated by the public sector under GEO guidance) but including some of the advantages indicated in Option 2 and deriving from the availability of private sector platforms and services which could be integrated in GEOSS and help in supporting some GEOSS user needs should be explored and analysed in detail.

European Commission

1. **Europe has played an important role in providing and advancing the use of Earth Observation (EO) for environmental and climate goals and promoted the sharing of open data and information, enhancing coordination and integration with other data.** Copernicus data and information is today widely used in the community and its services in the marine, land, atmosphere, and climate domains and are indispensable tools to address user needs around the globe.
2. **The exploitation of the European EO assets,** the level of international collaboration on building inter-operable EO systems, connecting data from various sources and building user-centric applications **is below its potential**
3. We **welcome the growing involvement of the private sector that is essential for providing sustained EO services in many areas. However, we like to ensure that their engagement remains within well-defined limits**. In our view, GEO needs to remain a government-driven group and its current governance structure should not be modified or called into question.
4. The GEOSS entails a **policy** and a **technical dimension**. In its current realisation, the GEOSS platform addresses the latter in a way that has been considered **unsatisfactory** in a report from an expert advisory group (EAG). In response to the expert advices, **we suggest that GEO puts more emphasis on the policy aspects and advocates further Open Data, namely the implementation of the GEO Data Sharing Principles, the endorsement and dissemination of good practices, open standardisation, and capacity building.**
5. **In the future,** a GEO platform could focus its activities on providing s**upport to the GEO initiatives** to achieve their objectives, helping them in making data and services discoverable, interoperable, accessible and actionable on a sustainable basis, **which implies promoting and liaising with existing infrastructures and data portals.**
6. **A renewed value proposition** should be based on the GEO overarching principle **that everybody around the globe** (scientist, policy maker, business, citizen) **who aims at addressing environmental challenges identified in international agreements - such as the Paris Agreement, the Sendai Framework for Disaster Risk Reduction, the Sustainable Development Goals** - should have **free and open access to all essential Earth observation data.** GEO is in a unique position to support governments in their effort to address these challenges and should reaffirm these agreements as its engagement priorities.

France

The EAG document proposes a first valuable work **It reaffirms the GEOSS concept as central for the GEO members.**

To continue the work on the GEO portal and reinforce the impacts of GEO, some elements must be explored such as a clear definition of the **typology of users**

The options have to be completed to include the GEO Knowledge Hub perimeter that concurs and completes certain functionalities of the GEO Portal.

Following the GEO strategy, for the community of developers, the **Data Access Broker need to be on open source and become a real community development project** that can be improved by the GEO community with abilities in this domain.

The GEO portal can become a central five star entry point to access such a type of data through API and Web services standard, interoperable and consistent with the GEO data principles and the FAIR principles.

Such a GEO portal, will allows the pilot initiatives, the initiatives, the flagships and the regional GEO to showcase their work and to have also access through any applicative platform (public or private) to valuable data and to develop operational applications answering to their objectives.

Japan

1. Japan requested the Expert Advisory Group to document clearly that this report mainly focused on the GEOSS platform, not a GEO-related infrastructure or a GEO concept. Secondly, Expert Advisory Group should clarify how GEO member states engage in the three options because the Expert Advisory Group report did not include a cost analysis for each of the options, which was very critical for the Executive Committee to make evidence-based decisions. Furthermore, Japan would like the GEO Secretariat to clarify the process and schedule for the Executive Committee to discuss these options.

Peru

1. EAG has finished its job and that GEO Sec should provide EXCOM with recommendation.

Switzerland

1. It is clear that GEOSS is used and users have an interest in using its various capabilities. However, it is important to further tailor it to the needs of the EO community.
2. Switzerland recognizes the importance of **having an open, inclusive, independent and neutral infrastructure supporting the EO community**. We are of the opinion that it is a fundamental element to build a strong EO community both from the data provider's and user's side.
3. In the rapidly evolving technological landscape, the role and capabilities of GEOSS should be strengthened and further developed

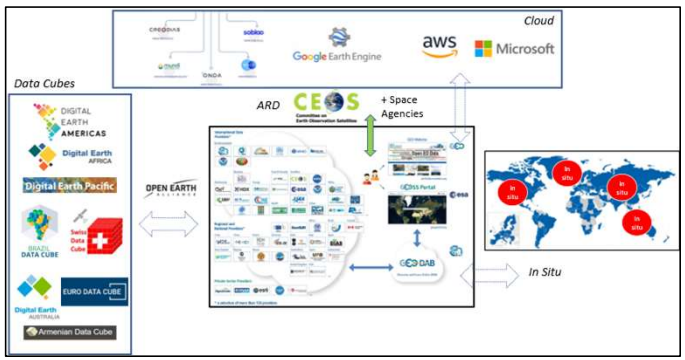
UK

1. UK sees value in the language for both Option 2 ('Pivot investments from the current GEOSS Platform towards end-user needs'), and parts of Option 3. From the Executive Summary recommendations, the UK supports recommendations 2 and 3 of the report. For recommendation 1, we agree that GEOSS could be more tightly focused, with a name that clearly reflects its function as part of GEO.
2. The UK **believes it would be very hard to maintain lists of accessible and public datasets globally.** We suggest that this could be a **function of national GEOs or databases pointed to by national GEOs**. We also suggest that many satellite datasets are well served but not consistently. Therefore, the UK suggests something like option 2 but **with the inclusion of a section of links to regional, national and space agency sources of data.**
3. For the replacement of GEOSS itself, **we agree that the service should link to open standards and be for long-term, maintained data.** However, it should **be a "meta data" service only and always link to the primary repository of data.** In this way, it will avoid resource implications and lessen the need for cloud services. Being a repository for some data sets would make the service incoherent and fragmented. **Tools should be very clear including a framework for tagging data as "GEO-approved" in the metadata.**

USA

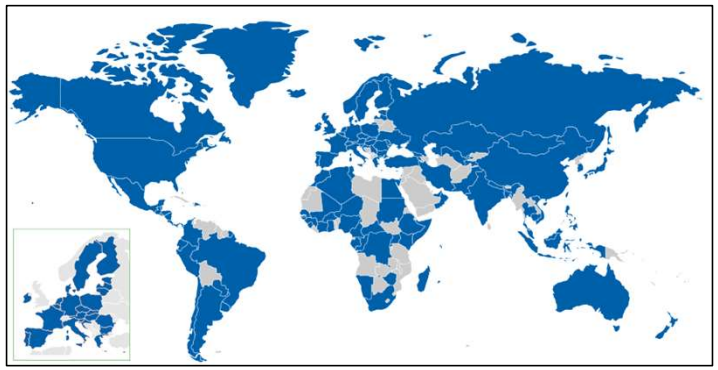
1. Welcomes the suggestion to improve **GEO branding**, communicate better, and implement GEO's mandate **via retiring the term GEOSS.** This would remove ambiguity, improve understanding, streamline communications, and strengthen the GEO brand.
2. The United States agrees that a single system of systems-oriented architecture may no longer be as applicable today as it was when GEO was first established.
3. Regarding **improving in-situ data support**, the United States agrees on the importance of this, but the idea of how to implement and what the resource costs would be are critical pieces of information that GEO needs before deciding on any move forward.
4. We note that the EAG report found that "Scientists and researchers (the "users") need access to **datasets, models, and computing capability**, which the GEOSS Platform does not provide."
5. We would also like to understand **how any changes to the platform could work with/improve ongoing GEO Work Programme activities.**
6. We would like to also better understand the potential role of other parts of GEO's data infrastructure, such as the **GEO Knowledge Hub**, in providing some of the proposed services and serving as a user-oriented platform that helps to promote and enable the use of open data. Final decisions should take into account the entirety of GEO-related data infrastructure items.

Future



GEO GROUP ON EARTH OBSERVATIONS

GEO WORK PROGRAMME 2023-2025
SUMMARY DOCUMENT
VERSION 1 - JULY 2022



GEO Knowledge Hub