Mid-Term Evaluation

This document is submitted by the Mid-Term Evaluation Team to Plenary for discussion.

GROUP ON EARTH OBSERVATIONS

MID-TERM EVALUATION OF THE GEO STRATEGIC PLAN 2016-2025: IMPLEMENTING GEOSS

Transmittal Letter from the MTE Team Chair to the Executive Committee

Dear Members of the Executive Committee:

The Mid-Term Evaluation Team (MTE Team) is pleased to provide you with the Mid-Term Evaluation report of the GEO Strategic Plan 2016-2025: Implementing GEOSS. This evaluation takes place midway in the implementation of the GEO Strategic Plan 2016-2025 and it includes in its scope the period from 2016 to 2020.

We would like to thank you for your support throughout the evaluation process. The Executive Committee has contributed to all the phases of the Mid-Term Evaluation by sponsoring the Mid-Term Evaluation Team members and participating in interviews and surveys that were prepared for the purpose of the evaluation.

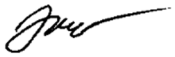
The Mid-Term Evaluation has taken place at a unique moment in history and has been partially affected by delays due to the COVID-19 pandemic. However, the commitment and dedication of the Mid-Term Evaluation Team and of the GEO community have been key for the realization of this important piece of work and are a testimony to the value and unique role of GEO in the field of Earth observations.

The Mid-Term Evaluation represents an opportunity to take stock of the progress and successes achieved by GEO since 2015 and also provides the chance to make possible improvements, with a view to the renewal of GEO's mandate in 2025. The key achievement of GEO is its ability to convene and facilitate interactions among various diverse stakeholders active in the Earth observation field by providing a flexible and adaptable framework for voluntary collaboration. Through the provision of this framework, GEO has been able to promote opportunities for data sharing and service delivery, for increased cooperation among different users, and for the creation of connections along the Earth observation value chain. However, there is room for improvement in key areas, which include:

- the definition of high-level priorities that would guide the work and evolution of GEO going forward;
- the need to reassess the concept of GEOSS and its continued relevance in its original form;
- and the development of a clear value added proposition that could renew stakeholders' support for GEO and its ambitious objectives.

We recommend that the Executive Committee, with support from the GEO Secretariat, prepare a brief statement acknowledging the receipt of this report. Such a response need not indicate whether the Executive Committee agrees, partially agrees, or disagrees with each of the Key Findings and Recommendations nor develop specific response actions. However, we encourage the Executive Committee to provide a general statement of support for consideration of the report findings in its future planning.

Sincerely,



Justyna Nicinska
Chair (USA)

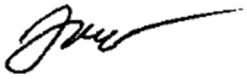
Preface

The Mid-Term Evaluation took place from February 2020 to June 2021. This Mid-Term Evaluation is intended to inform decisions regarding the implementation of the GEO Strategic Plan 2016-2025: Implementing GEOSS. This report presents key findings and recommendations based on evidence collected by the Mid-Term Evaluation Team through interviews, web-based surveys and reviews of GEO's key internal and external documents.

As with many other elements of GEO, the Mid-Term Evaluation Team is comprised of volunteers from Member States, who have been supported by a Monitoring and Evaluation Consultant. The Evaluation Team is chaired by the United States, and includes members from China, the European Commission, Japan, Malaysia, Mauritius, South Africa and the United Kingdom.

Given the importance of the Mid-Term Evaluation in ensuring the success of GEO, and the positive experience this particular evaluation has proven to be, we enthusiastically encourage other members of the Earth observation community to volunteer for subsequent efforts.

Sincerely,



Justyna Nicinska, Chair (USA)

Adrian Broad (UK)

Johan Pauw (South Africa)

Kate Hamer (UK)

Kun Yang (China)

Lim Ze Hui (Malaysia)

Mark Dowell (European Commission)

Surekha Ramessur (Mauritius)

Yoshihisa Shirayama (Japan)

Chiara Caimi (M&E Consultant)

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Acknowledgements

The Mid-Term Evaluation Team (MTE Team) thanks all interviewees and survey respondents for providing their contributions and insights on the Group on Earth Observations (GEO) and the Global Earth Observations System of Systems (GEOSS). The MTE Team would also like to thank the GEO Secretariat for the support they provided throughout the evaluation and for their helpful contribution in advertising the MTE community web-based survey. Finally, the MTE Team has been indebted to the support that Samantha (Sam) Reeves (UK Research and Innovation) has provided in organizing our meetings and documentation to allow us to concentrate on our main task of sifting through a wealth of information to condense into our report.

Acronyms

AfDB	African Development Bank
AI	Artificial Intelligence
APEC	Asia-Pacific Economic Cooperation
AWS	Amazon Web Services
CAMS	Copernicus Atmosphere Monitoring Service
CBD	Convention on Biological Diversity
CD WG	Capacity Development Working Group
CEOS	Committee on Earth Observation Satellites
CM4EW	Crop Monitor for Early Warning
CRADA	Cooperative Research and Development Agreement
DE Africa	Digital Earth Africa
DFAT	Department of Foreign Affairs and Trade
EARSC	European Association of Remote Sensing Companies
EC	European Commission
EDI	Equality, Diversity and Inclusion
EO	Earth Observation
EO4EA	Earth Observation for Ecosystem Accounting
EO4SDGs	Earth Observations for the Sustainable Development Goals
ESA	European Space Agency

ESRI	Environmental System Research Institute
EU	European Union
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
FAO	Food and Agriculture Organization
GBIF	Global Biodiversity Information Facility
GBON	Global Basic Observing Network
GCOS	Global Climate Observing System
GEE	Google Earth Engine
GEO	Group on Earth Observations
GEO-CRADLE	GEO Capacity Building in North Africa, Middle East, Balkans and Black Sea Region
GEOGLAM	Group on Earth Observations Global Agricultural Monitoring Initiative
GEOGloWS	Group on Earth Observations Water Sustainability
GEO LDN	Group on Earth Observations Land Degradation Neutrality
GEOSS	Global Earth Observation System of Systems
GERI	Global Ecosystem Research Infrastructure
GFOI	Global Forest Observations Initiative
GIDTT	GEOSS Infrastructure Development Task Team
GOOS	Global Ocean Observing System
GOS4M	Global Observation System for Mercury
GOS4POPS	Global Observation System for Persistent Organic Pollutants
H2020	Horizon 2020
IFI	International Financial Institution
IGOS-P	Integrated Global Observing Strategy Partnership
INEGI	National Institute of Statistics and Geography
INPE	Instituto Nacional de Pesquisas Espaciais
IOC-UNESCO	Intergovernmental Oceanographic Commission of United Nations Educational Scientific and Cultural Organization

IPCC	International Panel on Climate Change
IPR	Intellectual Property Rights
IRENA	International Renewable Energy Agency
JAXA	Japan Aerospace Exploration Agency
MDBs	Multilateral Development Banks
MEAs	Multilateral Environmental Agreements
MoU	Memorandum of Understanding
MTE	Mid-Term Evaluation
NASA	National Aeronautics and Space Administration
NMHS	National Meteorological and Hydrological Services
NOAA	National Oceanic and Atmospheric Administration
OGC	Open Geospatial Consortium
PFP	Private Fundraising and Partnerships
SBA	Societal Benefit Area
SDGs	Sustainable Development Goals
SMME	Small, Medium and Micro Enterprises
UN	United Nations
UNCCD	United Nations Convention to Combat Desertification
UNDRR	United Nations Office for Disaster Risk Reduction
UNECA	United Nations Economic Commission for Africa
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNGGIM	United Nations Committee of Experts on Global Geospatial Information Management
UNICEF	United Nations Children's Fund
UN OCHA	United Nations Office for the Coordination of Humanitarian Affairs
USGS	United States Geological Survey
VISC	Voluntary Indicative Scale of Contributions

WB	World Bank
WDS	World Data System
WFP	World Food Programme
WMO	World Meteorological Organization
WRI	World Resources Institute

Executive Summary

Introduction

The Group on Earth Observations (GEO) Mid-Term Evaluation Report is an assessment of GEO's key successes and opportunities for improvement during the first five years of the implementation of the GEO Strategic Plan 2016-2025: Implementing GEOSS, as well as GEO's ongoing efforts to connect the demand for sound and timely environmental information with the supply of data and information about the Earth. This evaluation addresses the full extent of the GEO Work Programmes 2016 and 2017-2019, the Engagement Priorities, Societal Benefit Areas (SBAs) and GEO activities in the period 2016 to 2020. An independent Mid-Term Evaluation Team (MTE Team) completed this report. The evaluation process was guided by key questions provided by the GEO Executive Committee to the Evaluation Team.

The MTE process and the writing of this report took place at a critical point in time for GEO, at the midpoint of implementation of its Strategic Plan and ahead of the renewal of GEO's mandate at the Ministerial Summit of 2025. The unique strategic importance of this moment, together with the interest of the GEO community in seeing GEO evolve and successfully embrace the next phase of its implementation, provided an important opportunity for the GEO community to provide their views and feedback on the first five years of the implementation of the GEO Strategic Plan.

Methodology

An analysis of feedback from 62 interviews, 143 responses to web-based surveys, 5 case studies, past evaluation reports and other GEO key documents, provided the basis for key findings and recommendations. The evaluation of progress was made against the goals and objectives contained in key documents as the GEO Strategic Plan 2016-2025, the GEO Engagement Strategy and the GEO Work Programmes over the period 2016 to 2020. The MTE Team identified six key focus areas that emerged from the research conducted, the analysis of documents, case studies, surveys and interviews results:

1) **GEO Organizational Model**,
2) **Policy and Users' Interface**,
3) **Interoperability with a separate focus on a) organizational interoperability and b) technical interoperability**,
4) **Regional GEOs**,
5) **The Private Sector**,
6) **The Trust Fund**.

Key Findings and Recommendations

Based upon the analysis of the collected information and careful deliberation by the MTE Team, the evaluation resulted in 15 findings and 10 recommendations. In general, one of the key achievements and added values of GEO is its ability to convene and facilitate interactions among the different stakeholders active in the Earth observation field by providing a flexible and adaptable framework for voluntary collaboration. Through the provision of this framework, GEO has been able to promote opportunities for data sharing and service delivery, for increased cooperation among different users and for the creation of connections along the Earth observation value chain. However, there remains room for improvement in key areas as the definition of priorities that would guide the work and evolution of GEO going forward and the development of a clear value added proposition that would renew stakeholders' support for GEO and its ambitious objectives.

KEY FINDING #1-Mission: GEO is making good progress on working towards becoming a world leading organization in coordinating availability, access and use of Earth observations. It is successfully contributing to unlocking the potential of Earth observations by connecting the demand for sound and timely environmental information with the supply of data and information about the Earth, facilitating their accessibility and application to global decision-making within and across many different domains. It has an opportunity to become increasingly recognized as a global convener of different communities including member states, international organizations, data and service providers, users and the private sector in the field of Earth observations given the increasing availability of data, increasing attention towards sustainability topics and the need for information that can support decision-making in this field. It can fulfil the above-mentioned role by leveraging its ability to connect such communities, particularly with a view to covering the downstream of the value chain, providing a platform for collaboration and representing a source of branding, recognition and trust. As regards the GEO-WMO relationship, respondents noted the need to better define and strengthen this relation, highlighting possible areas of complementarity.

KEY FINDING #2-Value proposition: A clear gap that is evident across GEO is the need to better define its value proposition. A clearly defined value proposition is missing from messaging to members, but also to external partners, including UN institutions, and partners, such as the private sector. GEO's voluntary nature can be an asset, but this needs to be tempered with a clear organizational vision that is communicated within the GEO community and to potential partners and funders. A part of this clarity will require greater interaction with individual members to better understand their needs and where GEO can contribute and what GEO can offer, for instance in convening, addressing capacity gaps, providing access to open Earth observation data or in the standing up of National GEOs. GEO's struggle to attract new donations to its Trust Fund can be partly tied to the lack of understanding among key stakeholders of the value of GEO coupled with a lack of communication/marketing of the value of GEO to the global community, as well as at the regional and national level. To define its value added, GEO should agree on specific areas of focus where it can deliver, in light of developing technologies relative to its founding goals and its convening function. There is a sense in the GEO community that the next phase of GEO should be more action-oriented on what GEO can deliver and where it can make unique contributions to establish itself as a global leader in Earth observation.

KEY FINDING #3-Communication and Engagement: From the surveys and interviews, it was shown that there are inconsistent methods of internal communication and coordination to share information across the GEO Work Programme and to engage both current and potential members and users. This has limited GEO's ability to advance as an organization. There is also a widespread perception that because of this lack of communication and engagement, many members are not involved or contributing as meaningfully as they could to the work and funding of the organization.

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.

KEY FINDING #5-Relations with the UN and other stakeholders: In the past five years, GEO's engagement with the UN and multilateral environmental agreements has improved consistently. This was largely due to the establishment of the Engagement Priorities that allowed for a better alignment of agendas in the context of the SDGs, the Paris Agreement and the Sendai Framework for Disaster Risk Reduction. However, there are opportunities to further improve relations with UN agencies both at a high policy level and at an operational level by deepening their collaboration with Regional, National GEOs and GEO Work Programme activities. GEO has made limited progress and it needs to work further to improve its relations with multilateral development banks and statistical agencies. There has been progress in this area over the past five years through Initiatives such as EO4EA and EO4SDGs making advancements, however GEO needs to continue to strengthen and expand these relationships across the organization. Strengthening such engagement would contribute to the establishment of a comprehensive ecosystem approach to the role of GEO in coordinating availability, access and use of Earth observations. Lastly, even though there has been progress in the engagement with the private sector and member states, better results can be achieved through a clearer definition of GEO value proposition.

KEY FINDING #6-Users' needs: Despite the different approaches adopted to this topic, GEO has not developed a systematic mechanism to report on users' needs and requirements, ensuring that these are identified and addressed, especially when different needs emerge at a regional, national and local level. This situation might vary at different levels of implementation of the GEO Work Programme, where specific activities, in particular Flagships such as GEOGLAM and GOS4M, or some Initiatives such as GEO LDN, GEOGloWS and EO4SDGs, may have a better understanding of their users' base. Regional GEOs together with the GEO Work Programme activities: Flagships, Initiatives and Community Activities have been indicated as bodies within the GEO global structure that could play a central role in reporting on users' needs and ensuring that GEO maintains contact with its users' base.

KEY FINDING #7-Internal processes and connections: The GEO Work Programme, while marked by bottom-up approaches and driven by coalitions of willing communities of practice, needs to be balanced with GEO's ability to maintain a clear vision and focus. The broad GEO Work programme would benefit from better coordination, improved communication and interoperability between GEO's implementation mechanisms. The scale of the current Work Programme makes this more challenging for the Programme Board and the GEO Secretariat to execute. Greater coordination at the thematic and regional level may help to reduce redundancies and improve integration. However, GEO needs to keep in mind that without additional resources (both within the Secretariat and from members) or improved rationalisation of existing activities it will be difficult to further expand the Work Programme while still maintaining its overall effectiveness and cohesion. The Executive Committee and Programme Board need to focus more on overarching thematic areas, and concrete goals for GEO providing more top-down direction, while balancing that with a bottom-up approach. The Societal Benefit Areas structure of the GEO Work Programme should be retained, alongside the Engagement Priorities to allow cross-cutting links. An increasing level of interaction between Regional GEOs should be encouraged. The new Knowledge Hub has a potential role

to play in providing information to show how Initiatives, Community Activities, Flagships and Regional GEOs currently connect, placing an emphasis on the value chain of Earth observation to users and where GEO provides this across its different initiatives.

KEY FINDING #8-External and technical interoperability: Despite recent attempts to improve it, the GEOSS Implementation Plan needs to be reviewed. The GEOSS portal, as described, is unable to meet user expectations in terms of its low technical capability, low performance compared with other global and regional systems, and the lack of good integration of in situ data. This view is supported by the low rates of use of the portal when compared with other global, regional and national portals. Technology advances have significantly changed the original concept for the GEOSS and GEO no longer has the tools, right partners or resources to meet the project GEO had intended in the early years (2005 – 2010) to build a system of systems. GEO would benefit from improved external connectivity with major Earth observation data portals, at all levels. Attention should be paid to links with global, regional and national data systems. Particular attention should be made to improving the availability and integration of in situ observations within the GEO Portal, working with in situ terrestrial, freshwater, coastal, ocean and atmospheric observation systems and new in situ initiatives such as GBON and others. It is believed that the new GEO Knowledge Hub could provide more support to the Earth observation value chain and, although still at an early stage of development, should become part of the GEOSS infrastructure. However, this development needs to be balanced against GEO's other priorities. Recently, the early development of the Knowledge Hub has required a high level of support from GEO Secretariat staff, and this heavy burden is not sustainable in light of other GEO priorities.

KEY FINDING #9-Role of Regional GEOs: Interviews with key informants highlighted that Regional GEOs need to become more integrated into the functions of the GEO Work Programme and the overarching structure of GEO itself. The current level of coordination and communication within GEO is insufficient to facilitate better interactions at the local/national/regional level with users and stakeholders. Regional GEOs could play a key role in helping to coordinate GEO Work Programme activities at the regional level and facilitating communication within GEO by serving as an intermediary between the development of the GEO Work Programme, the Secretariat, Working Groups and the Programme Board fostering collaboration and identifying potential synergies among all these bodies. Regional GEOs can also help bolster the implementation of GEO's capacity development strategy by showing where capacity development gaps exist and how GEO's efforts can have the most impact at the institutional level and organizational level. Regional GEOs also have a role to play in promoting exchange on best practices across GEO and upscaling/downscaling successful products, leveraging opportunities for engagement with the commercial sector and exploring funding opportunities at the regional level.

KEY FINDING #10-Capacity Development: Regional and National GEOs are in close contact with the users of GEO's EO-derived tools and services and as such these bodies, specifically when from developing economies, are also well-placed to identify and report on users' needs and requirements. These bodies would have a deeper understanding of local capacities and the level of expertise of defined categories of users' communities. Recognizing their role in support of capacity development will be important as GEO moves on to implement its capacity development strategy. Given that Regional GEOs have access to users they can tailor and scale solutions based on local conditions and priorities and have connections with other regional and national bodies.

KEY FINDING #11-Engagement with the Private and Commercial Sectors: Engagement with the private sector has increased over the past five years and overall is seen as beneficial and having added to the value of GEO. However, key informants highlighted that lack of the private sectors' involvement or views in GEO's activities such as in designing of GEO tasks or Work Programme and rules of engagement with the commercial sector adopted by GEO, among others, is causing the private sector, in particular small commercial sector companies, to not fully participate or see the benefits of participating in GEO's activities/programmes. In this sense, many noted that GEO should better define its value proposition for the commercial sector and that the GEO Secretariat and Regional GEOs could play a role to help match and broker possible collaboration between commercial sector partners and Work Programme activities. The majority of respondents called for GEO to establish rules of engagement with the commercial sector including integrity, independency, privacy and ethics principles. The majority of interviewees were also unaware of the existence of the Rules of Engagement with the Commercial Sector, which already address some of these items. This points to the existence of a communication gap across the organization. Those who were aware of their existence, noted that these rules currently provide very general principles for engagement that GEO should develop further in the future to address IPR and privacy with a more comprehensive approach. Some informants believe GEO is not engaging enough with the commercial sector, especially those having better resources and technology and they feel GEO is lagging behind in the development and application of technologies compared to the commercial sector.

KEY FINDING #12-Cloud Credits and License Programmes: The Cloud Credits and License Programmes have been mentioned by the majority as a positive example of engagement with the commercial sector with a clear value proposition aimed at promoting the use of Earth observations and skills development in developing countries. Informants suggested GEO should look at ways to make this engagement and the benefits derived from it become long-term by ensuring participants can retain and continue developing the skills acquired through the programme and that the programmes should become increasingly tied to the GEO Work Programme. By highlighting a disparity in the capacity levels of different participants, the programmes showed how further work is needed from GEO to support capacity development on the use of Earth observations.

KEY FINDING #13-Small, Medium and Micro Enterprises: Even though GEO's engagement has increased in recent years, respondents feel that GEO has so far shown little or no satisfactory engagement with the commercial sectors in SMMEs. GEO is perceived to engage more with multinational technology companies that conform with the GEO rules of procedure or afford the prospects of big grants. SMMEs, on the other hand, cannot compete with what can be offered by bigger companies at the international level and have structural barriers to engagement represented by limited opportunities and resources. Key informants feel that GEO should also engage more with SMMEs, diverse companies from different geographies and with different sizes, particularly in developing and least developed countries, with a clear plan to address structural barriers and equally pursue involvement with all of them. This perception stems from miscommunication more so than a lack of interest on GEO's part to engage with the SMMEs where a lot of the engagement with SMMEs and companies not involved in the Cloud Credits and License Programmes happens at the level of the Work Programme and is not publicised by the Secretariat. Some of the structural reasons limiting SMMEs engagement can be helped by better coordination but calling for a "level playing field" misses some of the structural challenges and does not fully consider all of what GEO attempted to date. However, there is room for improvement, especially where the need to communicate

better and clarify existing misconceptions is evident, and to improve coordination through an increased role of the Regional GEOs and the Secretariat.

KEY FINDING #14-Awareness: There is a general lack of awareness on the role of the Trust Fund and how it serves to support the operations of the GEO Secretariat, but also about the Standing Agreement and consequently the administrative arrangement in place between the GEO Secretariat and the WMO. This is demonstrated by the high percentage of respondents who chose not to address the question on the Trust Fund or declared they did not know enough to answer this question. This finding points to the need for systematic and continuous communication within the organization on priorities such as the GEO funding model, its functioning and role which allows the Secretariat to continue its operations.

KEY FINDING #15-Funding Model: The majority of interviewees and respondents to the surveys are in favour of maintaining GEO's voluntary funding model of best-effort cash or in-kind contributions to the Trust Fund. The majority believes that rather than shifting to a model requiring a minimum mandatory contribution, the current model should be optimized promoting an increase in the number of contributors, in the amounts contributed by each member and the number of in-kind contributions including secondments from member states, Participating Organizations and Associates. This can be done by promoting contributions according to the voluntary indicative scale of contributions, promoting public campaigns of support for GEO, exploring new funding opportunities and by enhancing members' perception of GEO value proposition through continuous engagement and better communication. In fact, it seems that the underlying issue behind the low level of contribution to the Trust Fund is the need to better define GEO's value proposition.

RECOMMENDATIONS WITH LINKS TO SUPPORTING KEY FINDINGS AND RELEVANT SECTIONS OF THE REPORT		
RECOMMENDATIONS	**SUPPORTING KEY FINDINGS**	**RELEVANT REPORT SECTION**
#1: GEO should improve the definition, targeting, communication of and emphasis on its value added proposition and benefits derived for external organizations to participate in GEO. Possible ways to do this include stressing GEO's messaging around its value added, its convening role, inclusivity and capacity development to foster greater engagement of all its existing and potential members, Participating Organizations and Associates. While no change is suggested to GEO's legal status and its Standing Agreement with the WMO, this specific relation, which is also administrative in nature, should be reviewed to identify possible areas of cooperation in light of recent improvements, taking into consideration the suggestions provided in the report.	• 1 • 2	• 3.2: GEO Organizational Model

#2: From an operational point of view, GEO should improve internal and external communication, as well as synergies among the different elements of the Work Programme, GEO governance bodies and the Secretariat, and to all of GEO relevant stakeholders, ensuring that frequency and content of communication is consistent across the organization and includes targeted communication on key items and decisions regarding the entire organization.	• 3	• 3.2: GEO Organizational Model • 3.3: Policy and Users' Interface • 3.4: Interoperability • 3.5: Regional GEOs • 3.6: The Private Sector • 3.7: The Trust Fund
#3: Given that the evaluation has highlighted that the concept of GEOSS and its implementation has come to assume different meanings across the organization, GEO should consider assessing the concept of GEOSS in light of the recent evolution of GEO. To do so, GEO should consider establishing an Expert Advisory Group composed of external experts, with expertise in Earth observation science, user engagement, as well as socioeconomic and policy domains, and internal members, to explore to what extent the concept of GEOSS is still relevant to the organization as it no longer appears to define the core of GEO's activities as originally defined.	• 4	• 3.2: GEO Organizational Model • 3.4: Interoperability (technical interoperability)
#4: GEO has made good progress on developing its relationship with UN institutions over the past five years and should work on strengthening this relationship further at a global, regional, national, and local level. GEO should also work on improving its engagement with International Financial Institutions, statistical agencies and the private sector increasing awareness of its role in the Earth observations field. To this end, GEO would benefit from a clearer value proposition and targeted focal themes that can help to improve linkages and coordination within the GEO Work Programme, as well as with external stakeholders. It is recommended that GEO's Executive Committee should	• 5	• 3.3: Policy and Users' Interface

revisit the 'flagship-centered strategy' it once proposed as a way to establish clearer overarching priorities that can help to create synergies in the Work Programme and align them with key focal themes that are relevant to GEO's users and stakeholders.		
#5: Reporting on and connecting with users' needs and their translation into requirements for products and services should be embedded in a more cohesive manner across the GEO Work Programme. GEO should consider a more structured way of collecting and consolidating requirements for their user community in a standardised format across the GEO Work Programme activities. GEO Work Programme activities should be expected to be able characterise and document these needs and requirements in a standardised format for their user community, by the time they reach the stage of a GEO Initiative. A greater role should be taken by Regional GEOs in collecting tailored requirements for their regions. The Programme Board should ensure that these needs and requirements are better integrated across GEO's system to guarantee the broad thematic scope of GEO engenders its full potential and to increase their capacity to link national and regional realities with the global GEO. GEO should also clarify how and if GEO activities should progress from a Community Activity to an Initiative to a Flagship. GEO should have greater clarity on the requirements to progress from one stage to the next and also on how many Flagships GEO should have, and when activities should remain at their existing level or when the latter should progress. In summary, there is limited guidance on the lifecycle of activities within the GEO Work Programme.	● 6	● 3.3: Policy and Users' Interface
#6: GEO would benefit from establishing clearer high-level focal themes that can serve to drive synergies and improve	● 7	● 3.4: Interoperability

coordination across the GEO Work Programme. That would be done by having them established at the Executive Committee level and then executed by the Programme Board and GEO Secretariat in coordination with the Work programme activities. It would be beneficial for the GEO Executive Committee to establish a team or teams, which can consider relevant international objectives and priorities of GEO's members that can in turn guide the identification of possible focal themes for GEO for a set number of years. This team, which is also encouraged to consult users and external communities, can advise the GEO Executive Committee on four important areas to improve synergies, knowledge sharing and reduce redundancies: i) improving connections between GEO activities that can link to high-level priority areas for GEO; ii) considering how these high-level focal themes will be benefitted by improved knowledge sharing and sharing of experiences using the new Knowledge Hub alongside other coordination mechanisms; iii) providing recommendations concerning the inclusion of further activities, and highlighting any gaps in the GEO Work Programme and the value chain on the use of Earth observation under the GEO Work Programme in consideration of the proposed focal themes; and iv) improved links between Regional GEOs, which will also need to be reflected in the proposed high-level focal themes approach.		(organizational interoperability)
#7: GEO should review the content of the GEOSS Implementation Plan to make sure it i) has good links with key global, regional and national data portals; ii) addresses gaps in the integration and availability of in situ data; and iii) plans for appropriate use of the Knowledge Hub within the GEOSS overarching structure to demonstrate the value of Earth observation to decision makers. In particular, the work of the In Situ Subgroup of the Data Working Group should be strengthened to	• 8	• 3.4: Interoperability (technical interoperability)

focus by GEO theme on in situ data gaps and access. GEO should continue promoting data sharing and management principles for in situ data, including how best to provide access to holdings of scientific networks, citizens' observation programmes, and non-government data providers.		
#8: Given that the MTE has highlighted the need to better integrate Regional GEOs within the GEO overarching structure and Work Programme, GEO should consider possible solutions to promote an increased engagement, coordination with, and contribution of Regional GEOs across GEO's governance structure and Implementation Mechanisms. This increased engagement should not add another governance level, but rather utilize existing mechanisms for improved operations between the regional and global level of GEO. Given the unique characteristics of each Regional GEO, it should also ensure a balanced approach that allows flexibility for members and GEO activities to engage directly with GEO at the global level depending on regional preferences and dynamics. Regional GEOs contributions should be focused in five key areas: - Improving overall communication and coordination across the GEO Work Programme and connection with the GEO Secretariat, - Contributing to the realization of GEO's strategy on capacity development given their unique knowledge of users' needs and requirements based on existing capacities, - Promoting opportunities for exchange of best practices and uptake/scaling of successful products that may be developed at a regional or subregional level, - Leveraging opportunities for engagement with SMMEs at the regional level by brokering relations among the SMMEs, the Secretariat and GEO Work Programme activities,	● 9 ● 10	● 3.5: Regional GEOs

- Exploring opportunities for the mobilisation of resources at the regional, national and local levels. To strengthen the role of Regional GEOs, GEO should consider a role for Regional GEOs that would create synergies with other bodies. Some considerations include having a seconded expert to serve as a point of contact and coordination for Regional GEOs at the Secretariat; holding a regular coordinating call between Regional GEOs; organizing an annual event for Regional GEOs to share best practices or establishing a communication tool/platform that Regional GEOs could use to exchange information, organize virtual meetings, and share materials.		
#9: In view of increasing its engagement with the commercial sector, GEO should try to address the needs of different commercial sector players that might be interested in getting involved, considering possible barriers to engagement and differences related to geography and size. To do so, GEO might consider adopting an action plan for engagement with the commercial sector, developing a targeted approach to address partnerships with companies of different sizes, sectors and geographies. While past engagements brokered by the Secretariat with Amazon, Google and Microsoft, and other engagements that developed at the Work Programme level have represented positive experiences, GEO should improve communication about these efforts across the GEO community. It should also increase awareness regarding the existence of Rules of Engagement with the Commercial Sector, that represent a flexible framework for engagement. A minority of the GEO community is aware of the existence of this framework, while many do not realize that this is already established. Given that GEO already has some basic principles laid out on IPR, it should work	• 11 • 12 • 13	• 3.6: The Private Sector

to make these clearer, develop these further in light of the work of the Data Working Group on IPR and privacy and evaluate how it should engage with different opportunities, given the role it is asked to play in each exchange with the commercial sector. In doing so, GEO may wish to explore, based on the nature of the commercial sector engagement, the use of solutions as memoranda of understanding, or tools such as CRADAs to ensure the establishment of a set framework to carry out such engagements in a collaborative fashion. Lastly, Regional GEOs and the GEO Secretariat would be best placed to play a key role to foster engagement with the commercial sector by assuming a more central role in brokering engagement and matching potential partners at a regional and global level with GEO Work Programme activities. The potential for an incubator supporting SMMEs active in the field of Earth observations may also be considered.		
#10: To favour awareness of the Trust Fund, its role and function, and to encourage contributions to it from GEO members and stakeholders, GEO should communicate its value proposition more clearly across the entire organization and highlight the importance of the GEO Secretariat and the role it plays in coordinating GEO's activities. This could be achieved by i) continuing to use public campaigns of commitment to show members' engagement such as the GEO Pledge campaign, ii) encouraging secondments and other in-kind contributions from all GEO members in line with the amounts suggested in voluntary indicative scale of contributions, iii) promoting more the role and value provided by GEO as a leading organization in the field of Earth observations, and by iv) actively exploring potential donors that GEO has not approached yet in order to diversify its donor base.	• 14 • 15	• 3.7: The Trust Fund

1. Evaluation Details

1.1 Introduction

GEO committed to conduct a Mid-Term Evaluation focusing on the developments within GEO from the beginning of the implementation of the GEO Strategic Plan 2016-2025: Implementing GEOSS. As mentioned in the GEO Strategic Plan 2016-2025 Reference Document, this evaluation addresses the full scope of activities within GEO and its primary focus is on the Strategic Objectives and expected results of the work of GEO.

The enhancement of monitoring and evaluation and tracking of the results and benefits of the work of GEO were called for by the Mexico City Ministerial Declaration signed in Mexico City in 2015 by Ministers, GEO members and participants. The GEO-XV Plenary, following recommendations from the Executive Committee, agreed that a comprehensive Mid-Term Evaluation would be commenced in 2019 to allow for the delivery of a final report at the time of the GEO-XVII Plenary. Subsequently, a Mid-Term Evaluation Team, hereby called the MTE Team, composed of nominated experts from GEO's Member States and Participating Organizations was tasked with carrying out the Mid-Term Evaluation of GEO's Strategic Plan 2016-2025.

The MTE process was performed under a very tight schedule because of delays due to the COVID-19 global pandemic. Also, the methodology had to be adapted to the home-working arrangements introduced with the pandemic. However, the MTE Team completed its work in order to present the final report to the GEO Executive Committee in July 2021 at its 55th meeting and to the GEO-XVII Plenary[1] in November 2021. The purpose of this Mid-Term Evaluation is to provide an objective assessment of the progress in the implementation of the GEO Strategic Plan 2016-2025 and GEOSS in order to verify the achievement of the expected benefits for the global community. The primary target audience for the evaluation is the GEO Plenary, the Executive Committee, the Programme Board and the Ministers of the GEO Members. The secondary audience are end users, potential new partners of GEO and all the stakeholders of GEO. This evaluation should inform decisions by both of these audiences regarding the future direction of GEO and may serve to broaden support for GEO. The members of the MTE Team are the sole authors of the evaluation report, which includes findings and recommendations to be explored by GEO.

1.2 Overview of GEO and GEOSS

GEO was launched in response to calls for action by the 2002 World Summit on Sustainable Development and by the Group of Eight leading industrialized countries. GEO was born with a mandate to promote international cooperation in Earth observations as a tool to support decision-making.

GEO is a voluntary partnership of governments, academic and research institutions, businesses and international organizations. It provides a framework within which these partners can develop new projects and coordinate their strategies and investments. As of April 2021, GEO Members include 113 national governments, including the European Commission. In addition, 135 Participating Organizations, 26 Associates and Observers are also part of this global

[1] The GEO-XVII Plenary was initially scheduled for 2020 but has been postponed to November 2021 due to delays caused by the COVID-19 pandemic.

network. GEO is also working to create a Global Earth Observations System of Systems (GEOSS) to integrate observing systems with a view to connecting existing infrastructure facilitating the sharing of environmental data and information collected from the large array of observing systems contributed by countries and organizations within GEO. Ministers of the GEO member countries have the decisional power to provide the political mandate of the organization and its strategic direction, they meet periodically in the GEO Plenary, which is the highest-level decision-making assembly of GEO. The regional caucuses every two years nominate 16 representatives from the Plenary that form the Executive Committee, which oversees the operations of the organization.

GEO's Engagement Priorities approved in November 2016 include the United Nations (UN) 2030 Agenda for Sustainable Development, the Paris Agreement, and the Sendai Framework for Disaster Risk Reduction. GEO also works across eight Societal Benefit Areas (SBAs), fostering the role of Earth observations in decision-making. The eight SBAs presented below have been confirmed as a focus for GEO activities in this decade by the GEO Strategic Plan 2016-2025.

- Biodiversity and Ecosystem Sustainability
- Disaster Resilience
- Energy and Mineral Resource Management
- Food Security and Sustainable Agriculture
- Public Health Surveillance
- Infrastructure and Transport Management
- Sustainable Urban Development
- Water Resources Management

1.3 Objectives

The Mid-Term Evaluation has been designed to answer critical questions about progress in the achievement of GEO Strategic Objectives and the implementation of GEOSS. The findings and recommendations of the MTE may be used to inform decisions concerning GEO governance, planning, operations and reporting processes, or other aspects of the implementation of GEOSS. The following objectives have been defined for the MTE of GEOSS implementation:

- Address the full scope of activities within GEO's Work Programmes 2016 and 2017-2019, with a primary focus on the Strategic Objectives and the expected results outlined in the Strategic Plan 2016-2025;
- Assess to what extent the priorities identified in the Mexico City Ministerial Declaration have been realized;
- Refine directions set out in the GEO Strategic Plan to take into account emerging trends and challenges.

1.4 Scope

The Mid-Term Evaluation includes years from 2016 to 2020 of the Strategic Plan 2016-2025: Implementing GEOSS. Listed below are the key mid-term evaluation parameters and specific exclusions from the scope of this evaluation. The three Strategic Objectives outlined in the Strategic Plan: *Advocate, Engage, Deliver* fall within the scope of this evaluation, together with

the Mexico City Declaration, the two Work Programmes for 2016 and 2017-2019, the GEO Engagement Strategy and Priorities and the Canberra Declaration. The Team has reviewed major decisions taken by GEO governance bodies and Work Programme activities with respect to the evaluation questions that were included in the Terms of Reference reported below.

1.4.1 GEO Strategic Plan 2016-2025: Implementing GEOSS

The Ten-Year Strategic Plan for the period 2016 to 2025 follows the first Ten-Year Strategic Plan from 2005 to 2015. The Plan defines a vision statement for GEOSS, its mission, values, strengths, scope and objectives, expected benefits, and lastly its approach towards implementation. The ten-year strategy revolves around the further development and strengthening of the building blocks of GEOSS as well as eight SBAs in biodiversity, disaster resilience, agriculture, infrastructure, energy, public health, urban development and water. The Strategic Plan notes how the need for greater capacity to access and use Earth observation data, information, tools and services is particularly strong in developing countries. To promote capacity building, GEO suggested it would foster the engagement of institutional users worldwide, including both developed and developing countries and assist developing countries and regions in increasing their capacity to benefit from the use of Earth observations[2]. The Strategic Plan points to the building of GEOSS as the core element of GEO's mission to facilitate the sharing and access to Earth observations data and information collected from observing systems contributing to GEO. This document serves as a key reference for the MTE with respect to clarifying the intended priorities and outcomes of GEO by 2025.

1.4.1.1 Strategic Objectives

GEO's three key Strategic Objectives: *Advocate, Engage, Deliver* are currently defined in GEO Strategic Plan 2016-2025: Implementing GEOSS. These Strategic Objectives represent the three key activities GEO will have to deliver on to achieve its mission and vision by 2025. They focus on advocating Earth observations as an important source of information, engaging with different categories of stakeholders to foster partnerships aimed at addressing environmental challenges in a more effective way through the use of Earth observations and lastly, delivering data and information to improve decision and policymaking.

1.4.2 Mexico City Declaration

The MTE Team will verify aspects of GEOSS implementation within the context of the priorities stated in the Mexico City Declaration of 2015 including the importance of continuing to grant full and open access to Earth observation data. Through the Mexico City Declaration and the Strategic Plan 2016-2025, GEO Ministers endorsed the strengthening of GEO's vision and mission. The declaration was a call to continuously increase the role of GEO to enable critical decision-making in the future for the benefit of humankind by engaging with its key stakeholders, fostering strategic partnerships and facilitating the active participation of developing countries.

1.4.3 GEO Work Programmes

The implementation of GEOSS has been coordinated through a series of GEO Work Programmes. Each Work Programme usually covers a period of three years and their implementation contributes to achieving GEO's Strategic Objectives. The MTE Team used GEO Work Programmes, in particular the Transitional one for the year 2016 and the one for 2017-2019 to determine the extent to which GEO and GEOSS implementation are progressing to meet the 2025 expectations of the GEO community.

[2] GEO (2015). GEO Strategic Plan, p. 12.

1.4.4 GEO Engagement Strategy and Engagement Priorities for 2017-2019

This mid-term evaluation will contribute to determining whether GEO has progressed towards the aims of its Engagement Strategy to become the reference global initiative that facilitates evidence-based decision-making by unlocking the potential of Earth observations. It also assesses how the three Engagement Priorities have acted as a driver for the engagement actions articulated in the GEO Engagement Strategy Implementation Plan for 2017-2019. The Engagement Priorities on which the Plenary has agreed GEO should focus on are the 2030 Agenda for Sustainable Development, the 2015 Paris Agreement and the Sendai Framework for Disaster Risk Reduction 2015-2030. Below is a map showing how these three Engagement Priorities interlink with GEO's eight SBAs where Earth observations play a key role in decision-making and that have been confirmed as a key focus for GEO over the period 2016-2025.

Mapping GEO's Societal Benefit Areas against the Engagement Priorities

	Sustainable Development Goals	Paris Agreement	Sendai Framework
Biodiversity and Ecosystem Sustainability	SDG 14 and 15		
Disaster Resilience			
Energy and Mineral Resources Management	SDG 7		
Food Security and Sustainable Agriculture	SDG 2		
Public Health Surveillance	SDG 3		
Infrastructure and Transport Management	SDG 9		
Sustainable Urban Development	SDG 11		
Water Resources Management	SDG 6		

Figure 1. Mapping GEO's Societal Benefit Areas against the Engagement Priorities

The Engagement Priorities have been considered as directly addressing the Societal Benefit Areas only when mentioned explicitly as areas of focus in the Engagement Priorities framework documents. For example, Disaster Resilience is indirectly addressed in the Sustainable Development Goals (SDGs), but there is no specific SDG focusing directly on this Societal Benefit Area.

Source: created by the MTE Team

1.4.5 Canberra Declaration

The Mid-Term Evaluation will verify aspects of GEOSS implementation within the context of the priorities stated in the Canberra Declaration of 2019 including the importance of Earth observations in creating opportunities for economic growth and increased engagement with a number of partners including international organizations and the private sector. Through the Canberra Declaration, the commitment of members to the GEO's vision and mission was

renewed, calling upon the GEO community to recognize and advocate the value of Earth observations for the benefit of humankind.

1.4.6 Evaluation Questions

As stipulated in the Terms of Reference for the Mid-Term Evaluation detailed by the Executive Committee in November 2019, five specific questions were to be addressed in the evaluation. The MTE Team made it a priority to gather answers to these from the survey and interviews it organized with the GEO community, as well as other supporting documents. The five specific questions are listed below, and the results of the evaluation have been organized in focus areas aimed at addressing these questions.

1. What results have been realized with respect to GEO's strengthened focus on users and stakeholders; in particular, on working with United Nation institutions, multi-lateral environmental agreements, multi-lateral development banks, statistical agencies, and the private sector?
2. What results has GEO achieved with respect to increasing the use, sharing and availability of Earth observations in implementing GEOSS as stated in the Strategic Plan?
3. What evidence exists for the influence of Earth observation information products and services developed, produced or delivered through GEO Work Programme activities on decision-making (by individuals, organizations, governments, etc.) and what evidence is there of benefits derived from such influence?
4. How has the implementation of GEO Engagement Priorities impacted GEO's work, including on: the GEO Work Programme, the GEO Secretariat, GEO governance bodies (GEO Plenary, Executive Committee, Programme Board, Regional GEOs), relations with GEO Members and Participating Organizations, and relations with other organizations?
5. To what extent have the changes introduced in the GEO Strategic Plan 2016-2025 impacted the effectiveness of the GEO Work Programme, decision flows and interactions amongst GEO governance bodies, and increased mobilization of resources to the GEO Trust Fund?

In subsequent meetings with the Executive Committee, the MTE Team was requested to take a closer look at the GEO Trust Fund model, and capacity development across GEO. The MTE Team sees the highlighted questions as components of the original five questions that have been included in the MTE's evaluation and has addressed these as part of the report focus areas.

1.4.7 Limitations of Scope

The Mid-Term Evaluation does not address the developments and details of the 2020-2022 GEO Work Programme except to the extent that these relate to key observations and gaps emerging from the implementation of the 2016 Transitional and 2017-2019 GEO Work Programmes. It is also important to note that the MTE Team's task was to evaluate GEO Strategic Plan's implementation and not GEO as an organization or its structure.

1.5 Report Structure

The Mid-Term Evaluation report is structured in five main sections: Methodology, Overview of GEO and GEOSS, GEO's Strategic Plan Implementation Progress with the six Key Focus Areas for the Mid-Term Evaluation and the section on Taking Stock of GEO's Strategic Plan Implementation. Included at the end of the report is a summary of major findings that emerged

during the Evaluation. Recommendations are also found at the end of the report in a summary table relating these to the key findings of the report.

2. Methodology

For this Mid-Term Evaluation report, the MTE Team drew data from various sources of information including GEO and non-GEO documents, interviews, surveys and case studies that have been conducted and analysed by the MTE Team.

The different evaluation methods that have been used to deliver the final report include:

1) **Review of GEO and non-GEO documents** including past evaluations, ministerial declarations, GEO Work Programmes, GEO Strategic Plan, Engagement Strategy and other GEO's official and unofficial reference documents, but also external articles and publications referring to GEO and GEOSS,
2) **Interviews with key informants:** Interviews have been conducted with a number of stakeholders including members of GEO governance bodies, participants in Work Programme activities and representatives of GEO Member States and Participating Organizations. The Team has conducted 36 interviews with key informants in total,
3) **Targeted interviews:** Considering that the Team has decided to highlight some specific areas of focus for the report, it has conducted 17 targeted interviews to gather the views of key GEO stakeholders on topics such as capacity development, GEOSS, the implementation of the GEO Work Programme, the Trust Fund, engagement with the commercial sector, equality, diversity and inclusion within GEO and the role of Regional GEOs. These interviews were useful in providing an additional layer of analysis to specific areas of the evaluation on which data was lacking,
4) **Interviews with the GEO Secretariat:** the MTE Team conducted 9 interviews with the staff of the GEO Secretariat based in Geneva, 5 of which focused on the role the Secretariat plays within GEO and 4 were focused on the analysis of specific topics,
5) **Survey for the GEO community:** the MTE Team has received 117 completed questionnaires by the GEO community,
6) **Survey for the GEO Secretariat:** the MTE Team has received 9 completed questionnaires by the GEO Secretariat's staff,
7) **Survey to the Commercial Sector and Associates:** the MTE Team has received 17 completed questionnaires by GEO's commercial sector partners and Associates.
8) **Case studies:** The MTE Team selected five case studies to be included in the final report, on which it has conducted a value chain analysis to deepen the understanding of key topics for the purpose of the evaluation. The five selected case studies include: Global Observation System for Mercury (GOS4M), Group on Earth Observations Global Agricultural Monitoring Initiative (GEOGLAM), Blue Planet, GEO Capacity Building in North Africa, Middle East, Balkans and Black Sea Region (GEO-CRADLE) and Digital Earth Africa (DE Africa)[3].

The COVID-19 pandemic has impacted the timeline and work approach of the MTE Team causing some delays to the original plan for the completion of the MTE Report. These delays regard, in particular, the extension of the time to complete surveys destined to the GEO Community, Secretariat, Associates and the commercial sector, subdued engagement and participation in the interviews by some key informants and cancellation of physical in-focus sessions planned with key stakeholders. Despite the situation described above, the MTE Team could carry out its task and managed to present the final version of the report to the Executive Committee at its 55th meeting in July 2021 and to the GEO-XVII Plenary in November 2021.

[3] More details on the Case Studies can be found in Chapter 7 of the Mid-Term Evaluation report.

2.1 Overview of the Sample

The MTE Team has drawn data for the purpose of this evaluation from a variety of sources. In total, among surveys and interviews, 205 participants have taken part in the evaluation process including surveys to the GEO Community, Commercial Sector and Associates and Secretariat which have received respectively 117, 17 and 9 answers. The MTE Team also conducted a total of 62 interviews including 36 interviews with GEO key informants, 9 interviews with staff of the Secretariat and 17 targeted interviews. In total, 4 out of the 9 interviews with the Secretariat staff focused on specific topics and 3 of the 17 targeted interviews focused on more than one topic. At the beginning of the evaluation, the MTE Team expected to conduct a total of around 60 interviews, which is in line with the final result.

In terms of the composition of the survey sample and interviewees, respondents have a wide variety of backgrounds and are related in different ways to GEO[4]. 42% of the respondents are engaged either in Regional GEOs or Initiatives, while almost a quarter is engaged in other areas of work, of which a significant percentage is represented by members of Working Groups, member countries delegations, representatives of the Executive Committee and Programme Board. The MTE Team interviewed 11 members of the Programme Board and 9 members of the Executive Committee including all the lead co-chairs of the Executive Committee. Around two third (64%) of participants in the MTE process are from Governments or Academia/Research institutions, 11% is from the Private/Commercial Sector and 10% is from Intergovernmental Bodies and the remaining 15% is from the GEO Secretariat, Non-Governmental Organizations or Community Activities.

The level of geographic diversity of the sample is quite broad; in fact, respondents come from a total of 44 countries. Almost a half (47%) of respondents come either from Europe or North America. Answers from Asia represent 14% of the total, from Africa and Central and South America respectively 13% and 12%, while 2% of the answers are from Oceania. Breaking down the results from a point of view of the

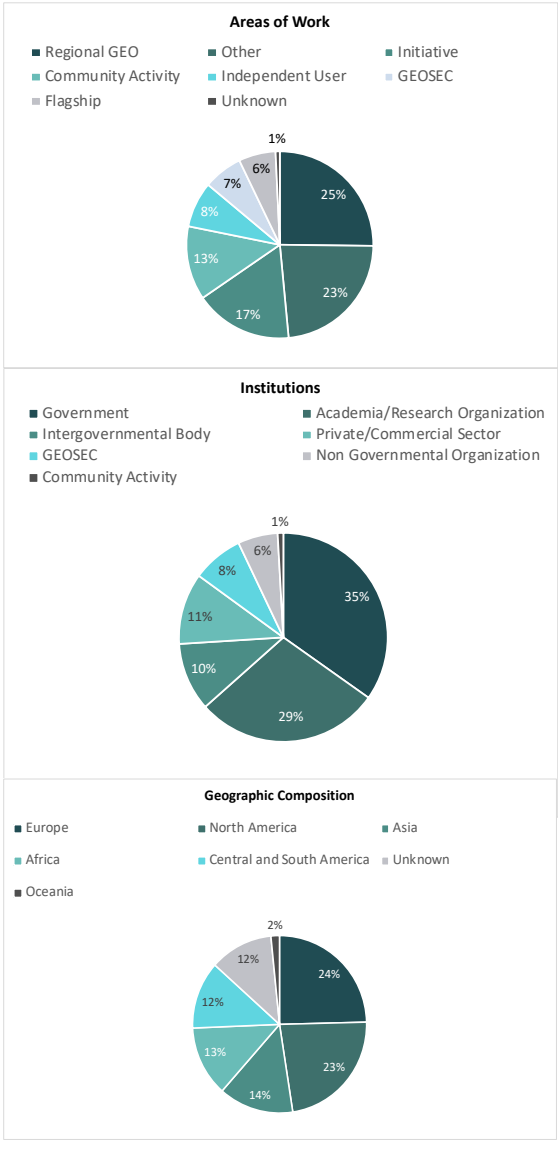


Figure 2. Sample Composition

[4] Secretariat's staff will not be accounted for in the geographic statistics presented below as their institution is GEO itself, which is located in Europe. Hence, the statistics on the geographic composition of the sample are calculated for surveys and interviews excluding staff of the Secretariat.

Regional GEOs, participants from the Americas region represent 35% of the total, from Europe 24%, from the Asia-Oceania region 16% and from Africa 13%. In total, 26% of respondents are from developing countries, coming from a total of 25 countries[5].

Given time and access limitations, the data and opinions gathered through the surveys and interviews conducted by the MTE Team cannot be considered to be representative of the views of the entire GEO community. However, the MTE Team made it a priority to achieve a high level of representation of the different communities and stakeholders of GEO.

[5] Developing countries are defined based on the information provided in the World Economic Situation and Prospects from the UN, p. 165 (2020).

3. GEO Strategic Plan Implementation Progress

3.1 Key Focus Areas

The MTE Team identified six key focus areas that emerged from the research conducted, the analysis of documents, case studies, surveys and interviews results:

1) **GEO Organizational Model:** Focus on the increasing role of GEO as a convening body of Earth observation interests, coordinating availability, access and use of Earth observations for the benefit of the planet and humankind,
2) **Policy and Users' Interface:** Evaluation of GEO's role and success in connecting across the Earth observation value chain and the policy-user interface,
3) **Interoperability:** Analysis of a) organizational interoperability among the key pillars of GEO and the GEO Work Programme and of b) technical interoperability of the GEOSS platform with different Earth observation systems,
4) **Regional GEOs:** Exploration of opportunities for an increased role of Regional GEOs within the global GEO structure, with an eye to their role in promoting capacity development and inclusivity,
5) **The Private Sector:** Review of the full scope of GEO's engagement with the private and specifically the commercial sector at the global and regional level,
6) **The Trust Fund:** Assessment of the funding model for GEO and the role of the Trust Fund as an enabler of GEO's prosperity and future growth, as well as GEO's financial sustainability.

The GEO definition of the *private sector* includes non-governmental organizations as research institutions, not-for-profit and other non-governmental organizations whereas the *commercial sector* category only includes for-profit organizations. For this reason and with reference to Focus Area 5 above, it is important to note that the MTE Team started by considering GEO's engagement with the *private sector* at large and later focused through targeted interviews and the Commercial Sector and Associates survey on analysing the relation with the *commercial sector*. The majority of the respondents interviewed commented on the engagement between GEO and commercial entities within the private sector, leading the analysis in this evaluation to focus on the commercial sector.

The key areas of focus of the report were agreed upon based on the main trends that were observed in the answers of interviewees and survey respondents, taking into consideration the specific evaluation questions provided by the Terms of Reference of the MTE included as Annex 7.1. The findings relating to each of these areas are presented below.

3.2 GEO Organizational Model

3.2.1 Overview

GEO is an intergovernmental organization, established on a voluntary, legally non-binding basis with a mission to connect the demand for sound and timely environmental information with the supply of data and information about Earth. For this reason, GEO does not have an independent legal personality and the GEO Secretariat is currently hosted and integrated as part of the World Meteorological Organization (WMO) in Geneva, which has an independent legal personality and provides the Secretariat with administrative services, including legal, financial, personnel and contracting services.

During the first decade following the setting up of GEO, its priority has been the development of GEOSS, advocating broad, open data sharing and access, initiating major global monitoring initiatives, strengthening regional coordination, and establishing a strong and diverse community. Building on its accomplishments and yet recognizing the need for further collective effort to foster the use of Earth observation resources to their fullest extent, the GEO Ministerial Committee extended the mandate of GEO for a second decade through the adoption of the GEO Strategic Plan 2016-2025. This Strategic Plan identifies improvements in areas highlighted in the Mexico City Declaration and also lays emphasis on achieving three Engagement Priorities, strengthening the SBAs; engaging more broadly with stakeholders including the United Nations and the private sector; establishing a robust, steady resourcing mechanism within the voluntary framework of GEO; identifying new opportunities for GEO and increasing the importance of users within the GEO structure, to address their needs and requirements and support capacity development. The Strategic Plan has been coupled with an Engagement Strategy launched in 2016 specifically addressing one of the three Strategic Objectives of GEO Strategic Plan, *Engage.* It provides an overview of the objectives, approach, target stakeholders and methodologies necessary to realize GEO's vision.

This focus area is dedicated to reviewing GEO's organizational model, its overall progression towards the implementation of its Strategic Plan 2016-2025, and the Strategic Objectives included in this plan. Analysing the GEO organizational model allowed the MTE Team to verify GEO's alignment with its institutional focus. This includes GEO's overall relevance and long-term sustainability as it is reflected in the organization's context for change and vision, its strategy, objectives, and values, as well as its capacity to deliver on its mission. The stakeholders with whom GEO works directly or influences through its work in the field of Earth observations, have been mapped below. GEO core stakeholders are the Plenary members, holding the decision-making authority within the organization, primary stakeholders are those with a direct interest in GEO, while secondary stakeholders are external stakeholders that do not directly engage in GEO.

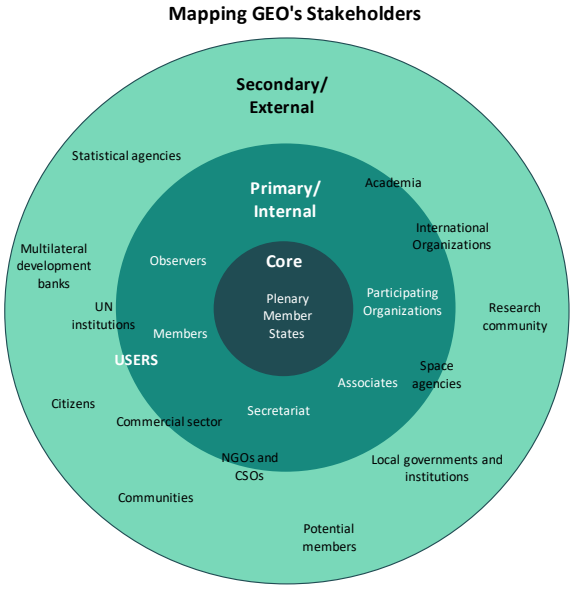


Figure 3. Mapping GEO's Stakeholders

GEO's stakeholders are classified in three different categories: Core, Primary or Internal and Secondary stakeholders. However, some fall under two categories as, for example, some space

agencies are Participating Organizations, while the ones that are not Participating Organizations can be considered as secondary stakeholders.

Source: created by the MTE Team

3.2.2 Evidence from Current Evaluation

3.2.2.1 Review of the GEO Organizational Model

The analysis of interviews and survey responses has highlighted that GEO carries out three main activities and as such has developed three main roles:

1) Role of GEO as a facilitator/convener for the Earth observation community and diverse stakeholders,
2) Role of GEO as a maintainer of technology infrastructure and
3) Role of GEO as a developer/provider of user-orientated information.

These activities are part of the GEO Core Functions as can be seen in Table 1 below. Until now, GEO has managed to encourage and support activities in all three areas. Responses to the GEO MTE surveys, questionnaires, and interviews spanning across different geographical regions and sectors have provided varying views regarding which of these areas of activity GEO should prioritize. Overall, these three areas remain relevant and important, but respondents did not have consensus about if and how these should be prioritized. However, respondents recognized that GEO potentially suffers from continuing to support such a wide portfolio of activities given its limited dedicated resources, as highlighted in the Cost Structure and Revenue Stream sections of the table below. Most interviews and survey respondents also highlighted how GEO should better frame its value proposition, by clearly prioritizing activities aimed at achieving results in a few key issue-areas. Once the overarching vision of the organization and its value proposition reflective of the various categories of GEO stakeholders has been clarified, respondents indicated that GEO should focus on communicating this clear value proposition internally with its members and externally with its partners and stakeholders.

Table 1. The GEO Organizational Model

<table>
<tr>
<td rowspan="2">KEY PARTNERS
1) Governments
2) UN Agencies, Treaties and Conventions
3) Academia and research organizations
4) Private and commercial sectors
5) Civil society</td>
<td>KEY ACTIVITIES
Carrying out GEO Core Functions:
1) Identifying user needs and addressing gaps in the information chain
2) Sustaining foundational observations/data
3) Fostering partnerships/mobilizing resources
4) Advancing GEOSS and best practices in data mangement, sharing
5) Implement sustained global and regional services
6) Cultivating awareness, capacity, innovation.
Three main functions of GEO:
1) GEO as a convener/facilitator
2) GEO as a maintainer of infrastructure
3) GEO as a provider of preoperational/operational services</td>
<td rowspan="2">VALUE PROPOSITION
Because of its broad intergovernmental membership and variety of contributing organizations, GEO is able to assemble and coordinate expertise from across different disciplines and communities. GEO uses this convening power to bring together the unique combinations of partners required to address societal challenges faced by communities across the globe at every scale, from individuals to countries, to continents, drawing on comprehensive, coordinated and sustained Earth observations (GEO Strategic Plan 2016-2025, p. 5)</td>
<td>STAKEHOLDER RELATIONSHIPS
In general, all of GEO's stakeholders that have been interviewed would like GEO to continuously and consistently communicate and engage with them from both a strategic and substantive and an operational point of view</td>
<td rowspan="2">STAKEHOLDER SEGMENT
1) Members (Member States, Participating Organizations, Associates and Observers): all of GEO members receive, and pay on GEO value proposition through their contributions to it. They also decide on GEO's value proposition and some have a primary role in its implementation through their position in the Executive Committee.
2) Potential members: governments, UN entities and other IFIs, private, academia and commercial sector entitites that are not members of GEO and that receive GEO value proposition</td>
</tr>
<tr>
<td>KEY RESOURCES
1) GEO Secretariat staffing
2) Trust Fund resourcing
3) GEO Work Programme funding
4) GEO Work Programme contributors</td>
<td>CHANNELS
1) GEO Implementation mechanism/ GEO Work Programme activities
2) GEO Executive Committee
3) GEO Secretariat
4) GEO Members and GEO Principals
5) Regional GEOs</td>
</tr>
<tr>
<td colspan="3">COST STRUCTURE
Direct and indirect costs of GEO/GEOSS (e.g. studies, reports, materials)
Direct costs of tjhe GEO Secretariat (e.g. salaries, travels, equipment)
Indirect costs of the GEO Secretariat (e.g. payments made to the WMO for provision of services to GEO)</td>
<td colspan="3">REVENUE STREAM
Cash and in-kind contributions to the GEO Trust Fund
Cash and in-kind contributions to the GEO Implementation Activities/GEO Work Programme</td>
</tr>
</table>

Source: created by the GEO MTE Team[6]

The GEO Organizational Model, which will be analysed further in section 3.2.2.3 is voluntary in nature and relies on the Trust Fund to fund the direct and indirect costs of GEO and its Secretariat as well as related GEO activities[7]. The data analysis carried out by the MTE Team has shown that the Trust Fund financing model and the voluntary nature of GEO are the preferred arrangement of the GEO community with the convening function being seen as the element that the largest proportion of respondents wished to see maintained on a sustainable basis (section 3.7). The MTE has shown that while the sources of GEO's funding may vary, GEO needs to improve ways to mobilize and diversify resources for long-term sustainability, and to decide which areas it chooses to prioritize given the broad scope of functions that the Secretariat has been trying to maintain. In light of this, GEO should formulate a clear vision for prioritizing action in selected key areas that are perceived by its leadership and community as the most relevant to the organization. From the data analysis, a few other areas have emerged as relevant to the GEO community, including the need to better link the policy and users' interface (section 3.3), to improve organizational and technical interoperability (section 3.4), to reinforce Regional GEOs (section 3.5) and to engage more with the private and commercial sectors (section 3.6).

As regards the need to link the policy and users' interface, GEO has made great progress in recent years in improving relations with some of its stakeholders and it needs to further develop these relationships, ensuring users' needs are fully taken into consideration by GEO activities and embedded in the GEO Work Programme. Concerning interoperability, respondents acknowledged that one of the successes of GEO is the significant variety and number of activities it supports, both within GEO itself and more widely the interfaces GEO has with external activities, programmes and Earth observation systems. However, this very success stretches GEO, affecting opportunities for communication, knowledge and best practice sharing, and linkages between the various internal GEO activities. For this reason, it has been noted how GEO should re-focus on strengthening internal coordination, communication and interaction, and how GEO should prioritize which external connections to support to maintain its future relevance. GEO's ability to effectively implement this will be determined by how it prioritizes its own internal resources in the Secretariat to support the members' resources.

A third element which was identified as pivotal to reinforce GEO's role going forward is the strengthening of Regional GEOs. Although these may present different maturity levels and may be focused on different operational activities, they have a role to play in increasing coordination across the GEO Work Programme. Regional GEOs could contribute to the sharing of experiences and best practices and to increasing GEO's outreach at the regional and subregional level. On engagement with the private and commercial sectors, respondents highlighted the success represented by the Cloud Credits and Licenses programmes, but also unanimously called for GEO to further explore opportunities for GEO to facilitate downstream commercial sector engagement with GEO, creating opportunities for companies of different geographies and sizes to engage with GEO.

Lastly, to better define its value proposition going forward, GEO should assess the relevance of GEOSS to the entire organization. This evaluation has shown that GEOSS has come to hold different meanings for different members and stakeholders of GEO. Hence, with a view to remaining relevant to its current and potential members, GEO should review the GEOSS

[6] The MTE Team has created this model using the examples provided by BusinessModelsInc (BMI).
[7] GEO (2019), GEO Rules of Procedure, p. 24.

project to better define its main focus, how it may interplay with the developing Knowledge Hub, and to establish a path to better integrate in situ data. These topics will be discussed both in this section and in section 3.4. Analysing all these items and taking a position on these, especially in terms of being able to prioritize and allocate resources in order to pursue a clear set of goals and deliver results are what will ultimately contribute to GEO sustainability and relevance.

3.2.2.2 Overview of Progress on the Strategic Plan and Engagement Strategy

The overall view that emerged from the interviews is that GEO is making good progress towards the implementation of its Strategic Plan 2016-2025, thus contributing to the achievement of its mission:

1) 57% of respondents agree that the Strategic Plan 2016-2025 had very high, high or moderate impact on improving the clarity of the Work programme,
2) 48% agree it had a very high, high or moderate impact on the interaction between governance structures within GEO, and
3) 54% think it had a very high, high or moderate impact on increasing participation in GEO activities.

For these three questions respectively only 8%, 11% and 12% of respondents think the impact on these three areas was very low or low and the remaining did not answer the question. Also, the Secretariat's survey shows that most of respondents agree with the view that emerged from the interviews that GEO is meeting the objectives of its Strategic Plan 2016-2025.

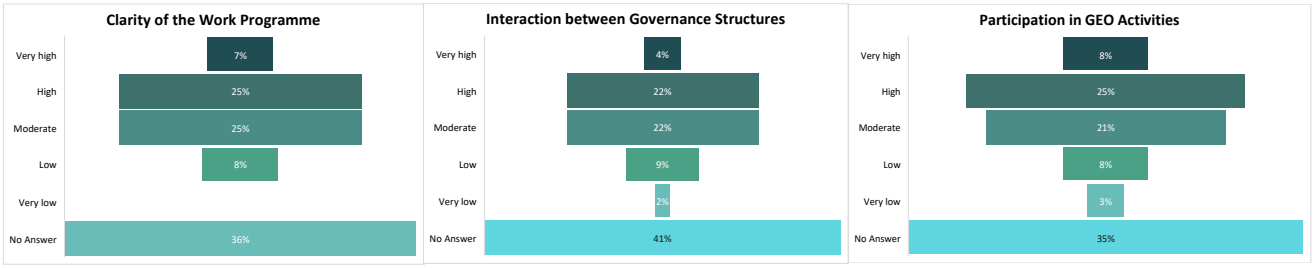


Figure 4. Impacts of the GEO Strategic Plan 2016-2025

As regards the Engagement Strategy, 36% say the activity they are involved with considered the Engagement Strategy and 36% agree this has brought good or moderate benefit to their role and the organization. 51% did not answer the question and this signals that there is little awareness, or even disregard, of the benefits brought about by the Engagement Strategy with a 30% minority saying it has been applied very well or well to their work and 21% declaring themselves neutral. GEO's engagement with users and stakeholders and visibility among the latter are rated excellent, good or moderate respectively by 65% and 61% of respondents. In terms of achieving the objectives of the Engagement Strategy:

1) 56% say GEO has made very good, good or reasonable progress on the broad open data policy,
2) 58% say GEO has made very good, good or reasonable progress on promoting GEOSS as a global reference for Earth observation systems, data and information.

This shows an overall good level of satisfaction towards the progress made in this area.

The Engagement Strategy also laid out the three Engagement Priorities of GEO for the period 2017 to 2019, which include the 2030 Agenda for Sustainable Development, Climate Change and Disaster Risk Reduction. Data shows how the bulk of the progress towards achieving the Engagement Priorities has been made in support of the 2030 Agenda for

Sustainable Development with 47% of respondents rating progress as very good, good or reasonable. The percentages of respondents rating progress as very good, good or reasonable for the other Engagement Priorities including in order Climate Change, Disaster Risk Reduction, Resilient Cities and Human Settlements, Ecosystem Accounting, and the UN Ocean Sustainability Decade are presented below showing the areas where more progress has been made.

Figure 5. Rating on the Achievement of the Engagement Priorities

Most key informants are satisfied with the introduction of the three Engagement Priorities and the impact they had on GEO's engagement and workflows. They have provided clarity on how the GEO Work Programme links with the global development agenda providing a common framework to engage with stakeholders at a global and regional level (for example, GEOGLAM opened up to more engagement opportunities through these). Only a few interviewees advocated for a complete return to the old structure organized only around SBAs. The majority agrees with maintaining the SBA structure alongside the Engagement Priorities as the first fits very well with the second ones as they can provide a good transversal and cross-thematic organization of GEO work. Moreover, there has been a positive reaction to the introduction of a fourth Engagement Priority on Urban Resilience. The proposal for the approval of Urban Resilience as a fourth Engagement Priority has been presented to the Executive Committee at its 53rd Meeting in November 2020, and interviewees expressed a positive view on this addition. In terms of what more could be done to ensure that the Engagement Priorities and SBAs are fully embedded in GEO's work, was suggested that GEO should adopt a multi-layered and targeted approach to the implementation of its Strategic Plan to reflect the specific needs emerging at regional/subregional level. These needs may not be entirely reflected by the Engagement Priorities and the SBAs and GEO should aim to better link the two showing how they are related and can be better connected (see Figure 1).

Overall, the implementation of the GEO Strategic Plan is considered successful. Data gathering and analysis phases conducted by the MTE have allowed the evaluation process to identify three key gaps that will be analysed further in the section below:

1) The need to better define, target and market the GEO value proposition and benefits that can be derived from participation in GEO;
2) The potential to increase the level of engagement of stakeholders and user communities and;
3) The need for improved and more consistent communication across the organization.

3.2.2.3 SWOT Analysis of the GEO Organizational Model

As shown in Table 2, GEO's voluntary nature and its structure as a best effort organization or **a "coalition of the willing" is perceived by the community as a key factor of strength, but also as a driver of some of the weaknesses characterizing the organization.**

Table 2. SWOT Analysis of GEO's Voluntary Model

GEO's Voluntary Model	
Strengths	**Weaknesses**
● Best-effort model fostering bottom-up engagement, inclusivity and participation from a number of stakeholders allowing for the establishment of a broad community.	● Commitment and funding are voluntary. Hence, GEO operates on a limited pool of financial resources and contributions, which may vary based on members' shifting priorities.
Opportunities	**Threats**
● The model may represent an alternative to mainstream international organizations and is, in general, flexible, agile and dynamic.	● It can be difficult to attract more contributions in a competitive environment and to maintain a steady level of engagement.

23 out 36 key informants think the GEO model is very sustainable, quite sustainable or overall sustainable, particularly when it comes to maintaining and attracting voluntary participation of stakeholders in data/products sharing principles and in funding resources. One area identified by most key informants for GEO to address in the future is the relationship between GEO and the WMO. This relation is both programmatic and administrative in nature and its status has been influenced by a perceived partial clash of mandates in the areas of climate and National Meteorological and Hydrological Services (NMHS). This has been emphasized even further in light of the recent WMO restructuring and the establishment of the Infrastructure and Services Committees. One key factor that emerged from interview data is the need to clarify the distinction between the two organizations' mandates in order to improve their relationship. In addition, a need was noted to strengthen and establish further opportunities for synergies, collaboration and complementarities between these two entities that are connected in a unique way through the GEO-WMO Standing Agreement. One of the reasons that has been identified by interviewees as a factor influencing the relationship between GEO and the WMO is the perceived lack of clarity between the two organizations mandates, which might have created some confusion for Principals that were involved in both organizations. A few respondents also mentioned that the GEO and WMO relationship and the lack of an independent legal status for GEO can be misleading for current and potential members and has given rise to some difficulties in obtaining Observer Status in some international fora and conventions. Overall, even though the GEO community has diverse and sometimes divergent opinions on the GEO model and the GEO-WMO relationship, the majority view this relationship favourably, and see ways in which collaboration between the two organizations can be strengthened, especially in areas where GEO can contribute to and complement the work of the WMO. Particularly, interviewees reported that this relation has recently improved, and that the establishment of a bilateral coordination mechanism may be another helpful step. Overall, the MTE has shown

that clarifying roles and responsibilities of GEO with respect to the WMO going forward would allow GEO to better execute its functions.

The strength of GEO is that its voluntary model allows for representation and participation of several communities in an international high-level forum contributing to set the global agenda in the field of Earth observations. GEO has been praised in particular for its unique convening power and capacity to reunite the most relevant players active in this field, providing them with a platform for collaborative action. Also, as explained above, GEO is making positive progress towards the implementation of its Strategic Plan and Engagement Strategy thanks to contributions from different stakeholders to its Work Programme and activities. Moreover, because of its recognized role and brand in the field of Earth observations, GEO has been recognized by 23 out of 36 either as a global leader or working towards becoming one in coordinating availability, access and use of Earth observations for the benefit of the planet and humankind. This view has been echoed also by the results of the Secretariat's survey. Responses to this question have varied based on the community of origin of respondents underlining how some communities think of other organizations as leaders in their specific field. For instance, the oceanographic community generally recognizes the Intergovernmental Oceanographic Commission of the United Nations Education, Scientific and Cultural Organization (IOC-UNESCO) as a leading Earth observation organization. However, even those that do not recognize GEO as a leader, acknowledge its relevance as a global player, occupying a unique space in this field.

Main factors identified as GEO's weaknesses include the need to better define, target and market its value proposition. This need has been voiced in several interviews with key informants, by representatives of member states, Participating Organizations and external partners including UN institutions and other partners, including the private and commercial sector. This value added proposition should be better communicated in a consistent way within the GEO community and externally, to potential members, partners, and donors by showing what GEO has to offer to different categories of stakeholders based on their needs and expectations for participating in GEO. For this reason, communicating with stakeholders on a continuous basis to understand their priorities and reasons for participation in GEO will be key to shaping GEO's value proposition. Better defining the value proposition will require the establishment of a clear set of priorities and deliverables by the GEO Executive Committee and a realignment of the GEO Secretariat with the Executive Committee to set GEO vision and strategic direction and successfully implement it. Addressing this gap and delivering a clear "value for money" has been described as one of the factors that would encourage member states to resource the Trust Fund.

The discussion on the future of GEOSS strictly relates to that on the value added of GEO. **GEOSS has been mostly referred to as a system of systems** and a data platform by key informants. However, the interviews have also shown that there is no consensus on what the system of systems actually is or what it aims to achieve. While GEOSS was a revolutionary concept when it was initially launched, now many organizations are developing similar platforms and it is not clear what GEOSS' comparative advantage or uniqueness is, especially as the system has been described as lagging behind in terms of technological development by most respondents. This inability to define its main operating principle seems to have become a limiting factor for GEO, preventing it from formulating a clear value proposition, which should rely upon a clear explanation of what GEOSS is and how it has evolved, also in view of GEO's plan to build a Knowledge Hub and its increased orientation towards users.

Key informants noted **limited engagement** at different levels within GEO, in particular, of the GEO Secretariat with the GEO community, and, conversely, of members with the organization itself. This has given rise to missed opportunities to engage with members, user communities, the private sector and Regional GEOs. However, because of GEO's limited funding and staffing resources, engagements with members, users, and all the Work Programme activities cannot be equally pursued by the GEO Secretariat. It is evident that the latter cannot support every function and activity across the GEO Work Programme, suggesting a need to prioritise a set of defined areas of work going forward. In fact, data suggest that GEO should focus on highlighting priority areas of focus to which resources should be allocated accordingly, carefully considering the roles that the Executive Committee, GEO Secretariat, Programme Board, and Regional GEOs could play to increase the focus and interconnection of the GEO Work Programme. At the same time, interviewees underlined how GEO should continue its work to equally involve all members to the organization by promoting principles as those outlined in the recommendations of the Equality, Diversity and Inclusion (EDI) Subgroup of the Programme Board.

The third gap evidenced by the evaluation is the lack of **consistent and continuous communication within GEO and to external stakeholders and the limited coordination between activities of the GEO Work Programme**. This lack of communication emerged as a cross-cutting issue, which has been noted on several occasions:

- Lack of clarity on the GEO governance structure where, based on GEO's Rules of Procedure, the Co-Chairs of the Executive Committee may be nominated by regional caucuses and approved by the Plenary after the Director presents them with a slate of nominees for approval. Upon approval, they serve for a period up to two years, but many interviewees believed that the role of Co-Chairs was fixed given representatives from only four countries have covered that role since GEO's establishment,
- Lack of awareness on the existence of Rules of Engagement with the Commercial Sector that were published as Annex C to the GEO Rules of Procedure in 2019, on the role and functioning of the Trust Fund, and on the existence of organization-wide strategies for example in the area of capacity development. Even before then, starting from 2016, GEO had developed an Annex C to the Rules of Procedure, which provided a framework for engaging the private sector in the implementation of GEOSS,
- Limited direct communication and lack of a point of contact within the GEO Secretariat were described as obstacles to engagement by many GEO Work Programme activities, Associates, Participating Organizations and other partners interviewed as key informants or invited to participate in the Commercial Sector and Associates survey.

This topic will be dealt with further in the coming sections, in relation to areas where the Mid-Term Evaluation has highlighted a lack of communication.

The GEO voluntary model has been described as a reason for GEO's limited **funding and staffing resources** available at the level of the GEO Secretariat. Members contribute on a voluntary basis to the GEO Trust Fund, and often contributions are insufficient to support the Secretariat's staffing and operations. Lastly, many interviewees mentioned that the GEO agenda is influenced by the diverse and sometimes diverging priorities of member states, especially at the level of the Executive Committee, which makes it harder to define a clear set of priorities. In general, respondents feel that GEO governance bodies dedicate too much time to agreeing on procedural items and high-level strategies, rather than focusing on the implementation and execution of these latter. For this reason, some interviewees described the GEO governance structure as only partially focused on results and delivering value to members.

The main opportunities that were identified by key informants and respondents to the community survey include the prospect of GEO becoming increasingly recognized as a leader in Earth observations strengthening its position as a convener and coordinating platform of different communities including member states, international organizations, data and service providers, users and the private sector. Equally, GEO has been urged to seize the opportunity represented by the data revolution to democratize data access and deliver added value to members and communities by showing how Earth observations can contribute to broad societal impact and evidence-based decision-making. Lastly, with a look to the future of the organization, it was suggested that GEO should seize opportunities to engage more with stakeholders including the private sector and to reinforce its role in promoting capacity development on the use of Earth observation data and services.

The main threats facing the organization extend from rising competition from data and service providers that have access to more advanced technologies than GEO or from international organizations that might represent an alternative to GEO. Also, diverging priorities within the GEO governance system and external factors such as rising nationalism and the COVID-19 pandemic that has required governments to prioritize public health systems, are seen as a growing challenge. **The pandemic, however, could also represent an opportunity** to connect Earth observations with health monitoring and to better clarify GEO's value proposition as it relates to societal benefits that GEO can help deliver in this domain. **Other possible risks that were identified by key informants** are those stemming from increased engagement with the commercial sector and possible implications for data privacy and intellectual property rights (IPR). Currently, the Data Working Group is working to address some of these concerns and the MTE has shown that these concerns can be partially explained by GEO's limited communication on some of its engagements with the commercial sector as the GEO Rules of Procedure already take IPR into account in a dedicated section. These will be better addressed in section 3.6 dedicated to the Private Sector.

3.2.3 Synthesis and Findings

GEO is showing good progress on the implementation of its Strategic Plan, which was launched in 2015. Also, the introduction of the Engagement Priorities served as a way to strengthen GEO's links with the international community and its alignment with the UN agenda for Sustainable Development and other global priorities such as the Paris Agreement and the Sendai Framework for Disaster Risk Reduction. However, the MTE revealed the need for a clear definition of GEO strategy and the prioritization of activities, which has to be supported by the allocation of adequate resources. GEO's work in the past five years, and prior to that, in its first ten years of implementation have contributed to increasing GEO's recognition and leadership in the Earth observation field, which can be strengthened even further by better defining, targeting, and communicating a clear added value proposition to GEO's, and by fostering members engagement and their support for GEO's voluntary model. The MTE has highlighted how GEO's success and its long-term sustainability will ultimately depend on its capacity to better market its added value. This can be achieved by building a compelling narrative around the many benefits that can be derived from the use and open access to Earth observations and by understanding what *Implementing GEOSS* means to the entire organization. In fact, clarifying what GEOSS and its continued implementation means over 15 years since GEO's inception are fundamental questions impacting the nature of the organization as a whole. The establishment of an Expert Advisory Group, which should primarily include external subject matter experts, representatives of users' communities and external stakeholders' representatives, in addition to representation from GEO's Implementing

Mechanisms, has been identified as the best way forward to address questions related to the evaluation of GEOSS.

The MTE has highlighted that the relation between GEO and the WMO needs to be strengthened, building on recent improvements of the latter that were mentioned in some of the interviews, to reinforce existing synergies and complementarities and establish new ones. Below are some suggestions to achieve better collaboration between the two:

1. Invite the WMO Secretary-General to sit ex officio on at least one of the yearly meetings of the GEO Executive Committee,
2. Invite the chair of one of the two WMO Committees to be a member of the Expert Advisory Group that will review the concept of GEOSS,
3. Establish a bilateral coordination mechanism to coordinate and to continue building on GEO and WMO's ongoing efforts to strengthen the GEO-WMO relationship, such as may be exemplified by WMO's participation in the GEO Programme Board.

As regards the suggestion under point 2, the revision of GEOSS may represent an opportunity to clarify the respective roles and responsibilities of GEO with respect to the WMO going forward and in particular with relation to its work on the Climate Engagement Priority, thus allowing GEO to better execute its functions.

Lastly, GEO's **role as a convener** in the Earth observations field has increased in recent years and this role is set to keep increasing in the future, as observed by the majority of interviewees, thus contributing to the achievement of GEO's mission to connect the demand for sound and timely environmental information with the supply of data and information about the Earth. Also, this role supports all the activities that GEO undertakes, and, for this reason, it would be important to consider this role when looking at better defining the GEO value proposition. Several interviewees have also noted how GEO is becoming more user-orientated and this shift has also been signalled by the approval of the Knowledge Hub project that will focus on the delivery of knowledge, tools and preoperational/operational services.

GEO can reinforce its role as a convener by making sure it keeps providing a flexible and dynamic structure welcoming and connecting multiple stakeholders **and acting to enable access and to increase availability and use of Earth observations for evidence-based decision-making.** To successfully cover this role, GEO should prove able to maintain and increase engagement and communication with all its stakeholders, hence becoming the organization of reference for all the communities active in the Earth observations field. GEO can do so by seizing the opportunity represented by the democratization of data access to strengthen its role as a promoter of the use of Earth observations for the benefit of humankind. The achievement of GEO's mission will ultimately also rely upon the enhancement of diversity in representation across the organization, as outlined by the recommendations of the EDI WG, whose report's findings and statement, pointing to the need for integration of different communities within GEO, were echoed by the views which emerged from the interview process. The EDI WG prepared a report and there is ongoing work to develop a statement that may be presented to the Plenary. In general, there is support by the GEO leadership to explore this topic further and recognizes its importance for GEO going forward[8]. These are all recent developments and still ongoing. Based on these developments it seems that GEO is increasingly taking into consideration historically and geographically disadvantaged and under-represented communities.

[8] GEO (2021). Draft GEO Statement on Equality, Diversity and Inclusion, p. 3.

Figure 6. The GEO Value Proposition

Source: created by the MTE Team[9]

Findings:

KEY FINDING #1-Mission: GEO is making good progress on working towards becoming a world leading organization in coordinating availability, access and use of Earth observations. It is successfully contributing to unlocking the potential of Earth observations by connecting the demand for sound and timely environmental information with the supply of data and information about the Earth, facilitating their accessibility and application to global decision-making within and across many different domains. It has an opportunity to become increasingly recognized as a global convener of different communities including member states, international organizations, data and service providers, users and the private sector in the field of Earth observations given the increasing availability of data, increasing attention towards sustainability topics and the need for information that can support decision-making in this field. It can fulfil the above-mentioned role by leveraging its ability to connect such communities, particularly with a view to covering the downstream of the value chain, providing a platform for collaboration and representing a source of branding, recognition and trust. As regards the GEO-WMO relationship, respondents noted the need to better define and strengthen this relation, highlighting possible areas of complementarity.

KEY FINDING #2-Value proposition: A clear gap that is evident across GEO is the need to better define its value proposition. A clearly defined value proposition is missing from messaging to members, but also to external partners, including UN institutions, and partners, such as the private sector. GEO's voluntary nature can be an asset, but this needs to be tempered with a clear organizational vision that is communicated within the GEO community and to potential partners and funders. A part of this clarity will require greater interaction with individual members to better understand their needs and where GEO can contribute and what GEO can offer, for instance in convening, addressing capacity gaps, providing access to open Earth observation data or in the standing up of National GEOs. GEO's struggle to attract new donations to its Trust Fund can be partly tied to the lack of understanding among key stakeholders of the value of GEO coupled with a lack of communication/marketing of the value of GEO to the global community, as well as at the regional and national level. To define its value added, GEO should agree on specific areas of focus where it can deliver, in light of

[9] The MTE Team has created this model using the examples provided by BusinessModelsInc (BMI).

developing technologies relative to its founding goals and its convening function. There is a sense in the GEO community that the next phase of GEO should be more action-oriented on what GEO can deliver and where it can make unique contributions to establish itself as a global leader in Earth observation.

KEY FINDING #3-Communication and Engagement: From the surveys and interviews, it was shown that there are inconsistent methods of internal communication and coordination to share information across the GEO Work Programme and to engage both current and potential members and users. This has limited GEO's ability to advance as an organization. There is also a widespread perception that because of this lack of communication and engagement, many members are not involved or contributing as meaningfully as they could to the work and funding of the organization.

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.

3.3 Policy & Users' Interface

3.3.1 Overview

As mentioned in the Strategic Plan 2016-2025, GEO's Core Functions include "identifying user needs and addressing gaps in the information chain" and "implementing sustained global and regional services to support the global sustainable development agenda and evidence-based decision-making"[10]. This support is provided by raising awareness and building capacity on the use of Earth observations among different stakeholders across the entire value chain, from observation to decision-making. The key to achieving these functions is engagement on multiple fronts: the high-level one interacting with different decision makers and stakeholders such as UN bodies, governments and businesses, but also intermediaries and end users. This section reviews GEO's capacity to connect and convene the two interfaces by serving as a platform that links decision-making by political entities with the needs of users' communities.

The 2015 Mexico Declaration called for both the strengthening of the focus on users and the policy interface including relations with the United Nations institutions, Multilateral Environmental Agreements (MEAs), Multilateral Development Banks (MDBs), Participating Organizations, GEO member states and the private sector. The Mexico Declaration also underlined GEO's role in fostering strategic partnerships to coordinate and integrate the resources of the GEO community and its partners through a stakeholder driven process aimed at identifying observation needs and gaps and enabling the delivery of useful services to users.

[10] GEO Strategic Plan 2016-2025, pp. 13-14.

The Mexico Declaration also called for GEO to strengthen and facilitate the active participation of developing countries in GEO and GEOSS[11]. In recent years, there have been discussions on whether GEO should focus more on the delivery of preoperational and operational services, which also led to the development of the Knowledge Hub project. In general, no clear consensus has been reached on this point and GEO continues to act as both a maintainer of infrastructure and a developer of services as part of its mandate. For this reason, and as part of its objective to provide tools to ensure decision-making is informed by coordinated, comprehensive and sustained Earth observations, GEO should actively work to ensure it addresses users' needs and connects across the Earth observation value chain.

As noted, the Strategic Plan 2016-2025 listed the identification of users' needs and addressing gaps in the information chain as one of the Core Functions of GEO, defining the scope of action needed for the attainment of GEO's Strategic Objectives. However, User Needs and Gap Analysis, which was a Foundational Task under the GEO Work Programme 2016 and 2017 to 2019, has been discontinued for the 2020-2022 GEO Work Programme because the task had been inactive for some time and has not been viewed as a priority in part due to the way that it was set up[12], with a lack of connectivity to the GEO Work Programme and a broad scope. The originally proposed approach to conduct user needs assessments on an SBA-by-SBA basis has proven to be impracticable to implement and for this reason, the preferred approach for the identification of user needs which has been suggested is to integrate it into the work of individual Flagships and Initiatives and embed it into the development of the GEO Work Programme.

The original SBA based approach to defining users' needs was inherited from the Integrated Global Observing Strategy Partnership (IGOS-P) process. This approach was declared not viable[13] by the GEO Programme Board in 2017 due to the limited resources GEO could rely upon to successfully track all users' needs. GEO indicated a preference for adopting a flagship-centered strategy[14] that would focus on identifying key issues or focus areas to work and deliver on over a several year cycle, such as five years. These focal themes or flagships were intended to provide high-level, overarching priorities for GEO, which could be linked with GEO's existing Flagships, Initiatives, Community Activities, and Regions to improve synergy across the GEO Work Programme, and to provide a clearer sense of future goals and direction. These focal themes would be determined by a selection process within GEO, guided by its members priorities, to identify the most relevant areas to focus on. The flagship-centered strategy was presented in 2017 but has not been fully implemented by GEO at this point. This strategy was also accompanied by the adoption of Engagement Priorities, which allowed GEO to develop a much clearer definition of who its users are in terms of key UN organizations, member states and other organizations. Using this approach, GEO sought to engage key UN organizations around specific global agreements to better support them, and in turn, to also support GEO Members as they responded to those agreements.

The flagships or focal themes identified in the strategy would be derived from an internal process designed to identify high-level priorities, discuss, debate, and rank possible issue-areas. The "flagship-centered strategy", should not be confused with GEO's existing Flagships, given that this term was used to refer to priority focus areas that GEO would determine through a review and selection process as noted above. Once these possible prospects reflective of

[11] GEO (2015). Mexico City Declaration, p. 2.
[12] GEO (2019). Proposed Structure for Foundational Tasks in the 2020-2022 GEO Work Programme, p. 4.
[13] GEO (2017). Action & Outcomes-GEO Programme Board 2017, sl. 8.
[14] GEO (2016). Executive Committee Strategic Outlook-2017 and Beyond, p. 7.

relevant issues were agreed to, they could be used to determine focal themes or 'programme thrusts' to focus on for a given period of time, such as five years. These focal themes, which would reflect GEO's members and other key stakeholder's interests, would be initially approved by the GEO Executive Committee and then presented to the Plenary for approval. Given that GEO's mandate will need to be renewed during the next Ministerial Summit, GEO may wish to consider how implementation of this flagship strategy centered on focal themes can be incorporated into planning for the next phase of GEO and the approach that it chooses to propose for its future development.

GEO's policy mandate lies in its ultimate capacity to foster users' engagement and full understanding of users' communities to enable the use of Earth observations in decision-making. This end-to-end process sees GEO engaged on multiple fronts and starts from the identification of users' needs and quantitative requirements to translate these into information products and tools and allows to contribute value to the policy and decision-making process that addresses societal challenges through the generation of products and services. GEO's Flagships, Initiatives and Community Activities bolster a bottom-up approach and early identification of the needs of communities and for this reason, they strongly contribute to this process. The flagship-centered strategy would seek to leverage existing activities of the GEO Work Programme to better connect these across the Work Programme. In particular, Flagships, among GEO Work Programme activities, serve common needs and/or well-defined groups and provide a measure of GEO's success in addressing users' needs. Flagships actively engage end users, helping to ensure the information and products developed meet users' needs for timely, comprehensible and actionable information. They force GEO to understand, and sometimes to work across, the entire Earth observation value chain, from measurement to decision. Hence, as part of the flagship-centered strategy, Flagships and Initiatives would be responsible for identifying, reporting and integrating users' needs.

The evidence presented below provides an overview of how GEO has been so far able to address and link the needs of the two interfaces, successfully connecting along the Earth observation value chain. The following section will be structured in three main parts, the first is dedicated to reviewing GEO's link with the policy interface, the second one looks at the users' interface and the third part provides an overview of how GEO connects across the entire value chain, from policy to users.

3.3.2 Evidence from Current Evaluation

3.3.2.1 The Policy Interface

As regards the policy interface, the community survey aimed to assess how GEO supplies the requisite Earth observations in support of effective policy responses for climate change adaptation, mitigation and other impacts across the Societal Benefit Areas and to contribute to the achievement of its set Engagement Priorities. In terms of measuring the use of GEO's information and tools for decision-making, results show:

- 44% of respondents find the products and/or information services available on the website either very helpful or helpful for decision-making,
- 15% find it neither helpful nor unhelpful,
- 6% finds it unhelpful, and
- the remaining 35% did not answer the question.

GEOGLAM and the Global Forest Observations Initiative (GFOI) together with other activities with a clear mandate have been mentioned as positive examples benefitting decision makers the most among GEO's activities. The regions where more than half or half of respondents

found the portal to be very helpful or helpful for decision-making are North America and Africa, with respectively 52% and 50% of preferences[15]. Also, 33% of respondents are positive about the idea of adding more products and information to the GEO website and only 4% are reluctant, signalling an increased interest towards products that can be used to support decision-making. Other respondents were either not sure or did not answer the question.

In order to ensure Earth observations increasingly constitute a tool for evidence-based decision-making in support of effective policy responses to some of the world's most pressing challenges, **key informants suggested that GEO has to expand its outreach with a targeted set of actual and potential communities that should be linked to its top issue-areas. These issue-areas could be identified through the adoption of a flagship-centered strategy, as mentioned in section 3.3.1. Communities GEO engages with include** governments, UN institutions, international financial institutions (IFIs), the socioeconomic community and the private and commercial sectors. While GEO has done well in expanding its membership base, it could improve the effectiveness of how it communicates the value of GEO. GEO provides a forum for all these players to work together on improving the quality, timeliness, range and availability of Earth observation data, information and knowledge about the Earth. Through this process, GEO brings together those who need Earth observation derived information with the developers of tools and applications aimed at addressing their needs. In addition to expanding outreach, GEO should focus on developing its messaging to ensure inclusivity with diverse groups, and consistency. In order to ensure effective communication internally, GEO should be able to devote appropriate time and resources to its existing member base, establishing defined goals, given its limited resources.

Starting from GEO's engagement with the UN, the community survey has shown that:

- 44% of respondents think GEO has good engagement with the UN and multilateral environmental agreements in their area of expertise,
- 10% say it does not,
- 31% do not know, and
- 15% did not answer the question.

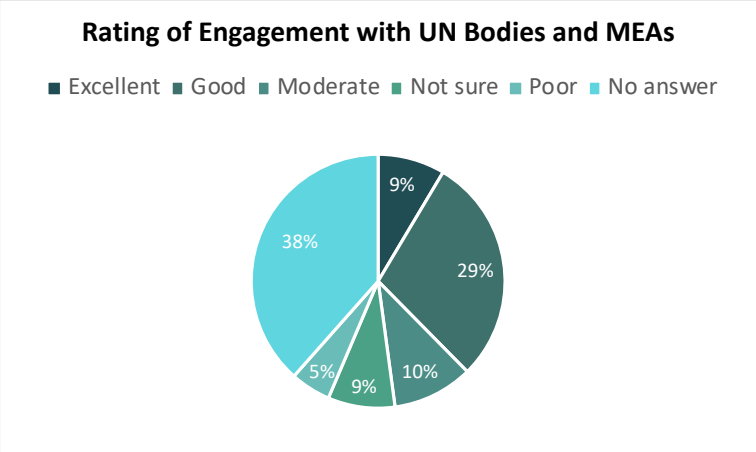


Figure 7. Rating of Engagement with UN Institutions and MEAs

Figure 7 shows how this engagement has been rated by respondents, who have added that the UN bodies with which GEO engages the most are United Nations Framework Convention on

[15] The same percentages for Europe, Asia, South America and Oceania are 40%, 39%, 30%, and 100%. Results for Oceania are not deemed to be significant as we only had two respondents from this region.

Climate Change (UNFCCC), United Nations Convention to Combat Desertification (UNCCD), Convention on Biological Diversity (CBD), UN Habitat, United Nations Environment Programme (UNEP), Intergovernmental Panel on Climate Change (IPCC), United Nations Committee of Experts on Global Geospatial Information Management (UNGGIM), Food and Agriculture Organization (FAO), World Food Programme (WFP), United Nations Office for Disaster Risk Reduction (UNDRR), United Nations Economic Commission for Africa (UNECA) and the WMO. The positive view expressed on advancement of relations with the UN is also supported by key informant interviews results. In fact, 27 interviewees out of 36 believe relationships with the UN have improved in recent years in particular after the introduction of the Engagement Priorities, which have facilitated an alignment of the two agendas at the regional and local levels of implementation, where the majority of work in partnership with UN agencies is carried out. The Engagement Priorities provide a common framework for engagement at the international level and a useful tool to initiate collaboration with several partners. On the other hand, a minority of interviewees have also highlighted the risk that the predominant emphasis placed on the Engagement Priorities may lead to side-lining needs and requirements of other activities of the GEO Work Programme, which are not directly covered or linked to the Engagement Priorities. As such, they identified SBAs as still relevant to the organization, especially as they provide a cross-cutting tool to organize GEO's work and identify users' needs in relation to key societal benefits.

A few respondents mentioned more recognition of GEO is needed at the policy level, while a minority reflected on the fact that GEO might be using too many resources to strengthen relations with the UN instead of focusing on serving the interests of its member countries and organizations. Some interviewees also noted that in order to successfully contribute to international conventions, GEO should be well aware of the needs of member states and organizations which it serves and who are parties to those same conventions and international agreements. By addressing the needs of member states, it would better contribute to such conventions. Other interviewees mentioned that given that the priorities of many member states may be in line with those outlined in UN documents and conventions, in particular the SDGs and the Paris Agreement, pursuing these engagements is also seen as ultimately contributing to addressing the priorities of member states. Overall, GEO has carried out a number of positive actions to improve its engagement with UN organizations and certain users. Nonetheless, it seems that these would benefit from a more comprehensive strategy to identify and address the different needs of policy communities it serves and that, as such, there is further potential to increase uptake of GEO products and tools[16]. This may be especially the case as GEO reinforces its efforts to produce preoperational and operational services. As regards to strengthening the collaboration with UN agencies, there is definitely space for further improvement and Regional GEOs are seen as well positioned to strengthen the relationship with UN agencies, especially those operating at a regional and local level as they have better knowledge of local realities, projects and the organizations active on the ground.

Relations with Multilateral Development Banks (MDBs) and Statistical Agencies have not improved significantly since the introduction of the new Strategic Plan:

- 20% of respondents say that GEO has a good engagement with multilateral development banks and statistical agencies in their area of expertise,
- 15% say it does not,

[16] Similar results including the need to better identify users' requirements have been also recently reported in the EU Special Report on EU Space Programmes Galileo and Copernicus by the EU Court of Auditors (2021), showing that GEO is not the only organization facing similar challenges.

- 49% do not know, and
- 17% did not answer the question.

Results show this is still a niche area for GEO, but many interviewees underlined how the engagement with the statistical community and multilateral development banks will become crucial going forward to promote an all-encompassing and systemic approach to integrating Earth observations as a basis for decision-making. As underlined in the GEO Engagement Strategy, the engagement with IFIs and, in particular MDBs, may help GEO demonstrate the value of Earth observations in decision-making in developing countries, contributing to the implementation of the SDGs in such countries[17]. In fact, key informants noted how GEO should establish stronger relations with these bodies and in general, the socio-economic modelling and statistics community.

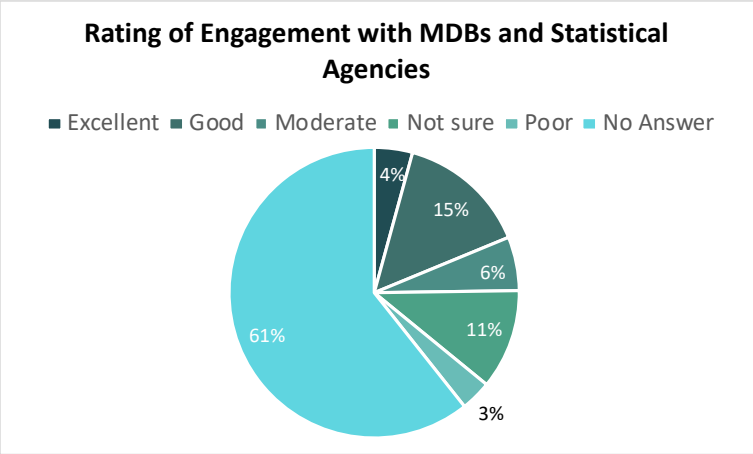


Figure 8. Rating of Engagement with MDBs and Statistical Agencies

Figure 8 shows that only 25% rate current engagement as either Excellent, Good or Moderate and 3% rate it as poor, 11% is not sure but an overwhelming 61% did not answer the question showing there is little awareness of this engagement across the community. Main bodies with which there is an engagement are: World Bank (WB), African Development Bank (AfDB), National Institute of Statistics and Geography (INEGI), World Data System (WDS), World Resources Institute (WRI). However, the interviews have highlighted that some activities of the GEO Work Programme such as Earth Observation for Ecosystem Accounting (EO4EA) and Earth Observations for the Sustainable Development Goals (EO4SDGs) have made significant progress in this area.

Regarding private sector engagement in GEO, the community survey shows that:

- 32% of respondents say GEO has engagements with the private sector in their area of expertise,
- 17% said it does not,
- 33% do not know, and
- the remaining 17% did not answer the question.

On the level of engagement, 31% of respondents say engagement with the private sector is excellent, good or moderate (for 6% it is excellent, for 12% it is good and for 13% it is moderate). 5% say the level of engagement is poor while 57% did not answer the question and the remaining 7% is not sure. Engagement with this sector will be analysed in greater detail later in the report under section 3.6 on the Private Sector.

[17] GEO (2016). GEO Engagement Strategy, p. 9.

One of the most pivotal weaknesses and areas of improvement for GEO and its governance structure identified in the interviews is a lack of engagement and commitment from member states. Declining participation has been partially ascribed to the perception of many members' that there is limited return on investment **from GEO and the fact that they are not being engaged on a continuous and consistent basis. This showed a geographic pattern with some developing countries, in particular, sharing this perception.** Declining participation has been described as the lack of engagement from certain countries and the fact that, even though membership numbers have grown, contributions have not followed this trend. The MTE has shown that to change this perception it would be necessary to continuously engage members to show them the benefits derived from participating in GEO. This is the case in particular in developing countries that could greatly benefit from an increased capacity to use Earth observations and Earth observation-derived (EO-derived) products for decision-making. Interviews suggested that defining a clear value proposition and an outreach and communication strategy aimed at involving member countries on an ongoing basis would contribute to changing the above-mentioned perception. Regional GEOs could contribute to reinforcing bottom-up engagement and participation as they are already doing this by supporting new members who are joining GEO and encouraging their participation at different levels within the organization. By becoming increasingly embedded in GEO's structure, Regional GEOs could further advance the message of GEO's value added at the regional and subregional level. Greater engagement from members is an important goal to pursue through communication and improved messaging by placing an emphasis on inclusivity and capacity development.

Interviews suggested that there is a need to enhance inclusion and opportunities for developing countries, to show GEO's value added and to engage members more directly. This will likely lead to greater engagement, along with having a clearer, high-level sense of direction. Lastly, what could be beneficial in this case would be better communication on the formal structure and procedures based on which GEO's governance structure operates and creating opportunities for improved representation and increased participation of all GEO members. This highlights the need for some changes which involve improved communication, setting of focal themes by the Executive Committee, the need to re-evaluate GEOSS and to establish GEO's top priorities. The need to deliver a clear added value to members also links with GEO's contribution to specific conventions. In fact, as mentioned above, it is clear that by addressing the needs of member states that are parties to these conventions, GEO would contribute to the objectives of such conventions.

3.3.2.2 The Users' Interface

One of the GEO Core Functions highlighted in the GEO Strategic Plan 2016-2025 is to identify users' needs and address gaps in the information chain. To verify GEO's progress towards the implementation of this Core Functions, the community survey asked whether respondents thought GEO had become more user-friendly since the adoption of the new Strategic Plan:

- 52% of community survey respondents think GEO has become more user centric,
- 11% said it has not,
- 23% did not know,
- 14% did not answer the question.

Answering on whether they were satisfied with the engagement and assistance GEO offered to them as users, 37% of respondents said they are very satisfied or satisfied, 32% are neutral, 6% are dissatisfied, 3% are very dissatisfied and 21% did not answer the question. Moreover, 21% say GEO engages with them 50% or more of the time to help them meet their users' needs and

requirements, while other respondents said GEO engages with them less than 50% of the time or did not answer.

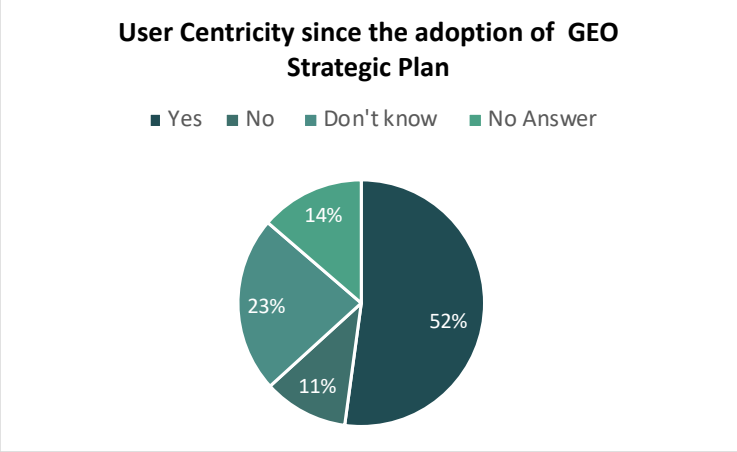


Figure 9. Increased User Centricity since the adoption of the Strategic Plan

As the GEO portal is one of the main drivers of users' engagement with GEO, providing and enabling access to Earth observations data and derived information, the community survey questions also aimed to verify how often and for what reasons respondents use the GEO Portal. **Results showed the GEO Portal is not widely used and in general, it is not complete and/or easy to use.** Only for 21%, the GEO Portal meets their users' needs, while for 17% it does not and 62% did not answer the question.

- 41% find the Portal easy or acceptable to use,
- 16% find it difficult or very difficult to use and
- the remaining 44% did not answer the question.

Interviews pointed to the fact that the Portal is characterized by missing metadata and non-functioning or non-existent links. In general, interviewees find it is characterized by an outdated technological structure that does not allow to process the data online, but rather requires to download it, which can represent an obstacle especially for users that do not have access to modern internet technology and rely on limited computing power. Mostly, users access the website either for products and information (26%) or for both: products and information and Earth observation data (26%).

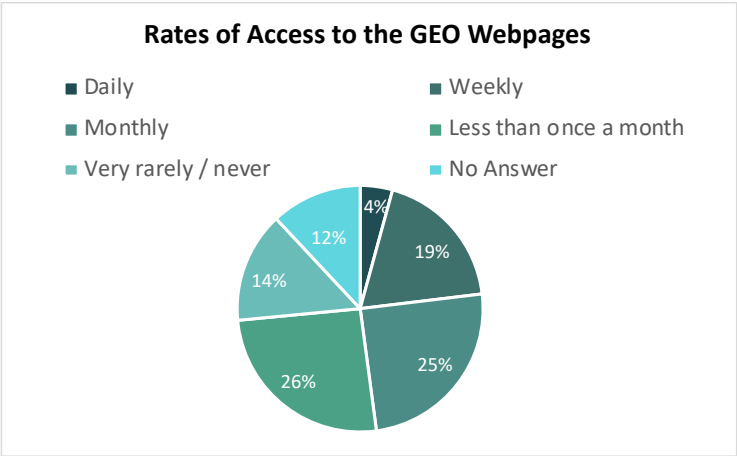


Figure 10. Rates of Access to the GEO Webpages

As shown in Figure 10, the rate of access to the webpages is also low. In particular:

- the highest percentage of daily and weekly access to the GEO webpages is found in Africa where 42% of respondents access the webpages either daily or weekly compared to 29% in Asia, 20% in Europe, 16% in North America, 5% in Central and South America,
- 36% of respondents from Africa declare they always use the GEO Portal compared to 7% in Europe, 5% in Central and South America and Asia and 0% in North America,
- Africa also shows the highest percentage of respondents saying the portal meets their needs (43%) and it is either very easy or easy to use (28%).

Rates of use of the GEO Portal show how much users refer to it to access Earth observation data, while the access to the webpages goes beyond the use of the GEO Portal and shows how many respondents access the GEO website in search for information that could also include GEO key documents and other relevant material. In general, those who answered they always use the GEO Portal as users, also have the highest access rates to the webpages, accessing it either daily or weekly.

Looking at all the above-mentioned elements provides an overview of the level of users' engagement with GEO, how satisfied they are of this engagement and whether they use the data and services provided by GEO. The next paragraph will be dedicated to investigating a trend that has been highlighted throughout the entire data collection phase, showing that different users' communities, member states and other organizations engaging with GEO have different and sometimes diverging priorities and interests that they aim to address through their participation in GEO based on their belonging to defined communities, regional origin and other factors.

Looking at how respondents are distributed across the GEO Societal Benefit Areas gives an indication of what topics are of major interest to the GEO community and users. The SBAs that community survey respondents work the most with are shown below.

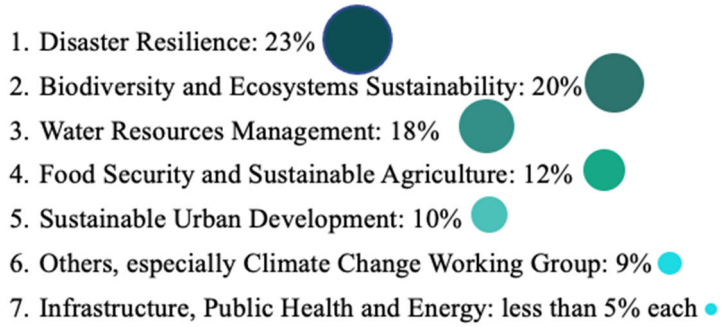


Figure 11. Distribution of community survey respondents across SBAs

From a regional perspective:

- Biodiversity and Disaster Resilience are the first areas of interest in Europe and Central and South America with respectively 22% each of preferences,
- Biodiversity is the first area of interest in Africa (23%), followed by Sustainable Agriculture and Water Resources Management (each 19%),
- Disaster Resilience is the first area of interest in North America and Asia with 27% and 23% of preferences respectively,

- In Asia, two other major areas of focus are Sustainable Urban Development and Water Resources Management (15% each).

This shows how the priorities of different regions do not always converge and there is a need for a mechanism within GEO that can help fully represent these. Being aware of such distinctions can also help create coordination mechanisms aimed at tapping into this diversity to promote cross-regional and thematic collaborations across the GEO Work Programme activities.

To provide a higher level of analysis, **answers to the community survey from respondents that classified themselves as Users were considered separately[18].** This showed that 21% or 30 out of 117 respondents identified themselves as users of GEO:

- 53% of which said that GEO has become more user centric since the adoption of the new Strategic Plan.
- Users in different regions prioritize different SBAs as shown by the data analysis. The SBAs that interest users the most are Biodiversity and Ecosystem Sustainability (24%), Disaster Resilience (21%) and Water Resources Management (17%). Biodiversity and Ecosystem Resilience is the first area of interest for users in Europe with 24%. Disaster Resilience is the first area of interest in North America with 38% of preferences and Water Resources Management is the first SBA in Africa with 33% of preferences. While in Central and South America and Asia, Biodiversity and Disaster Resilience rate the same with 25% and 14% of preferences each respectively.

Results provided by respondents who classified themselves as users also showed that:

- 34% are very satisfied or satisfied with the assistance GEO provides to them as users, 33% are neutral, 10% are very dissatisfied or dissatisfied and 23% did not answer
- 70% say GEO does not or moderately actively engages with them to help them meet their user needs and requirements, 13% says it engages with them most of the time and 17% did not answer. This percentage is relevant if compared with the results of the general survey, where 60% of respondent said GEO does not or moderately engages with them to help them meet their user needs and requirements, 21% mentioned GEO engages with them most of the time or always and 19% did not answer. If compared with this data and understood also in light of the results that emerged from interviews, this evidence suggests a need to better address users' requirements**.**

The 2010 Mid-Term Evaluation made a recommendation on the need for GEO to better understand, engage and respond to users' communities. To ensure that such needs would be fully addressed, it was agreed that the User Requirement Registry (URR) would be further consolidated as part of the GEO Common Infrastructure[19]. The URR project was later abandoned because it had too broad of a scope and was not well linked to the GEO Work Programme, which made it complicated to manage. Later in 2017, the Programme Board suggested abandoning the SBA approach for reporting on users' needs, attributing the responsibility for addressing and reporting on users' needs to Flagships and Initiatives themselves, according to what was outlined in the flagship-centered strategy. The MTE Team recommendation in this area also focuses on providing a strong link and embedding users' needs and requirements within the GEO Work Programme by attributing a primary responsibility to activities themselves to track and report on such needs. Views that emerged

[18] Users are identified as respondents who answered users to question number 2 *"What is your main role in question number 1?"* This includes respondents who classified themselves as independent users in question number 1 and those that contribute to the GEO Work Programme and GEO work as users.

[19] GEO (2014). Progress in the Implementation of Recommendations of GEOSS Evaluation, p. 2.

from some interviews showed that some Initiatives and Flagships are already reporting on users' needs. However, this needs to be done in a more systematic way throughout the Work Programme. Some interviewees also pointed to the need to engage more with entities including data providers such as the Committee on Earth Observations Satellites (CEOS) and looking at the example provided by Copernicus to ensure users' needs are systematically turned into data requirements. Interviewees also suggested that the SBA approach relied too heavily on the role of the Secretariat, which had limited resources to carry out this task in a comprehensive way for the entire organization.

Interviews also underlined that GEO does not have a feedback loop mechanism to keep track of how identified users' needs are later addressed and provide users with the opportunity to share their views through a review mechanism. Suggestions on how to address this issue mostly focused on the need to increasingly, and directly, involve activities and Regional GEOs in the identification, reporting and engagement phase aimed at identifying and addressing users' needs and translating these into clear requirements. On a positive note, a few interviewees added they see the Knowledge Hub as a step forward in the process of better reporting and meeting users' needs as this will represent a new tool to address users' needs for products, preoperational and operational services developed from Earth observations data.

In general, **it appears that GEO has existing gaps in identifying and addressing users' needs.** However, interviews showed how some Initiatives as EO4SDGs, Group on Earth Observations Land Degradation Neutrality (GEO LDN), Group on Earth Observations Global Water Sustainability (GEOGloWS) and Flagships as GEOGLAM and GOS4M, among others, represent an exception to this trend. More attention and effort should be dedicated to having those firmly and systematically embedded in the GEO Work Programme. GEO may be unable to track, capture and transform a wide range of requirements to better connect these with the policy interface, without a well-defined understanding of where to focus. This task can be best handled through the Work Programme, which is directly connected with the users' needs, and will be better positioned to identify its target user base and their requirements. The work being done at the GEO leadership level to identify key focal themes as part of the flagship-centered or thematic strategy would trickle down to the Work Programme allowing to capture the different layers of needs and requirements that might emerge at a regional, national and subnational level. Based on the data collected**,** different regions and communities might have diverging priorities. Given the differences emerging at a local level, it seems clear that GEO Work Programme activities, because of their connection to communities of practice and end users of the applications and services they develop, would be best placed to report on users' needs. Hence, they should play an increasingly important role in making sure that GEO is well-connected to its user base by gathering information on their needs and requirements. This would further contribute to the provision of services, enabling co-creation of products suitable for effective uptake by user communities and decision makers. In general, the interview process has also highlighted the fact that having a clear policy mandate, as is the case for Flagships, helps to focus and target the efforts of activities to better identify and report on users' needs.

3.3.2.3 Linking the Policy and Users' Interface

Looking at how the two interfaces could be better connected means looking at whether GEO has been able to equally address the need for Earth observation data and products responding to users' and policy needs.

The key informant interviews had a specific question on whether GEO has been able to maintain the balance between GEO's development of data infrastructure, and access

initiatives to societally relevant products and the user interface. Overall, 18 out of 36 of the interviewees agree that at present there is no good balance among the development of the data infrastructure and access initiatives and that of societally relevant products and applications and the user interface or that such balance was present in the past, and it has been partially replaced by the prioritization of other areas. GEO has partially moved away from the initial focus on building the data infrastructure, also because, some interviewees noted, it has become increasingly orientated towards users. This shift has been signalled also by the adoption of the strategy for a results-oriented GEOSS, which has recently included the project to develop a Knowledge Hub. The Knowledge Hub aims to facilitate the interplay and collaboration among different actors active in the Earth observations field by advancing the transformation of data into knowledge-based preoperational and operational services for evidence-based decision-making. For this reason, it has been noted how, to develop policy relevant products that are fit-for-purpose, GEO should develop ways to better track and report on users' needs and the Knowledge Hub could be a key contribution in this sense. Interviewees have also noted how assuming a structured approach to collecting and tracking users' needs and requirements would provide an added value to GEO members as it would provide them with a traceable basis for implementing products and service development in other contexts, within other agencies or as a template to engage in shared products and service development with other international partners. However, this approach should be fully embedded in the GEO Work Programme and be adopted considering existing GEO priorities.

The analysis of the case studies, which has been included in section 6, also shows that the most successful activities in the GEO Work Programme are those with the ability to connect across the continuum of the value chain to deliver operational services to users. This is done more easily by activities which have put in place a feedback/consensus mechanism that allows them to take users' needs into account in the early stages of development of their information products. This shows that, partially because of their natural development path and partially because of GEO requirements to evolve from being an activity to an initiative, these activities are focused on meeting users' needs, on finding ways to make sure these are continuously addressed. In general, Flagships benefit from having a clear policy mandate that allows the latter to easily identify users and address their needs. The value chain analysis has also shown that activities benefit from GEO's convening role as this allows them to easily access and connect with key stakeholders, whose needs they are trying to address, by developing a comprehensive ecosystem approach to identify, connect with users and address their requirements. The case studies and interviews showed that some activities are interested in becoming Initiatives and/or Flagships. However, the MTE indicated that there is a lack of understanding in the GEO community concerning the lifecycle of Work Programme activities. Some activities may have aspirations to progress, at the same time the Work Programme cannot welcome an indefinite number of Flagships going forward and it is also not clear whether GEO supports this evolution process. At the same time, other activities may not be willing to do the same and for this reason, this may be another point of clarification for GEO. Also, the GEO Work Programme should develop in line with the strategic overarching direction set by the Executive Committee. To ensure that this is the case, calls for activities to be included in the GEO Work Programme should also be aligned with the overarching direction and priorities set by the Executive Committee, to allow for a coherent development of the GEO Work Programme.

Capacity development is an area of considerable focus for GEO that has come to assume increasing relevance in recent years. This focus will allow GEO to better co-design and co-develop solutions to connect to its users' base and policy objectives to promote the use, access

and availability of Earth observations. The Capacity Development Working Group (CD WG) actively works to support GEO Work Programme activities to implement their capacity development strategy. While the Working Group does not directly work on identifying users' needs, as this task is carried out by Flagships, Initiatives and Activities themselves as per the GEO Strategic Plan 2016-2025, it facilitates implementation, coordination and sharing of best practices. The Capacity Development Working Group has released a capacity development strategy in 2019 that contributes to the definition and promotion of best practices in this area also through direct engagement with GEO Work Programme activities. This Working Group is still fairly recent, and they have had limited GEO staff support. For now, the Capacity Development Working Group has assisted Blue Planet and GEOGLAM to build a long-term capacity development strategy. This shows that there may be little awareness of the work of this group across GEO. Therefore, capacity development should be better embedded in a cohesive manner across the GEO Work Programme going forward, supporting coordination and participation of GEO Work Programme activities with the Capacity Development Working Group, and also through the support of Regional GEOs.

In the context of GEO, capacity development relates to the need to better address users' requirements in light of local population capacity and skills to use Earth observations data and services. For these reasons, Regional GEOs, which have comprehensive understanding of users' needs due to their proximity and direct engagement with the user base, can play a central role in support of GEO's capacity development efforts at an individual, organizational and institutional level. Lastly, building inclusivity within GEO and ensuring that GEO is a diverse organization also relates to capacity development. In order to better integrate capacity development into its work, GEO should consider starting from the results and recommendations that emerged from the report of the EDI Subgroup of the Programme Board in 2020. This report includes specific recommendations on enhancing and improving diversity in representation across GEO that can serve as a foundation for GEO's future efforts. While the EDI group's work is ongoing, the MTE Team recognizes these steps as essential to improving the visibility and participation of underrepresented groups with the aim of increasing their use, access and capacity to use Earth observations.

3.3.3 Synthesis and Findings

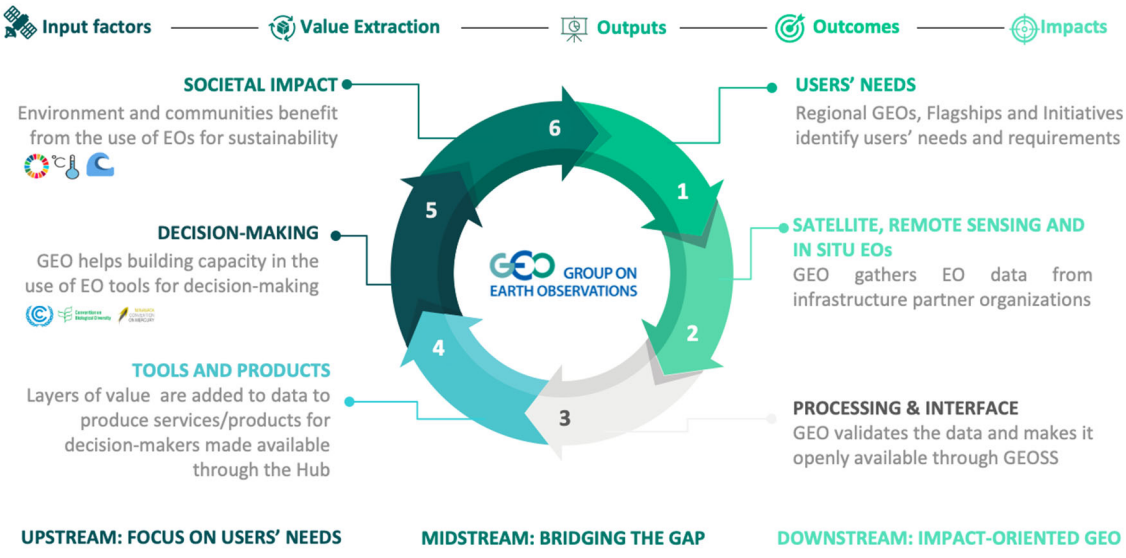


Figure 12. The GEO Value Chain connecting the Policy and Users' Interfaces

Source: created by the MTE Team

GEO has been able to become a unique, multidisciplinary initiative providing a flexible and agile forum for many players active in the field of Earth observations to collaborate on improving access and use of Earth observations data, information and knowledge. GEO is also a facilitator of policy level dialogue on the importance of Earth observation for global policymaking based on sound evidence as shown in Figure 12 representing the GEO Value Chain. The figure shows how GEO connects users' needs (step 1) with step 4 and 5 by adding layers of value to Earth observation data that are then made available to decision makers to be used as a basis for informed decisions, ultimately benefiting the environment and communities.

To further leverage its convening power and capacity to connect along the Earth observation value chain, GEO should reinforce its capacity to engage with key communities active in this field and to track users' needs through the GEO Work Programme. By doing so, GEO would successfully bring together those who need information for sound decision-making, with those who collect information about the Earth, and those who turn information into knowledge and package it as user-friendly tools, applications and services[20]. These steps would help GEO to position itself as the global leader in the field of Earth observations.

The data presented in this section has shown that GEO could achieve the above-mentioned objective by:

- Having the GEO leadership set a limited number of priorities and key issue-areas and focal themes for GEO to focus on for a number of years in particular in view of the next phase of GEO that will be starting in 2025. This would allow GEO to prioritize action in these areas and to align activities which are included in the GEO Work Programme accordingly, thus allowing GEO to formulate and deliver a clear value proposition. The flagship-centered strategy developed 2017 provides a reference for the adoption of a priority-setting approach going forward;
- Strengthening its role as a convener in the field of Earth observations, providing a platform for different stakeholders to engage and further cultivating its relations with UN agencies, multilateral development banks and statistical agencies among others. In this way, GEO would be building on the positive progresses that it has made up to the midpoint of implementation of GEO's Strategic Plan. This progress has been facilitated through the establishment of the Engagement Priorities which have provided an overarching framework to link GEO work to major policy initiatives;
- Engaging and delivering value on a continuous basis to member states, Participating Organizations, Associates, current and potential user communities, and international organizations including the UN and other external stakeholders by better defining GEO's value proposition, identifying benefits deriving from involvement with GEO, and consequently succeed in increasing participation and commitment to GEO both at the governance and Work Programme levels. It should be noted that addressing the needs of members also contributes to serving the conventions of which these members are parties;
- Translating information on needs and requirements at a strategic and operational level within GEO through the GEO Work Programme activities by adopting a flagship

[20] Strategic Plan 2016-2025, p. 7.

centered approach identifying key issue-areas and focal themes, that would facilitate the tracking and monitoring of users' needs. This approach would rely on the identification of a few focal themes and would attribute the responsibility to track users' needs primarily to GEO Work Programme activities that would have to be supported by the contribution of Regional, National GEOs, and the Programme Board. The flagship-centered strategy provides a scalable system that can be adapted to the multi-layered and diverse range of issues that the GEO Work Programme activities try to address, while still allowing flexibility in the Work Programme to include new activities where gaps have been identified.

- Developing a framework to report on users' needs which should be well-linked to the GEO Work Programme and capture the granularity of requirements expressed by users in different regions or states reflecting their different priorities as emerged from analysing the previously attempted SBA approach to tracking user needs. Challenges in implementing the SBA approach demonstrated that these needs would be better captured and coordinated at the level of the Work Programme, with an increasing role to play by Regional GEOs in fostering connections with the users' base and by attributing a central role to GEO Work Programme activities. This would also be in line with the direction set by the Programme Board in 2017 that individual Flagships and Initiatives should be made responsible for identifying, reporting and integrating users' needs.

Possible solutions that were suggested by interviewees include increased collaboration with CEOS, the Global Climate Observing System (GCOS) or other external partners focussed on users' needs, learning from the successes of Copernicus[21] in this area and/or relying more on Regional GEOs as intermediaries to gather information on users' needs and requirements, while also addressing capacity gaps at the regional, subregional and local level. Below, is a table reporting some best practices highlighted from the interviews and literature reviews on how other organizations report on users' needs that GEO could explore and consider for implementation going forward. By implementing these practices, continuing to progress in deepening its relations with key partners and ensuring GEO Work Programme activities, in particular Flagships and Initiatives consistently document users' needs, GEO would increase its capacity to serve the two interfaces, successfully linking Earth observation-based decision-making by political entities with the needs of users' communities.

Table 3. Best practices on how to report on users' needs

Best Practices on reporting on users' needs	
Actions	**Actors**
1. Clearly identify the different categories of users	GEO Work Programme activities Regional GEOs Programme Board (active oversight role)
2. Conduct users' consultation through interviews, workshops, surveys	
3. Conduct desk studies on the relevant policies and analysis of relevant published reports and translate needs into quantitative requirements	

[21] Copernicus is particularly close to users' communities, collects on a regular basis information about users' requirements and specifically addresses those needs as shown in the Working Document Expression of User Needs for the Copernicus Programme, EC (2014).

4. Maintain a database keeping track of users' needs to show how these evolved in time[22]	

Findings:

5. Relation with the UN and other stakeholders: In the past five years, GEO's engagement with the UN and multilateral environmental agreements has improved consistently. This was largely due to the establishment of the Engagement Priorities that allowed for a better alignment of agendas in the context of the SDGs, the Paris Agreement and the Sendai Framework for Disaster Risk Reduction. However, there are opportunities to further improve relations with UN agencies both at a high policy level and at an operational level by deepening their collaboration with Regional, National GEOs and GEO Work Programme activities. GEO has not made significant progress and it needs to work further to improve its relations with multilateral development banks and statistical agencies. There has been progress in this area over the past five years through Initiatives such as EO4EA and EO4SDGs making advancements, however GEO needs to continue to strengthen and expand these relationships across the organization. Strengthening such engagement would contribute to the establishment of a comprehensive ecosystem approach to the role of GEO in coordinating availability, access and use of Earth observations. Lastly, even though there has been progress in the engagement with the private sector and member states, better results can be achieved through a clearer definition of GEO value proposition.

6. Users' needs: Despite the different approaches adopted to this topic, GEO has not developed a systematic mechanism to report on users' needs and requirements, ensuring that these are identified and addressed, especially when different needs emerge at a regional, national and local level. This situation might vary at different levels of implementation of the GEO Work Programme, where specific activities, in particular Flagships such as GEOGLAM and GOS4M, or some Initiatives as GEO LDN, GEOGloWS and EO4SDGs, may have a better understanding of their users' base. Regional GEOs together with the GEO Work Programme activities: Flagships, Initiatives and Community Activities have been indicated as bodies within the GEO global structure that could play a central role in reporting on users' needs and ensuring that GEO maintains contact with its users' base.

3.4 Interoperability

3.4.1 Overview

There are two aspects concerning interoperability, the first relates to organizational interoperability or internal operational connectivity among the key pillars of GEO and the second relates to technical interoperability or external connectivity looking at the more technical aspects of the GEOSS data infrastructure. The first aspect refers to **internal connectivity** among GEO leadership and different elements of GEO's Work Programme and implementing mechanisms, looking at how Flagships, Initiatives, Regional GEOs and Community Activities share information, knowledge, principles and best practices across the GEO Work Programme. **The external connectivity** aspect looks at data access and technology systems enabling interoperability between different types of Earth observation systems aimed at increasing data access and adoption of principles of Data Sharing and Management.

[22] This action should be undertaken in particular by Flagships and Initiatives

3.4.1.1 Overview of Organizational Interoperability

Organizational interoperability and coordination are operating principles underpinning the functioning of GEO and of the GEO Work Programme. These principles help to connect all the different elements of GEO, under the coordinating role played by the Executive Committee, the Secretariat, and the Programme Board. The Executive Committee has the primary task to provide strategic leadership and maintain the policy framework set by the Plenary by executing the strategy and advancing the objectives set forth by the Plenary. The Programme Board supports the implementation of the GEO Strategic Plan through multi-year Work Programmes[23]. While the GEO Work Programme is characterized by a bottom-up structure, the inclusion of grassroots initiatives and a voluntary nature, there is a lack of clarity as to what extent the GEO Work Programme should expand its activities, and how these activities are interconnected while meeting GEO's main goals and delivering impacts. Also for this reason, thematic and geographic coordination of activities continues to present a challenge for GEO. The organization of the work around SBAs and more recently Engagement Priorities has tried to provide an improved overarching framework for operations, but in many cases challenges and opportunities to better leverage the linkages between the two remain. In fact, improving existing links between SBA targets and GEO Engagement Priorities can help address the risk that these two are becoming less directly connected. However, some respondents described the SBAs as more comprehensive.

GEO sought to improve its internal structure and organization through the Strategic Plan 2016-2025, which envisioned the establishment of a Programme Board to substitute the three different Implementation Boards that characterised GEO until 2015: the Institution and Development, Infrastructure, and Societal Benefits Implementation Boards. The Programme Board has the role of overseeing the GEO Work Programme to ensure it is aligned with the scope and substance of the activities proposed by GEO. In this sense, the Programme Board has been established to provide a more strategic and top-down approach to the implementation of the Work Programme that could balance its bottom-up structure, tightly linked to GEO's voluntary model. It is important to note that even though Regional GEOs are part of the GEO Work Programme, these are not subject to the oversight of the Programme Board, as these are overseen by the respective caucus. Further down in this section, we will consider how this change and other GEO governance and Work Programme structures, and their interplay, have influenced coordination levels within the organization. Lastly, the Secretariat supports and facilitates all GEO activities and their implementation by coordinating with the above-mentioned bodies.

3.4.1.2 Overview of Technical Interoperability

Focusing on external connectivity, GEOSS has evolved a lot from its initial launch in 2005. GEO was born with the main objective of realizing a system of systems primarily promoting open data sharing and providing some decision-support tools to a wide variety of users. At that time, GEOSS aimed to connect already existing spatial data and Earth observations infrastructures by making these latter interoperable, shareable and discoverable. Interoperability among different data systems is a complex concept which encompasses three layers: **technology, semantics and organization interoperability.** The first concerns technical data issues such as discoverability and accessibility, and the definition of interfaces and protocols. Semantics interoperability ensures that information is understandable through data and metadata standards, of good quality and provenance, and usable by all the users accessing or wishing to use the system**.** Lastly, organizational interoperability deals with

[23] GEO (2019). GEO Rules of Procedure, pp. 7-8.

modelling organizational processes and aligning information architecture with organizational goals. GEOSS initially understood interoperability as standardization[24]. Because of the large and multidisciplinary nature of GEO as an infrastructure, the standardization approach was seen as not being sufficient and GEOSS was invited to use more advanced and current technologies in 2011 to realize GEO's vision[25]. This is why in 2011, GEOSS shifted to a brokering approach to interoperability with a view to facilitate multidisciplinary and participatory research in a global environment. Despite the progress made, a report presented to the Plenary in 2014, tracking progress on the implementation of the GEOSS Evaluation's recommendations found progress on this point to be unsatisfactory[26].

With the beginning of the second decade of GEO's mandate in 2016, GEOSS evolved into a multi-organizational and global ecosystem that transformed its common infrastructure into a web-based platform making use of new available technologies such as Big Data Analytics platforms, artificial intelligence (AI) Tools and analysis ready data (ARD) systems and with Regional GEOs platforms playing an increasingly central role within GEOSS[27]. However, some important issues such as improved incorporation of in-situ data into GEOSS, which were also underlined in the Sixth and Summative Evaluation of GEOSS Implementation[28] were not fully addressed. The GEO Work Programme 2017-2019 included GEOSS In situ Earth Observation Resources as a Foundational Task, which aimed at filling observational gaps in this domain. In 2016, the Task Team developed a report on "In Situ Observations: Coordination Needs and Benefits". This latter highlighted the fact that there is no comprehensive coordination mechanism for terrestrial in situ observations and that GEO could play a niche role in this area, fostering integration of different networks through its convening power[29]. Following this report, there was limited follow-up on the integration of in situ data, which has been later included in the concept of the Knowledge Hub. The Task has also been recently reactivated with the establishment of the In Situ Data Subgroup of the Data Working Group, which began its operations in May 2021.

In 2018, GEO endorsed the Strategy for a Results-Oriented GEOSS to renew GEOSS architecture in line with the possibilities offered by modern technologies and address existing gaps of GEOSS. The strategy specifies that GEOSS should assume the role of trusted broker to support its members' access to different Earth observations data sources transforming from being a discovery and access facility to becoming a Knowledge Hub providing results relevant across the three main Engagement Priorities of GEO. Key items presented in this strategy included:

- The development of a GEOSS result-oriented framework, which is based on four pillars: Delivery of a) policy relevant, b) country relevant, c) project-based and d) knowledge-based products and services,
- The establishment of a Knowledge Hub as part of GEO's 2020-2025 Work Programme **to close current gaps** in the implementation of GEOSS[30].

The GEO-XVI Plenary accepted the proposal for the GEO Secretariat to develop an implementation plan for the GEO Knowledge Hub, in consultation with the GEOSS

[24] Nativi et al. (2013). The GEOSS solution for enabling data interoperability and integrative research.
[25] GEO (2011). Second Evaluation of GEOSS Implementation.
[26] GEO (2014). Progress on Implementation of Recommendations from GEOSS Evaluation, p. 4.
[27] Huadong et al. (2020). Big Earth Data science: An information Framework for a Sustainable Planet.
[28] GEO (2015). Sixth and Summative Evaluation of GEOSS Implementation, p. 4.
[29] GEO (2016). GEOSS components, pp. 8-9.
[30] GEO (2018). A Strategy for a Results-Oriented GEOSS, pp. 3-4.

Infrastructure Development Task Team (GIDTT) group and the Programme Board[31]. At the 52nd Executive Committee meeting in July 2020, the GEO Knowledge Hub Implementation Plan for the period July 2020 to June 2021 was approved. The Knowledge Hub aims to play the role of a digital repository providing access to knowledge required to make applications developed based on the use of Earth observations replicable. It also aims to promote better integration of citizen science and in situ observations within the GEOSS system. A key point will be seeing how it can be integrated to transform the GEOSS Portal into a tool that addresses current gaps in GEOSS. One of these gaps is the need for a greater focus on user needs and provision of data products and information that can be readily adapted to drive results for decision makers.

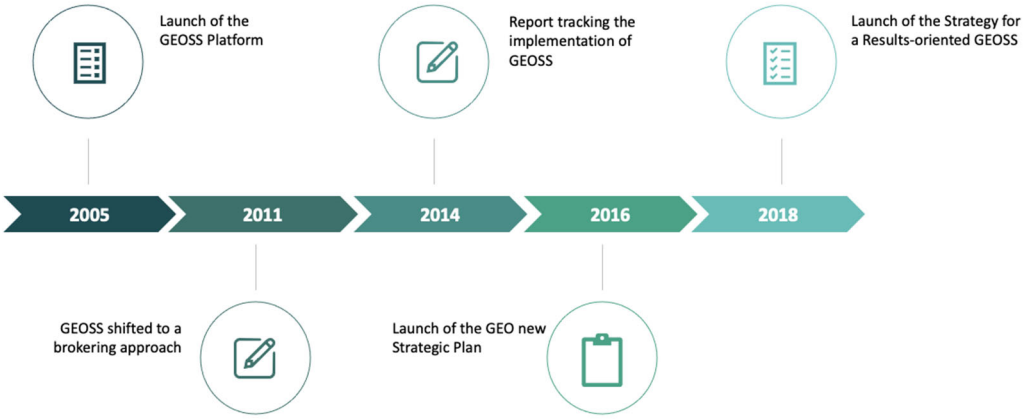


Figure 13. Timeline of the evolution of GEOSS

Source: created by the MTE Team

Because the operationalization of the Knowledge Hub project falls under the 2020-2025 Work Programme, it is not included in the scope of this mid-term evaluation. However, the MTE reports on progress made in the implementation of GEOSS according to respondents that also gave their views on the new framework for a results-oriented GEOSS, which is currently underpinned by the Knowledge Hub. Hence, the MTE Team will comment on the appropriateness of the Knowledge Hub concept and integration within GEO's current framework as opposed to its operationalisation which will be completed by 2025.

The following section comprises two main parts, one looking at elements of organizational interoperability within GEO and the other looking at technical interoperability, which is more related to technology systems.

3.4.2 Evidence from Current Evaluation

3.4.2.1 Organizational Interoperability

In examining internal interoperability of GEO's Implementing Mechanisms, findings indicated that the GEO Work Programme needs to improve organizational interconnectedness. The review looked at what activities and internal processes could be established to improve interoperability among the different components of GEO. Even though results from the community survey show that 57% of respondents think the Strategic Plan has had a very high, high or moderate impact on improving the quality of the Work Programme,

[31] GEO (2020). GEO Knowledge Hub Implementation Plan, p. 1.

comments focused on the fact that the Work Programme bottom-up structure led to a proliferation of activities. While this underlines the success of GEO's voluntary model, it can also represent a weakness, which has limited GEO's ability to establish synergies across the Work Programme.

GEO has recently undertaken efforts to couple this bottom-up approach with a top-down push towards implementation aiming to maintain traits of inclusiveness while recognizing the value added of grassroots elements of the Work Programme. The ultimate responsibility for setting the overall direction of GEO as an organization and of the GEO Work Programme lies with the Executive Committee and the Programme Board is the body with oversight of the different GEO Work Programme activities. The Programme Board has also recently established more formalized structures, procedures and thematic Engagement Teams to keep in contact with the GEO Work Programme activities and to better understand their status and assist them in furthering objectives as identified in the strategy. Interviews showed that the introduction of such mechanisms at the 16th Programme Board Meeting in 2020 has been viewed positively by Work Programme activities and by the Executive Committee. The establishment of Engagement Teams also aims to enhance the role of the Secretariat in supporting and monitoring the progress of the GEO Work Programme activities.

The Executive Committee has control over the allocation of resources for the Trust Fund. However, given that the GEO Work Programme is supported by voluntary contributions and/or members and partner organizations, GEO does not have direct funding control over all the GEO Work Programme activities. Because of this and of the bottom-up structure of the GEO Work Programme, where efforts to monitor progress can be limited by the diverse nature of the projects, objective measures of outcomes and impacts remain elusive. Also, it can be challenging to systematically collect information on the progress of activities towards their established targets. Interviews showed that more synergies would be needed between various activities, coupled with a focused vision from the Executive Committee on what top priority areas are for GEO. This could be done through the adoption of a flagship-centered approach aimed at establishing a few overarching issue-areas and focal themes that GEO should focus on in the next few years. This mandate and indication on top, high-level priority areas should come directly from the Executive Committee. It would introduce more synergies and high-level goals to the GEO Work Programme that would in turn facilitate the Programme Board's execution of its functions. Changes to the Work Programme and Programme Board role and structure have not been identified as the best solution by interviewees, however, it is clear that the Programme Board would benefit from improved high-level direction coming from the Executive Committee, providing an overarching vision to the organization.

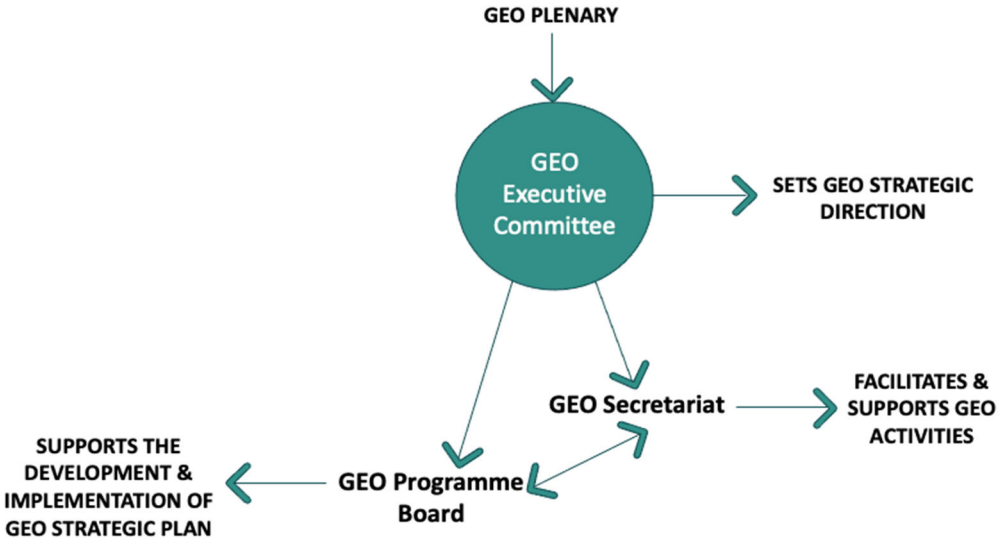


Figure 14. Role of the GEO Executive Committee

Source: created by the MTE Team

Regional GEOs, with their role in the Work Programme, represent another important component of organizational interoperability. The GEO-XV Plenary in Kyoto updated the role for Regional GEOs, which continued to be included in the GEO Work Programme, but without being subject to the oversight of the Programme Board[32]. A subgroup of the Programme Board, which was established to examine the role of the Regional GEOs more in detail at the time, noted that these have a strong role in promoting engagement and coordination across the GEO Work Programme at the regional level. Their role is unique among GEO Work Programme activities and that is what the majority of interviewees referred to, mentioning that it would have to be strengthened from an operational point of view so that they can contribute to increasing vertical and horizontal interconnectivity within the GEO Work Programme. On multiple occasions, it has been remarked that Regional GEOs should improve the role they play of intermediary information bodies serving local, national and regional needs and feeding this information into the global GEO governance structure. This would contribute to and enhance the creation of a multilateral communication system that would allow for recommendations and decisions to be taken at a centralized level to be shared and implemented geographically across the GEO community. As important intermediaries, Regional GEOs can and should improve communication between the Secretariat, with GEO Principals, National GEOs, Initiatives, Flagships, Community Activities and amongst themselves. The clear intention is to improve horizontal and vertical coordination, through the sharing of good practices and lessons learnt.

The Secretariat's communication with the Regional GEOs has until now happened mostly on an ad hoc basis, even though it has recently increased. Several interviewees suggested a few options to achieve greater coordination between the Secretariat and Regional GEOs such as having a point of contact for Regional GEOs at the Secretariat or setting up monthly coordination calls between the Secretariat and Regional GEOs. Interviewees highlighted that

[32] GEO (2018). Information regarding Regional Groups on Earth Observations (Regional GEOs), p. 1.

GEO activities that have a point of contact at the Secretariat benefit from better connection to the global GEO and the overall GEO community, and the same can be expected for Regional GEOs.

In terms of providing interconnectedness across the GEO Work Programme, the introduction of the Engagement Priorities is described as having impacted positively on the workflows, with only a few interviewees advocating for a return to the structure based solely on SBAs. However, the majority of key informants seem to agree with maintaining the SBAs alongside the Engagement Priorities as the first can provide a good transversal organization of GEO work and also emphasize activities which may not directly relate to the Engagement Priorities. Some interviewees mentioned the connection between SBAs and Engagement Priorities has not been leveraged enough.

The Executive Committee is seen as having a key role to play to enhance GEO internal interoperability. The majority of key informants described the Executive Committee as being focused on procedural and formal arrangements surrounding GEO's functioning and operations rather than on setting a clear direction for the implementation of GEO strategy and engagement plan. In general, interviewees have called for the Executive Committee to play an operational role through decision-making on substantive matters aimed at increasing its contribution to prioritization of activities and GEO capacity to deliver clear benefits to member states and organizations. The interview process has shown that what is often missing in GEO is the political will to define clear priorities, which has direct implications for GEO ability to define a clear value proposition. This aspect of consensus decision-making may be having the Executive Committee take a different approach, more focused on setting clear outcomes for GEO. Interviewees also suggested that the GEO Secretariat, given its limited staffing and funding resources, should focus on supporting the implementation of GEO's priorities set by the Executive Committee, which would allow for a better alignment of the operations of the Secretariat and Executive Committee.

GEO sought to address prioritization and the identification of key issue-areas in the past by proposing a flagship-centered strategy at the 38th Executive Committee meeting in 2016. This strategy aimed to calibrate the focus of the Executive Committee and align it with selected, discrete, high-level policy goals that can focus GEO objectives, align outputs with outcomes tied to key global agendas, and relevant stakeholders. This strategy, while not implemented, provides one possible foundation for GEO to develop its strategic focus for the next phase of its implementation.

Lastly, the case study analysis highlighted the need for GEO to address how it approaches and defines the development and progression of activities within its Work Programme. As currently defined, the structure of the Work Programme suggests that all activities should aim to become Flagships developing from a concept towards a more operational model that is driven by a policy mandate. While certain activities have expressed a willingness to become Flagships, it is unclear to what extent the Work Programme could accommodate more Flagships and whether this is an ambition of multiple activities. In practice, it does not appear that GEO intends for all of its initiatives to advance to the Flagship level, however, as currently described, this is not clear in GEO's guiding documents. For this reason, GEO should try to formulate a clear strategy on the principles defining this progression. GEO should look at maintaining elements of the flexible, bottom-up structure of the Work Programme, while also developing the Work Programme in a consistent manner that fosters synergies, builds complementarities, and addresses any gaps that may impact its outcomes.

3.4.2.2 Technical Interoperability

The GEOSS project is one of the founding pillars of GEO as an organization. Many appreciate the concept of GEOSS and the work GEO has done to promote Data Sharing and Management principles, however, most respondents believe that GEOSS has remained very theoretical and given recent evolutions in the technology sphere, its initial design and the data portal might be outdated.

Looking at the role the GEO data Portal has had within the growing ecosystem of Earth observation systems has shown that the GEO portal is not widely used, and that GEO should work to make access to Earth observation data and information easier.

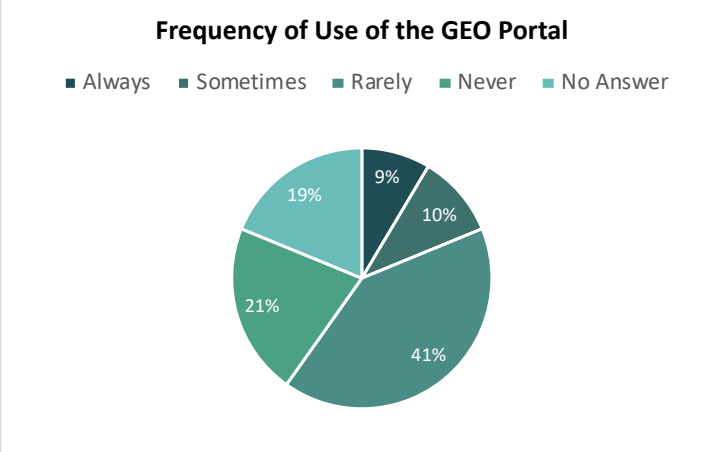


Figure 15. Frequency of Use of the GEO Portal

In fact, **as shown in Figure 15,** 91% of respondents to the community survey do not always use the GEO Portal to look for Earth observation data and information. The portals used as alternatives include National Aeronautics and Space Administration (NASA), European Space Agency (ESA), Copernicus, the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT), the WMO, the National Oceanic and Atmospheric Administration (NOAA), the United States Geological Survey (USGS), Instituto Nacional de Pesquisas Espaciais (INPE), Copernicus Atmosphere Monitoring Service (CAMS) and Google Earth Engine (GEE). Users also seem to prefer thematic platforms within the GEO system like GEOGLAM when they are looking for specific data. Some respondents to the survey and interviewees mentioned that using the direct source of the data can provide important context and tools to understand it better, noting how GEO does not provide this latter. Different communities have their own portals of reference, as is the case with IOC-UNESCO for the oceanographic community. Users also show a tendency to use data portals they are familiar with providing specific data, unless they are looking for more general information and, in that case, GEOSS is considered a useful alternative. Asked about how they think GEO can improve use, sharing and availability of Earth observations, community survey respondents listed as one of their top answers that GEO should improve access to in situ observations, interconnection with other systems and should focus on carrying out more training activities including joint programs with organizations working in developing countries to bridge the digital literacy gap. In particular, the in situ data component is essential to validate remote sensing and, in this area, **GEO still needs to close an existing gap that will help it better coordinate, facilitate and advocate access and use of Earth observations.**

In line with what was mentioned in the *GEO Organizational Model* section (3.2), **interviewees described GEOSS as a theoretical concept, which does not reflect the original design and expectations the community had for the system of systems.** Many of the key informants noted that GEOSS is an outdated concept, and some respondents to the survey suggested abandoning the terminology GEOSS. GEOSS is not seen as being user-friendly. Its critical shortcomings, according to interviewees and respondents include:

- little integration of the in situ data component,
- scarcity of filtering options that do not allow users to select information based on their needs,
- missing metadata and links that often do not work,
- poor visualization tools.

The majority of key informants are supportive of the Knowledge Hub and they think it will contribute to making GEOSS more concrete. **Also, some interviewees agree that GEO should put more emphasis on GEOSS' role as a discoverability platform rather than a data infrastructure** and the majority believes that GEO should continue promoting interoperability standards of Data Sharing and Data Management. Nevertheless, only a minority of interviewees suggested that GEOSS should completely abandon the infrastructure development project. The minority that supported this preference to abandon the development of the GEOSS platform noted that commercial sector technologies are more technologically advanced than GEOSS, and that the costs related to developing and maintaining the infrastructure do not seem to justify the benefits enjoyed by a limited group of users**.**

Opportunities for improvement of the GEO Portal include the full integration of the in situ data component within the GEOSS system. The Work Programme 2017-2019 included a Foundational Task on in situ data and the Canberra Declaration, in 2019, also provided a mandate to GEO to improve the integration of in situ data within GEOSS[33]. The interviews pointed to the need for a more comprehensive effort to meet this mandate and that **little progress has been made** until now to integrate in situ data providers within GEOSS. While challenges to the full integration of in situ data remain and affect the entire Earth observation community as these are structural in nature, considerable work remains to be done at the level of advocating for open access with some countries which may be still reluctant, because of historical and research-related reasons, to share their data. Also, in some regions, in situ data collection is still limited. Key informants remarked that Regional and National GEOs and increased coordination with GEO member states could play a relevant role in unlocking access to in situ observations. Interviews also highlighted that GEO should continue promoting principles of Data Management and Data Sharing in relation to in situ data. When advocating for such principles, GEO should be aware of other organizations active in this field and consider coordinating also with the latter.

Interviewees suggested that GEO should use cloud technologies to address existing gaps in the GEOSS system. It was noted that GEO should be aware of the strong evolution of cloud-based data processing environments provided by the commercial sector and how these can interact with government funded cloud offerings especially as it focuses more on engaging the commercial sector. Moreover, findings from the interviews with key informants showed that some interviewees believe GEO should think of how to position itself in relation to these opportunities and whether it would consider introducing changes in the way it processes and stores data such as the use of cloud computing technologies.

[33] GEO (2019). Canberra Declaration, p. 2.

Lastly, the Knowledge Hub represents a major development in the GEO technological landscape. Interviewees noted how the development of this project fostered internal divisions prior to its approval in 2019 at the Canberra Ministerial Summit. Currently, the Knowledge Hub is overall perceived as a positive development by the community showing that some of the initial challenges and issues related to this new project have been successfully addressed by GEO. Many mentioned that, if developed, the Knowledge Hub may contribute to making GEOSS more practical and help it evolve from a data to a knowledge platform. However, some concerns were expressed regarding the resources required for GEO Knowledge Hub implementation. Specifically, respondents noted that the Knowledge Hub should be balanced against other GEO priorities, given the limited staffing resources of the Secretariat, which is leading on this project. In particular, the findings noted that the Knowledge Hub should be contextualised in light of other GEO focus areas and the need to invest and focus resources on engaging members on a more consistent basis and improving the existing GEOSS infrastructure. One of the concerns that was voiced by the GEO community is that the Knowledge Hub is diverting attention from completion and enhancement of the functionalities of the GEOSS infrastructure, which is still ongoing.

In general, interviewees agreed that more attention should be placed on developing an overarching framework integrating the Knowledge Hub within GEOSS. This approach should support complementarities and synergies among the two systems. Furthermore, pilot cases should be developed and communicated to the community to demonstrate how existing initiatives can connect with the Hub, ensuring more buy-in for this project and its effective scalability by ensuring that Work Programme activities take increasing ownership of it. Lastly, it has been suggested that the Knowledge Hub development phase may represent an opportunity to harness the use of new and more modern technologies. However, views and suggestions on how to better implement the Knowledge Hub were only expressed by a minority of the community and for this reason, recommendations in this case will focus on the need to review the Knowledge Hub project in light of existing GEO priorities and limited resources of the GEO Secretariat. Only suggestions will be provided regarding how Knowledge Hub can be better integrated going forward given that its implementation is still ongoing and many of the above-mentioned issues are being addressed by the team working on its development.

Asked if the GEO Portal interoperates with other significant global and regional Earth observation data access portals:

- 21% of respondents said yes,
- 37% answered they did not know,
- 5% said it does not,
- 37% did not answer the question.

Comments to the community survey show that GEOSS interoperates quite well with Regional GEOs portals, in particular AmeriGEO, but also with Copernicus, NextGEOSS and the NASA Earthdata portal. On a negative note, some respondents noted that GEO should work more with other systems to incorporate common links and resources by assuming a more modern conceptual architecture and giving direct access to information available on other portals instead of just providing links.

Given that there has been a rise in the number of Earth observation data portals in recent years, **emphasis has to be placed on interoperability where data principles and connectivity across portals increasingly drive value added information for users within specific**

sectors. The community survey, as shown in Figure 16, pointed to the fact that there has been good progress in terms of GEO achievements in Data Sharing:

- 36% say there has been very good or good progress on GEOSS Data Collection of Open Resources and Open Data,
- 23% say there has been average progress,
- 7% say progress has been poor,
- the remaining did not know or did not answer.

In terms of GEO's achievements in Data Management including the need for common standards, discoverability, accessibility, usability, preservation, curation and interoperability arrangements:

- 41% of respondents say progress was very good or good,
- 15% say it was average,
- 6% of respondents say progress has been poor,
- the remaining did not know or did not answer.

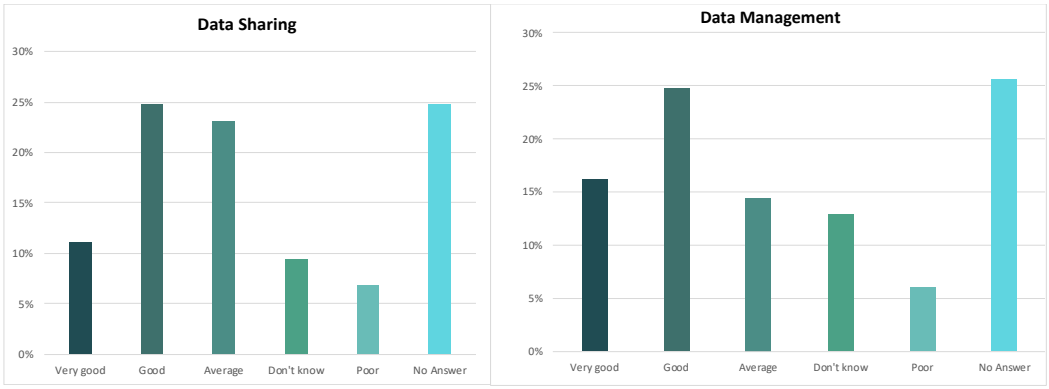


Figure 16. GEO's Achievements in Data Sharing and Data Management

On connectivity with other Earth observation data portals, 56% of respondents to the community survey agree that GEO needs to strengthen its relationship with complementary global and/or national Earth observations programmes and organizations such as NASA, ESA, WMO, Copernicus, NOAA, CEOS, EUMETSAT and the International Renewable Energy Agency (IRENA) and the wide range of providers of in situ data. Other comments pointed to how GEO should strive to become increasingly complementary to the WMO in terms of providing data on areas of focus not covered by the WMO (for example, urbanization and demographics). Another opportunity for complementarity which has been highlighted is with IOC-UNESCO data system. This system has been described as very advanced on in situ data and not yet connected to the GEO data portal. The opportunity to link GEOSS with this system is even more relevant in the context of the UN Decade of Ocean Science for Sustainable Development, especially given that respondents have noted a lack of awareness of GEO's capabilities within the IOC. Lastly, in the answers to the community survey, respondents noted how GEO would need to strengthen relations with national institutions which are responsible for Earth observation programs. Involving National GEOs will be key in developing countries to enhance capacities to use Earth observation data and services.

By increasing the scope and quality of the connections with complementary Earth observation systems in developing countries, GEO could also contribute to its goal of promoting capacity development in the use of Earth observations in such countries. In fact, respondents pointed to the fact that GEO and consequently the use of the GEO portal and EO-derived information in the developing world might be affected by the digital literacy gap

that some of these countries experience. Hence, increasing linkages with national Earth observations data portals may increase use and access to Earth observations in specific countries. Some respondents also mentioned GEO should work to develop capacities to use tools and products that will be made available through the Knowledge Hub. Suggestions included organizing trainings, joint programmes and exchange/networking opportunities, with a particular attention to increasing capacities to use such tools in developing countries where GEO could team up with local small, medium and micro enterprises (SMMEs) to provide the above-mentioned training opportunities. One example of this already taking place at the regional level is the Inter-American Academy that was established through AmeriGEO.

3.4.3 Synthesis and Findings

3.4.3.1 Organizational Interoperability

Organizational interoperability among different elements of the GEO Work Programme has increased in recent years thanks to some of the changes that were introduced with the Strategic Plan 2016-2025 such as the establishment of the Programme Board and of the Engagement Priorities. In particular, the Engagement Priorities have contributed to giving an overarching sense of purpose to the work of GEO. These have helped in improving connections with external stakeholders and international policy frameworks that GEO members are parties to, but more efforts are needed to increase internal interoperability and synergies across GEO. To achieve a higher synergy among the different activities, GEO should set a high-level vision of its future direction and consequently align its Work Programme in a cohesive manner, establishing a nexus among its activities. This could be achieved through the implementation of a flagship-centered strategy, which would lead to a reorganization of the Work Programme around key issue-areas and focal themes established by GEO leadership as priority for the coming years. Greater clarity and focus should come from the Executive Committee, which should play a more central role in terms of setting clear goals and outcomes for GEO as an organization, providing the Secretariat and Programme Board with a sense of clear objectives that GEO should pursue. The establishment of a clear focus and priorities can better guide the work of the Secretariat and its alignment with the Executive Committee as these bodies have key leadership roles within GEO. Synergies should also be established among the GEO Secretariat and Regional GEOs in order to improve communication and overall coordination across the organization.

Table 4 below represents contributions of GEO Work Programme activities, in particular Flagships and Initiatives, to the Engagement Priorities, Societal Benefit Areas, how activities have been organized per Engagement Teams, which were established under the Programme Board in 2020[34], and includes a suggestion on how they could be arranged considering the four Nexuses that have been identified in view of the GEO Plenary in 2021[35]. Even though the development of such nexus areas is still in an early-development phase, considering how to harness this construct could help improve coordination across the GEO Work Programme. The different elements presented in the table show that GEO needs to identify and prioritize impact areas, where it wants to focus for a number of years, that should be set at the Executive Committee level. The identification of such impact areas can be based on the flagship-centered strategy presented in 2017 or through another alternative approach, which GEO may choose to adopt. Once agreed upon, these impact areas decided through a thematic or nexus model, should show clear linkages and synergies between the GEO Work Programme activities,

[34] 16th Meeting of the GEO Programme Board, p. 4.
[35] The need to organize activities per key issue-areas is a common practice also for other organizations, as shown in the Copernicus SDGs alignment mapping report of 2018.

aligning GEO activities and their contributions to a common vision in a comprehensive manner. The impact areas may represent key global goals that Earth observations can support, whereas the thematic or nexus linkages could be established across the GEO Work Programme to connect to these high-level priorities and create better integration across GEO. Given the development of the GEO Knowledge Hub project, it may also be worth considering how its potential could be harnessed to provide a thematic organization of the material shared on the platform.

Table 4. GEO Work Programme Linkages

	Sustainable Development Goals	Paris Agreement	Sendai Framework	Societal Benefit Areas	Engagement Teams	Nexus
GEOBON	SDGs 2, 3, 6, 13, 14, 15			Biodiversity and Ecosystem Sustainability	Ecosystems	Climate-Ocean-Biodiversity Land-Food-Water-Biodiversity
GEOGLAM	SDGs 2, 8	Adaptation		Food Security and Sustainable Agriculture	Land	Water-Food-Energy Land-Food-Water-Biodiversity
GFOI	SDGs 13, 15, 17	Cap Dev/Tech Transfer, Reporting/Global Stocktake, Mitigation	Target G	Biodiversity and Ecosystem Sustainability, Food Security and Sustainable Agriculture	Ecosystems	Climate-Ocean-Biodiversity Land-Food-Water-Biodiversity
GOS4M	SDGs 3, 6, 12, 17			Public Health Surveillance	Atmosphere	Climate-Ocean-Biodiversity Climate-Health-Infrastructure Land-Food-Water-Biodiversity
AQUAWATCH	SDGs 6, 14			Public Health Surveillance, Water Resources Management	Water	Climate-Ocean-Biodiversity Water-Food-Energy Land-Food-Water-Biodiversity
BLUE PLANET	SDG 14	Mitigation	Target G		Water	Climate-Ocean-Biodiversity Land-Food-Water-Biodiversity
DIAS	SDGs 1, 2,3, 6, 7, 8, 9, 11, 12, 13, 14, 15		Target A		Cross-cutting	Climate-Ocean-Biodiversity Water-Food-Energy Climate-Health-Infrastructure Land-Food-Water-Biodiversity
EO4EA	SDGs 2, 6, 7, 8, 9, 11, 12, 14			Biodiversity and Ecosystem Sustainability	Ecosystems	Climate-Ocean-Biodiversity Land-Food-Water-Biodiversity Water-Food-Energy
EO4HEALTH	SDG 3		Target G		Urban	Climate-Health-Infrastructure
EO4SDG	SDGs 1, 2, 3, 6, 7, 8, 9, 11, 12, 13, 14, 15, 17				Cross-cutting	Climate-Ocean-Biodiversity Water-Food-Energy Climate-Health-Infrastructure Land-Food-Water-Biodiversity
GDIS	SDG 6	Loss and Damage		Biodiversity and Ecosystem Sustainability, Food Security and Sustainable Agriculture, Water Resources Management	Land	Water-Food-Energy Land-Food-Water-Biodiversity
GEO-DARMA				Disaster Resilience	Disasters	Climate-Health-Infrastructure
GEO-GNOME	SDGs 1, 2, 3, 6, 7, 9, 13, 15	Adaptation, Loss & Damage, Cap Dev/Tech Transfer, Reporting/Global Stocktake, Mitigation	Target A, B, C, D, G	Biodiversity and Ecosystem Sustainability, Disaster Resilience, Water Resources Management	Cross-cutting	Climate-Ocean-Biodiversity Water-Food-Energy Climate-Health-Infrastructure Land-Food-Water-Biodiversity
GEO-LDN					Land	Climate-Ocean-Biodiversity Land-Food-Water-Biodiversity
GEO-VENER	SDG 7	Adaptation, Loss & Damage, Cap Dev/Tech Transfer, Mitigation	Target C, D	Energy and Mineral Resources Management	Atmosphere	Water-Food-Energy Climate-Health-Infrastructure
GEO-WETLAND	SDGs 6, 15	Reporting/Global Stocktake, Mitigation		Biodiversity and Ecosystem Sustainability, Water Resources Management	Ecosystems	Climate-Ocean-Biodiversity Land-Food-Water-Biodiversity
GEO-CRADLE	SDGs 1, 2, 3, 7, 9, 11, 13, 15, 17	Adaptation, Cap Dev/Tech Transfer, Mitigation			Cross-cutting	Climate-Ocean-Biodiversity Water-Food-Energy Climate-Health-Infrastructure Land-Food-Water-Biodiversity
GEO-GLOWS	SDG 6			Disaster Resilience, Energy and Mineral Resources Management, Food Security and Sustainable Agriculture, Public Health Surveillance, Water Resources Management	Water	Water-Food-Energy Climate-Health-Infrastructure Land-Food-Water-Biodiversity
GOS4POPS	SDGs 3, 6			Public Health Surveillance, Sustainable Urban Development	Atmosphere	Climate-Health-Infrastructure
GSNL	SDG 11		Target F, G	Disaster Resilience	Disasters	Climate-Health-Infrastructure
GUOI	SDG 11	Adaptation, Mitigation		Biodiversity and Ecosystem Sustainability,Disaster Resilience, Public Health Surveillance, Sustainable Urban Development	Urban	Water-Food-Energy Climate-Health-Infrastructure Land-Food-Water-Biodiversity
GWIS	SDGs 1, 3, 11, 13, 15, 17	Mitigation	Target G	Biodiversity and Ecosystem Sustainability, Disaster Resilience	Disasters	Climate-Ocean-Biodiversity Water-Food-Energy Climate-Health-Infrastructure Land-Food-Water-Biodiversity
HUMAN-PLANET	SDGs 11, 15	Loss & Damage	Target G	Disaster Resilience, Sustainable Urban Development	Urban	Water-Food-Energy Climate-Health-Infrastructure Land-Food-Water-Biodiversity

Source: created by the MTE Team[36]

3.4.3.2 Technical Interoperability

Section 3.2 on the GEO Organizational Model underlined that there currently is limited clarity on what GEOSS has come to mean to the organization and its stakeholders. The majority of respondents also believe that the GEOSS Implementation Plan would need to be reviewed to address some structural issues of the system of systems such as its technological development and the limited integration of the in situ data component. Respondents noted that in order to further promote the integration of in situ data within GEOSS:

- GEO should continue working to make sure all GEO Members agree to openly share their data by advocating for Data Sharing and Data Management principles in this context,
- GEO should also continue to partner with existing agencies and scientific network organizations that are custodians of global in situ data and data policies by developing a clear value proposition for these latter to engage,
- GEO could consider partnering with other leading organizations in this field such as the Global Biodiversity Information Facility (GBIF), the Global Ecosystem Research Infrastructure (GERI) and Global Ocean Observing System (GOOS), with which Blue Planet has already engaged, among others, to provide a platform for the sharing of in situ data, with a specific reference to Essential Variables. In particular, GEO may consider ways in which it could contribute to the WMO Global Basic Observing Network (GBON) and coordinate with the WMO on the in situ data component of GEOSS,
- GEO could consider better integrating citizen science across GEO, linking it with other data sources and GEOSS. GEO currently has a Community Activity dedicated to citizen science and this could be leveraged to better connect citizen science across the GEO Work Programme and with external partners. GEO could also consider collaborating with the commercial sector that could agree, under pre-set conditions, to share some of the in situ data gathered through instruments such as phones and other technologies, such as water temperature sensors present on boats to track rising sea temperature.

In general, the In Situ Data Subgroup of the Data Working Group is considering steps forward to address some of these challenges. This also points to other possible challenges for GEO to consider such as IPR, data rights, and data sharing principles, which the Data Ethics Subgroup of the same Working Group is currently considering. Overall, it has been noted that the GEOSS Implementation Plan should pay more attention to emerging technologies and to making sure GEOSS is in line with users' expectations and capable of responding to users' needs from a content but also a technological performance point of view.

Based on the MTE's findings, the GEOSS value proposition is shifting towards an increasing focus on the delivery of knowledge, tools and products for users. This intention has been underlined by the approval of the Knowledge Hub. However, there is still a need to reinforce the capacity of GEO to deliver on the technical structure needed to build tools in line with what is described in the Strategy for a Results-Oriented GEOSS. This will also include the further integration of climate, natural disasters and epidemic disease surveillance data to better address the Engagement Priorities and emerging areas of interest in the aftermath of the COVID-19 global pandemic, such as public health surveillance. Even though the evaluation cannot express itself on the Knowledge Hub, which has not been completed yet, it does show the optimism of

[36] This table has been developed by the MTE Team using information from the GEO Work Programme 2020-2022, on the Engagement Teams established under the Programme Board and using information on the nexus areas that are being developed in view of the GEO Plenary in 2021.

the community about the potential of what the Knowledge Hub could deliver in terms of closing current gaps in GEOSS implementation. The challenge for GEO will be to look at a plan that can integrate the Knowledge Hub to advance or transform the current GEOSS system, while ensuring that this is done in a sustainable manner that allows time and resources necessary for other key GEO priorities to continue.

The Knowledge Hub is quite broadly perceived as a positive development for the GEOSS platform, but this project is also seen as partially competing with other GEO priorities and not fully integrated with the existing GEOSS infrastructure. For this reason, going forward, the Knowledge Hub project should be carried out taking into account GEO's limited resources and considering other GEO priorities. Suggestions highlighted from the interviews point to the fact that the Knowledge Hub should support complementarities with the existing GEOSS infrastructure bridging these two complex ecosystems through increased transparency, reproducibility and knowledge sharing. For this purpose, developing pilot cases to show the usefulness of the Knowledge Hub may help attract further contributions in terms of data and products shared to this project from the GEO Work Programme activities and show its potential to address users' needs. Also, considering that there are different types of Knowledge Hubs, GEO may want to review existing models available to define how its Knowledge Hub should be structured. For example, the IPCC Knowledge Hub provides a good example of a mature and well-established knowledge hub.

Lastly, in terms of external interoperability, GEO has successfully contributed to the promotion of Data Sharing and Management Principles over past years. In order to build on this success, there is further space to improve interoperability of the GEO data portal with complementary Earth observation systems, especially at the regional, national and local levels and this can be achieved by increasing connections with Regional, National GEOs and Principals. This may contribute to increasing access and availability of data, in particular in situ observations and to increase developing countries' capacity to access and use Earth observations and EO-derived products.

Findings:

7. Internal processes and connections: The GEO Work Programme, while marked by bottom-up approaches and driven by coalitions of willing communities of practice, needs to be balanced with GEO's ability to maintain a clear vision and focus. The broad GEO Work programme would benefit from better coordination, improved communication and interoperability between GEO's implementation mechanisms. The scale of the current Work Programme makes this more challenging for the Programme Board and the GEO Secretariat to execute. Greater coordination at the thematic and regional level may help to reduce redundancies and improve integration. However, GEO needs to keep in mind that without additional resources (both within the Secretariat and from members) or improved rationalisation of existing activities it will be difficult to further expand the Work Programme while still maintaining its overall effectiveness and cohesion. The Executive Committee and Programme Board need to focus more on overarching thematic areas, and concrete goals for GEO providing more top-down direction, while balancing that with a bottom-up approach. The Societal Benefit Areas structure of the GEO Work Programme should be retained, alongside the Engagement Priorities to allow cross-cutting links. An increasing level of interaction between Regional GEOs should be encouraged. The new Knowledge Hub has a potential role to play in providing information to show how Initiatives, Community Activities, Flagships and Regional GEOs currently connect, placing an emphasis on the value chain of Earth observation to users and where GEO provides this across its different initiatives.

8. External and technical Interoperability: Despite recent attempts to improve it, the GEOSS Implementation Plan needs to be reviewed. The GEOSS portal, as described, is unable to meet user expectations in terms of its low technical capability, low performance compared with other global and regional systems, and the lack of good integration of in situ data. This view is supported by the low rates of use of the portal when compared with other global, regional and national portals. Technology advances have significantly changed the original concept for the GEOSS and GEO no longer has the tools, right partners or resources to meet the project GEO had intended in the early years (2005 – 2010) to build a system of systems. GEO would benefit from improved external connectivity with major Earth observation data portals, at all levels. Attention should be paid to links with global, regional and national data systems. Particular attention should be made to improving the availability and integration of in situ observations within the GEO Portal, working with in situ terrestrial, freshwater, coastal, ocean and atmospheric observation systems and new in situ initiatives such as GBON and others. It is believed that the new GEO Knowledge Hub could provide more support to the Earth observation value chain and, although still at an early stage of development, should become part of the GEOSS infrastructure. However, this development needs to balanced against GEO's other priorities. Recently, the early development of the Knowledge Hub has required a high level of support from GEO Secretariat staff, and this heavy burden is not sustainable in light of other GEO priorities.

3.5 Regional GEOs

3.5.1 Overview

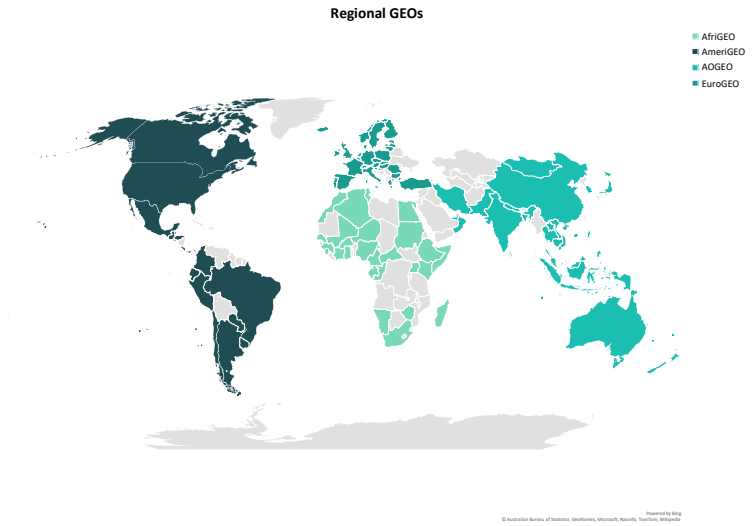


Figure 17. Regional GEOs Member Countries

Regional GEOs' primary function as established in the GEO Rules of Procedure[37] is to engage regional stakeholders in GEO activities and coordinate implementation of GEO activities within the region.

At the GEO-XV Plenary in Kyoto, Regional GEOSS Initiatives were renamed as Regional GEOs[38]. GEO currently has four Regional GEOs based on four of the GEO Caucus regions:

[37] GEO (2019), GEO Rules of Procedure, p. 13.
[38] GEO (2018). Information Regarding Regional Groups on Earth Observations (Regional GEOs), p. 1.

AfriGEO, AmeriGEO, AOGEO and EuroGEO as can be observed in Figure 17. The CIS Caucus does not currently have a corresponding Regional GEO. The MTE has found that Regional GEOs can enable further engagement, collaboration, and participation in GEO, hence the creation and strengthening of this mechanism can be helpful in advancing GEO members' goals and engagement. The caucuses set priorities and oversee activities of the Regional GEOs. Also, to complement the two main functions of Regional GEOs presented above, their role may also include:

1) Engaging national agencies and regional intergovernmental organizations and other potential users of Earth observations,
2) Identifying regional needs for Earth observation applications and conveying these to global GEO activities,
3) Facilitating the collaboration of regional with global activities,
4) Promoting communication among Regional GEOs members and with other Regional GEOs,
5) Identifying funding opportunities to support GEO's activities and projects.

The Engagement Strategy mentions that Regional and National GEOs are key mechanisms for engagement, linking GEO Principals, national agencies and the research community at national and regional levels[39]. These structures are instrumental in coordinating Earth observation strategies, investments, activities and programmes at national and regional levels. They help to leverage the use of Earth observations to enhance decision-making, as they benefit from easier access to regional and international Earth observation sources. In turn, the existence of these mechanisms enhances the representation and participation of the corresponding GEO members in GEO, increasing GEO's visibility and impact. The data collection process has highlighted the importance of Regional GEOs as key in attracting more member states to join GEO and playing the role of information providers and access points for new members joining, as well as for many other participants that refer to Regional GEOs as a conduit of communication with the global GEO.

Apart from the above-mentioned roles, **Regional GEOs together with Flagships and Initiatives and to a lesser extent Community Activities are described in the Strategy for Capacity Development presented at the 12th Meeting of the Programme Board of 2019 as having a key role in promoting GEO's holistic vision of capacity development based on co-creation of efforts and going beyond individual capacity to integrate institutional and organizational ones[40].** They are the main target audience of the Capacity Development Working Group involved in designing, implementing and evaluating the GEO Capacity Development Strategy at three different levels: individual, organizational and institutional. They would then implement and assist GEO Work Programme activities in the implementation of the lessons learnt from working with the Capacity Development Working Group in their relation with end users.

Also, the Equality, Diversity and Inclusion Subgroup's report of 2020 underlines how proactively and regularly engaging with Regional GEOs will be important to identify tailored solutions to promote equality, diversity and inclusion of underrepresented groups in GEO as different regional networks may identify suitable models for the different regional realities[41]. This Subgroup of the Programme Board has also developed an EDI draft statement that has

[39] GEO (2016), GEO engagement Strategy, p. 12.
[40] GEO (2019), Toward a GEO Strategy for Capacity Development, p.4.
[41] GEO (2021). GEO Report on Equality, Diversity and Inclusion, p. 10.

been recommended to the Executive Committee for endorsement in view of being presented to the GEO XVII Plenary for approval.

The following section reviews findings on Regional GEOs aiming to define how these can be better integrated within GEO by enhancing their contribution in several key areas including communication and coordination, capacity development and overall engagement with GEO's stakeholders.

3.5.2 Evidence from Current Evaluation

3.5.2.1 The Perspective of Regional GEO Representatives from the data analysis

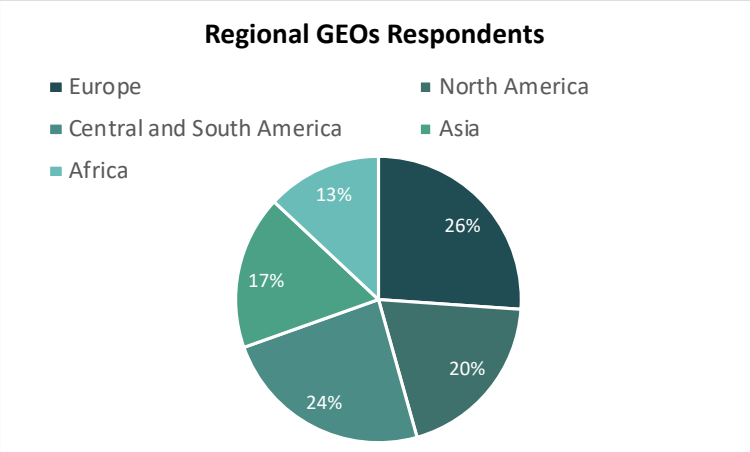


Figure 18. Geographic Composition of Respondents from Regional GEOs

The data that is presented in this subsection shows that Regional GEOs participants and respondents to the community survey feel quite engaged by GEO, are active in the organization and believe that their needs are being met or that GEO is working to make sure it keeps these into consideration. This portrays a promising situation with quite high levels of engagement, interaction and satisfaction.

Overall, 30% of the respondents to the community survey or 46 out of 117 are from Regional GEOs[42]. According to the answers given to the questions on the level of activity related to their current role in GEO, this category seems to have quite high activity levels within GEO:

- 54% declaring they have very high, high or moderate activity levels within GEO,
- 17% saying they have little activity levels,
- 17% saying they have very little activity levels within GEO,
- 11% did not answer the question.

The same results for the users' category were 16%, 23%, 47% and 13% respectively, showing different activity levels. The Societal Benefit Areas they work the most with can be observed below in Figure 19.

[42] As question 1 in the GEO community survey "Which area of the GEO Work Programme do you currently engage with" allowed respondents to list more than one answer, respondents who answered they engage with Regional GEOs may also engage with other components and activities of the GEO Work Programme.

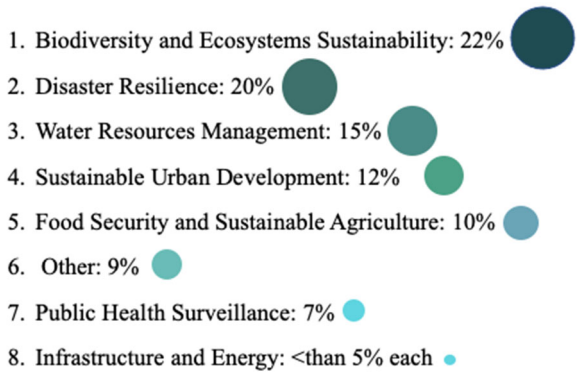


Figure 19. SBAs Regional GEOs respondents work the most with

Also for this category of respondents, there was a trend showing that the answers to the question relating to the SBAs vary based on the region of origin of the institution of respondents. In fact, Biodiversity and Ecosystem Sustainability is the Societal Benefit Area respondents work the most with in North America (28%), Central and South America (28%), and Africa (22%) and Disaster Resilience is the first respondents work the most with in Europe (19%) and Asia (27%).

In general, respondents from Regional GEOs are quite satisfied with the efforts GEO has made to become more user centric. In fact, 61% of respondents from Regional GEOs find that GEO has become more user centric since the adoption of the 2016-2025 Strategic Plan, 20% do not know and 9% say it has not, the remaining 11% did not answer the question. The percentage of those saying GEO has become more user centric is higher than that observed in general results that reached 52% suggesting that representatives of Regional GEOs show on average higher levels of satisfaction. The highest percentages of satisfaction with GEO increased user centricity were found in Asia (100%), Africa (83%) and North America (56%).

This consideration is further supported by other findings from the data analysis that show that:

- 48% of respondents are either very satisfied or satisfied with the engagement and assistance that GEO provides to them as users,
- 28% is neutral,
- 4% is dissatisfied,
- 2% is very dissatisfied,
- 17% did not answer the question.

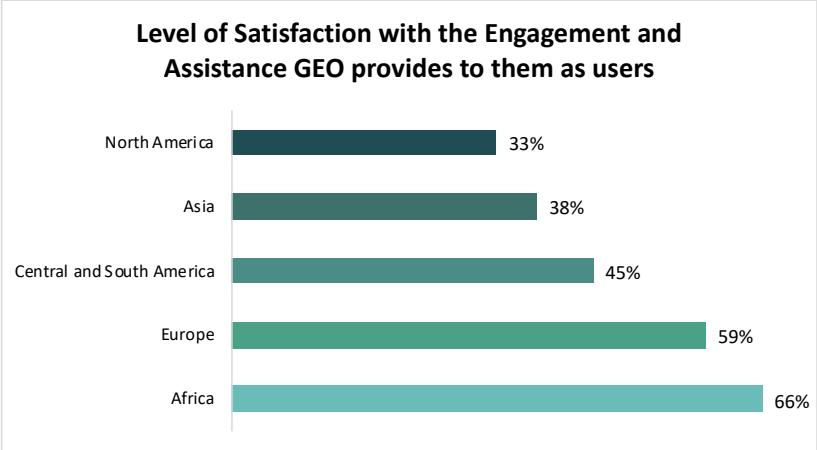


Figure 20. Percentage of Regional GEOs representatives that are very satisfied or satisfied with the engagement and assistance GEO provides to them as users

Figure 20 also shows that the highest percentages of those saying they are very satisfied or satisfied with the assistance GEO provides to them as users can be found in Africa and Europe. Overall, results from the community survey have shown that the needs of Regional GEOs are in general met quite well by GEO. In fact, 48% of respondents from Regional GEOs say GEO does not or moderately engages with them to help them meet their needs and users' requirements, while the same percentage was 60% in the general survey and 70% for those who classified themselves as users[43]. On the other hand, 31% say GEO most of the time or always engages with them to help them meet their users' needs compared to 21% in the results from the general survey and 13% for those who classified themselves as users. If, in general, these results cannot be considered as exhaustive and representative of the entire GEO community, they still are relevant and support the finding according to which there is a gap in engagement of certain categories.

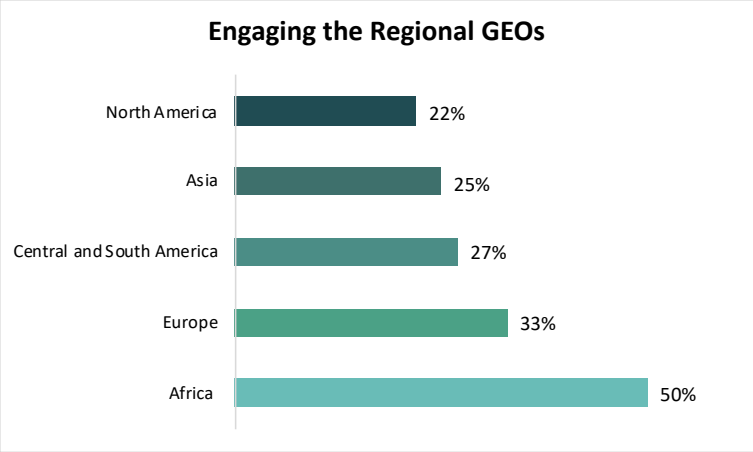


Figure 21. Percentage of respondents from Regional GEOs saying GEO engages with them always or most of the time to help meet their needs and requirements

The highest percentage of users from Regional GEOs who say GEO most of the time or always engages with them to help them meet their users' needs can be found in Africa and Europe as shown in Figure 21. On the opposite side, the highest percentage of users who say GEO does not or only moderately engages with them to help them meet their needs and users' requirements can be found in Asia (63%) and Central and South America (54%). Among the four Regional GEOs, by looking at the results of the community survey from respondents from Regional GEOs, it is clear that respondents from AfriGEO seem to be particularly satisfied with GEO's increased user centricity, the engagement level it has demonstrated towards them, but also the assistance provided to them as users and the documentation of their needs. In total, they represent 13% of respondents from the Regional GEOs.

3.5.2.2 Broader Perspective on Regional GEOs from the data analysis and interviews

Taking into consideration the views of the broader GEO community, what emerged clearly from the interview process is that the development and strengthening of Regional GEOs should be supported further to ensure the long-term sustainability of global GEO. In fact, the long-term sustainability and relevance of GEO is seen as increasingly relying on

[43] This category also included some representatives from Regional GEOs as there was a partial overlap of the two categories in the data and the question in the survey allowed for more than one answer.

continuous engagement with users' communities and improved understanding of their needs and requirements. Regional GEOs can make a significant contribution to both areas.

In fact, Regional GEOs contribute to fostering bottom-up engagement within GEO and they have already significantly contributed to increasing the number of GEO participating member states and organizations, but also to promoting participation and representation of regional members and underrepresented communities. It has been noted that GEO should think of how to structure interaction with Regional GEOs from both a strategic and operational point of view, aiming to increase their relevance as flexible instruments to further engagement with GEO communities, without representing in any way a barrier to direct engagement with GEO. From a strategic long-term perspective, it has been suggested that GEO may consider ways to integrate Regional GEOs in its organizational and governance structure to allow them to take up a more central and proactive decisional and operational role within the organization. However, there has not been a clear majority that has expressed itself on a best way forward to integrate Regional GEOs in the GEO governance structure and this is why this remains a suggestion and has not been included as a recommendation until now. From an operational perspective, it has been highlighted that Regional GEOs should set up more opportunities for exchange at the regional and cross-regional level, which may be easier to attend for GEO members from developing countries, thus contributing to fostering a high level of engagement within GEO and that might contribute to the sharing and scaling of best practices. This may also increase representation and participation of underrepresented communities, which may encounter some barriers in terms of limited time and resources in attending GEO meetings.

In general, the interviewees noted how Regional GEOs have developed differently throughout the years and, as such, their level of maturity is different. Some may be at an earlier stage of development than others and each may be well-equipped to deal with challenges related to their specific region of reference. For this reason, interviewees noted that there is a need to increasingly coordinate operating criteria across Regional GEOs through the sharing of best practices and common operating principles that can be then adapted to the specificities and priorities of each region, which may diverge as shown by the SBAs analysis. Below is a table showing the different mandates of the four Regional GEOs, their key strengths and a set of best practices for each of these that have been highlighted from the data collection and in particular the interview process.

Table 5. Regional GEOs

Regional GEOs
AmeriGEO **Purpose:** 1) Address user identified priority coverage gaps, 2) Develop actionable tools and services, 3) Build capacity in GEO member countries leveraging on existing capacity, 4) Apply the knowledge and capability of partner members to address gaps and challenges. **Highlights from the interviews:** ● Good technical interoperability of the AmeriGEO with National GEOs data portals providing a good example of interoperability within the GEO system at the regional level,

- Links with GEO Principals and their national agencies at the regional level to connect with policy implementers and to secure those products are actually picked up by policymakers,
- High level of involvement in capacity development efforts across the region through a number of Open Geospatial Consortium (OGC) pilots and USGEO-supported projects and work with the Inter-American Academy of Geosciences and Applications.

Example of best practice:

- Monthly call of the AmeriGEO Coordination Working Group with GEO Principals open to non-members to highlight achievements and identify gaps,
- High level of regional integration through AmeriGEO data platform, exchange of best practices, building of capacity across the region and coordination.

AfriGEO

Purpose: 1) Strengthen connection with GEO Principals and national government agencies enlarging GEO partnership in the region, 2) Increase uptake of Earth observation in Africa through the promotion of human capital development programmes, 3) Facilitate and drive programmes towards the achievement of regional goals and the Engagement Priorities by supporting international collaboration, fostering synergies, liaising with the Secretariat to streamline operations, 4) Advocate for the uptake of Earth observation in decision-making and raising communication, awareness on their benefits, 5) Develop a strategy for access and dissemination of Earth observation data and information in the region.

Highlights from the interviews:

- Support to capacity development efforts across the region and alignment with an increasing number of GEO activities at a regional level,
- Improved linkages with regional African institutions in view of supporting continent objectives and priorities (for example, Agenda 2063 for Africa),
- Increased representation and participation of African countries within GEO, Boards and Working Groups, activities, events and meetings.

Example of best practice:

- Specific contribution of AfriGEO in supporting increased membership and active participation within GEO of African countries and organizations.

AOGEO

Purpose: 1) Identify regional needs and convey these to global GEO activities, 2) Facilitate regionally coordinated Earth observation activities utilizing available infrastructure, resources and capacity, 3) Provide a platform for regional countries to advance data sharing and services, 4) Promote dialogue, communications and cooperation among the AOGEO Members and the rest of GEO including Regional GEOs, 5) Support sound decision-making at local, national and regional scales.

Highlights from the interviews:

- Positive example of internal decision-making processes, which are inclusive and representative of the different member states, their interests and priorities,

- Increasing integration of regional data platforms and services in relation to specific SBAs,
- Proactive approach to the implementation of projects and sound internal communication mechanism.

Example of best practice:

- Good level or regional integration achieved through communication and coordination and capacity to identify priority areas of interest for the region.

EuroGEO

Purpose: 1) Identify existing Earth observation applications under development in Europe with high potential to respond to consolidated European user needs, but requiring further development, 2) Up-scale selected pilot applications by streamlining innovation instruments available, 3) Connect EuroGEO pilot applications and related GEO actions to allow for appropriate scaling-up and scaling-down, 4) Showcase GEOSS' benefits to the European community and promote the GEO vision in Europe, 5) Support the consolidation of National GEO management structures across Europe.

Highlights from the interviews:

- Good technical interoperability of the Copernicus data portal with GEOSS data portal,
- High level of interaction with European institutions because of pre-existing multilateral cooperation at the European Union (EU) level,
- Copernicus as provider of best practices in terms of identifying, tracking and meeting users' needs and requirements,
- European support through the Framework Programme for research and innovation Horizon2020 (H2020) to GEO projects.

Example of best practice:

- Attention attributed to the user dimension with particular emphasis being put on the last step of the innovation process, ensuring applications meet users' needs, thus enabling pre-operational services and promoting operational deployment.

Source: created by the MTE Team

While the suggestion that emerged in the interview process is not that of standardizing the operating mechanisms of Regional GEOs to allow for flexibility and to preserve GEO dynamic model, many interviewees have noted that GEO should share and promote best practices which can be adopted across Regional GEOs.

In some of the interviews, it has also been noted how Regional GEOs can strengthen the engagement and encourage the establishment of the National GEOs in countries that do not have them by increasing coordination between the regional and national level and communicating directly with the points of contact identified in each country. Regional GEOs can encourage member states and regional organizations' participation and serve as an entry point sharing the necessary information for these to effectively contribute to GEO. Strengthening or establishing National GEOs, noted some of the interviewees, would be desirable to have a central body in each country being aware of all the GEO activities and

projects that are being implemented in that country, which would increase the level of coordination at the national, regional and consequently the global GEO level.

Below are provided examples of possible contributions of Regional GEOs to improving communication, coordination and effectiveness of operations within GEO. As highlighted in the interviews, Regional GEOs could:

- Serve as intermediary information bodies between the global GEO and the different elements of the Work Programme and National GEOs, with a key role to play in reporting on local stakeholders' needs and what different regions and or nations plan to use Earth observation data for,
- Facilitate interaction among the different elements of the GEO Work Programme, especially Initiatives, Flagships and Community Activities with a view to increasing synergies and complementarities,
- Promote and support the implementation of GEO capacity development strategy at a regional and subregional level by facilitating interactions between GEO Work Programme activities and regional stakeholders,
- Interact among themselves, thus favouring the exchange of information on regional best practices and success stories that can be relevant and adopted by the other Regional GEOs,
- Scale down or favour the uptake of user-driven applications developed by GEO, serving as focal points that can promote the implementation of GEO's solutions at the local level.

Other potential areas of contribution identified for Regional GEOs include promoting access and integration to in situ data, promoting equality, diversity and inclusivity across GEO, and contribution to capacity development efforts. It was noted how Regional GEOs could leverage their knowledge of local contexts to identify opportunities for collaborating and mobilising resources, potential partners, and donors. When it comes to in situ data, the challenge is that many countries do not openly share this data as their sharing and integration functions vary in a structurally different way from that of satellite data. To further gain access to this data, the global GEO push for open data sharing standards could be supported by the complementary efforts of Regional GEOs to promote such standards.

As Regional GEOs, in many cases, have a tighter connection to member states than global GEO, they also have a primary role in fostering representation and participation of GEO member states at the central governance level within GEO. They are in closer contact with users and based on their inherent nature, they tend to foster a sense of equity, inclusivity and diversity. For example, Regional GEOs played a pivotal role in increasing the representativeness of the Programme Board and Equality, Diversity and Inclusion Subgroup. In fact, interviews showed how, following a top-down push from the Programme Board to establish the EDI Subgroup and to increase the level of representation within the Programme Board and the group itself, Regional GEOs served as a conduit to encourage experts from underrepresented member states to join these groups **showing how their role provides key support to the Secretariat and GEO efforts to promote inclusivity** through their strong, regional networks that they can leverage for this purpose. Interviewees suggested their role in this area needs to be increased in the future together with their contribution to the implementation of **GEO's strategy in capacity development. The strategy already signals that Regional GEOs are best placed to further GEO efforts in this area and this view has been corroborated by the interviews' results, which have shown that respondents also believe Regional GEOs can help promote a holistic approach in this area. Interviewees**

recognized Regional GEOs can foster stakeholder engagement, recognize the needs, skills, knowledge and specific gaps in expertise of participating parties, thus fostering the co-development and co-design of solutions. Furthermore, they have direct access to users and can tailor solutions to their needs. Regional GEOs can address language and other barriers, such as geographic distance, which is harder to address from a global GEO perspective, thus favouring the inclusion and direct engagement of member states.

Some interviewees noted how potential members may be hesitant to join GEO because of their limited understanding of the benefits related to the open access and use of Earth observations and derived products. This also points to a need for improved communication at all levels of GEO. Hence, raising awareness and building capacity at the regional and subregional levels can contribute to increasing participation in GEO. GEO capacity development efforts, as stated in the Capacity Development strategy, will be directed at reinforcing the institutional, organizational and individual capacity of GEO to use Earth observations and GEO's products and tools for decision-making. Regional GEOs can promote capacity development in different forms including trainings, workshops, events, joint programmes and seminaries involving SMMEs, other local development aid agencies and grassroots organizations, but also by promoting the exchange of best practices and uptake or downscaling of solutions that have proved to be successful and reproducible in different contexts.

Interviewees also noted that Regional GEOs could play a matchmaking role between commercial organizations at the regional and the subregional level, the activities of the GEO Work Programme, and the global GEO, potentially contributing to an increase in the diversity of commercial sector organizations engaging with GEO to include more SMMEs and local realities. This, in turn, may bolster EO-related economic activity in the regions, increasing government's perception of value added by participating in GEO. In the implementation of all these tasks, Regional GEOs would benefit from increased collaboration with the GEO Principals and National GEOs that could represent points of access for coordination and communication at the national level.

While benefits that could be derived from strengthening the contribution of Regional GEOs are clear and have been reiterated by many interviewees, it has also been noted that there is a need to develop a light framework and think of how Regional GEOs' contributions could be integrated within the GEO system without representing a barrier for those who prefer to work more directly with the global GEO.

In terms of how to better integrate Regional GEOs within GEO, a number of possible solutions have been suggested. These include having a point of contact within the Secretariat managing bilateral communication and coordination between Regional GEOs, the GEO Secretariat, and the GEO Work Programme. This example was raised given that this approach has been beneficial for a number of Initiatives/Flagships, to have a representative attend the Secretariat's coordination meetings and provide a coordinating function between the GEO Secretariat and Regional GEOs. Another possible solution, which was suggested, is to have Regional GEOs representatives attend a monthly coordination call with the Secretariat. Adopting such solutions would help to maintain Regional GEOs in direct contact with the GEO Secretariat and receive direct information on the decisions adopted at the Executive Committee and Programme Board levels across the GEO regions and member states. This will help to coordinate with the GEO Secretariat at the global level, to better integrate connections between Regional GEOs, and to connect Regional GEOs to key discussions in GEO. However, Regional GEOs should also receive this information from their respective caucuses and should be in close contact with

their GEO Principals and Co-Chairs. Also, interviews showed that Regional GEOs have had greater engagement with the Programme Board in recent years, so these channels should also ensure that Regional GEOs remain connected and relevant. A minority of respondents suggested having Regional GEOs as part of the GEO governance structure. However, this solution may lead to a partial overlap and duplication of functions with the caucuses and may have implications for maintaining the flexibility of the overarching framework provided by GEO.

3.5.3 Synthesis and Findings

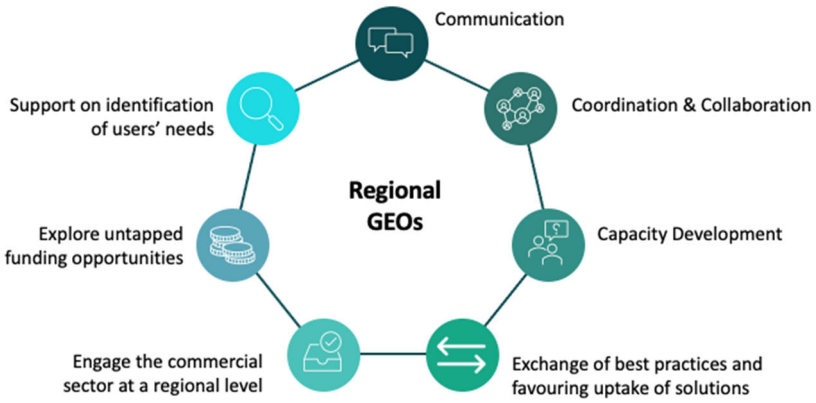


Figure 22. Key contributions of Regional GEOs

In terms of the main contributions of Regional GEOs, interviewees referenced their central role in helping GEO to attract new members. In addition, they were mentioned multiple times in relation to their role as promoters and implementers of capacity development activities and enablers of inclusivity, communication, and coordination across GEO. Making sure that all Regional GEOs become more involved in the implementation of the GEO Work Programme going forward will contribute to the achievement of GEO's mission and will allow these latter to proactively participate in the implementation of the GEO Work Programme. Reinforcing the role of Regional GEOs is key for the long-term sustainability and relevance of GEO as an organization. The areas to which Regional GEOs are critical contributors or where their current contributions should be strengthened include **communication, coordination, capacity development, promotion of inclusivity and reporting on users' needs.** Here, we summarize what their contribution can be in these key areas as shown in Figure 22:

1) Serving as information intermediaries, facilitating communication between the national and local realities and the global GEO structure. Additionally, they can establish linkages between the Work Programme activities and Regional GEOs to create synergies and complementarities;
2) Contributing to GEO's efforts in capacity development through collaboration with the different activities of the Work Programme, local institutions and organizations, as well as their unique knowledge of capacity gaps, users' needs and requirements;
3) Promoting opportunities for exchange of best practices and uptake/scaling of successful products that may be developed at a regional or subregional level;
4) Leveraging opportunities for engagement with commercial sector organizations of various sectors and sizes, in particular SMMEs, at the regional and global level by

brokering relations among these latter and GEO Work Programme activities through coordination with the Secretariat;

5) Exploring untapped funding opportunities and taking advantage of their position to mobilise resources and contributions for GEO at a regional, national and local level;
6) Contributing to gathering and reporting information on users' needs allows GEO to adopt a bottom-up and feedback loop approach to its relationship with end users aimed at integrating their requirements in the development of new Earth observation tools. This is also made possible by Regional GEOs' capacity to address engagement barriers, such as language and time/geographic location constraints and to offer opportunities for direct engagement (local events and meetings).

Over the course of the evaluation process, the unique nature of Regional GEOs in terms of size, scope, participation, and representation became evident. Given that GEO's membership base has grown, and that some of the regions cover broad and diverse areas, in the future, GEO may wish to consider the structure of these bodies relative to GEO's caucuses to ensure that they can remain effective and representative of GEO as a whole. Overall, increasingly integrating and consolidating the role of Regional GEOs in these identified areas of work would contribute to favouring a holistic and granular approach to the promotion of the adoption of Earth observations as a basis for decision-making, hence, supporting GEO in the achievement of its mission to promote the use of Earth observations for the benefit of humankind.

Findings:

9. Role of Regional GEOs: Interviews with key informants highlighted that Regional GEOs need to become more integrated into the functions of the GEO Work Programme and the overarching structure of GEO itself. The current level of coordination and communication within GEO is insufficient to facilitate better interactions at the local/national/regional level with users and stakeholders. Regional GEOs could play a key role in helping to coordinate GEO Work Programme activities at the regional level and facilitating communication within GEO by serving as an intermediary between the development of the GEO Work Programme, the Secretariat, Working Groups and the Programme Board fostering collaboration and identifying potential synergies among all these bodies. Regional GEOs can also help bolster the implementation of GEO's capacity development strategy by showing where capacity development gaps exist and how GEO's efforts can have the most impact at the institutional level and organizational level. Regional GEOs also have a role to play in promoting exchange on best practices across GEO and upscaling/downscaling successful products, leveraging opportunities for engagement with the commercial sector and exploring funding opportunities at the regional level.

10. Capacity Development: Regional and National GEOs are in close contact with the users of GEO's EO-derived tools and services and as such these bodies, specifically when from developing economies, are also well-placed to identify and report on users' needs and requirements. These bodies would have a deeper understanding of local capacities and the level of expertise of defined categories of users' communities. Recognizing their role in support of capacity development will be important as GEO moves on to implement its capacity development strategy. Given that Regional GEOs have access to users they can tailor and scale solutions based on local conditions and priorities and have connections with other regional and national bodies.

3.6 The Private Sector

3.6.1 Overview

As mentioned in section 3.1, GEO's definition of the *private sector* includes organizations such as research institutions and non-governmental organizations whereas the *commercial sector* category only includes for-profit organizations. For this reason, it is important to note that the MTE Team started by taking into consideration GEO's engagement with the private sector at large and later focused through targeted interviews and the Commercial Sector and Associates survey on analysing engagement with the commercial sector more in detail. However, based on interviews conducted by the MTE Team, it seemed apparent that most interviewees referenced the commercial sector in particular, when answering questions on the private sector, especially as the distinction between these two sectors is not clearly made within GEO itself.

Engagement of GEO with the private sector on common areas of interest related to Earth observations is crucial for the benefit of humankind and the planet and can positively contribute to GEO's progress towards the achievement of its mission. Starting from this understanding, at the 11th Executive Committee meeting that took place on 27 November 2007, the Executive Committee asked the Secretariat to analyse opportunities to work with the private sector through an analysis of best existing practices. The study released in 2010 highlighted that engagement with the private sector can be undertaken at various levels of the GEO Work Programme as an infrastructure provider, service provider, potential user and/or donor[44]. It also pointed to the fact that GEO should consider developing a more detailed implementation plan to engage with private sector entities. Since then, GEO's engagement with the private sector has increased and the Strategic Plan 2016-2025 further outlined engagement opportunities GEO could offer to the private sector by serving their needs in areas related to the SBAs and the Engagement Priorities.

As regards the commercial sector, as of 2019, the GEO Rules of Procedure include Annex C on Rules of Engagement with the Commercial Sector[45] and establish the following principles for that engagement:

- need to preserve the public good foundation of GEO and to have the engagement respect GEO's principles of Data Sharing and Management,
- GEO's ability to act independently and be impartial in upholding standards of ethics and integrity,
- need for all the services developed by commercial sector organizations as a contribution to GEO to be made freely available.

Following the introduction of such principles regulating the engagement of GEO with the commercial sector, the Canberra Declaration of 2019 highlighted, as shown in Figure 23, that GEO's ability to deliver on its vision would be enhanced by growing its engagement with the commercial sector, as also highlighted in the report on Current and Future Value of Earth and Marine Observing to the Asia-Pacific region, by the Australian Government and the Asia-Pacific Economic Cooperation (APEC), which was launched at the GEO Week in 2019[46]. This report calculated the current economic value of earth and marine observation to APEC economies, and estimated their potential by 2030 showing the commercial opportunities deriving from earth and marine observations value chains. Other factors enabling GEO to deliver on its vision would also include leveraging the observations the commercial sector

[44] GEO (2010). Engaging the Private Sector in GEO and GEOSS, pp. 1- 3.
[45] GEO (2019). GEO Rules of Procedure, pp. 21-23. An initial version of these guidelines was provided already in the 2016 version of the Rules of Procedure and included in Annex C.
[46] Current and Future Value of Earth and Marine Observing to the Asia-Pacific Region, p. 15.

collects and partnering in developing and delivering sustainable products and services that meet the needs of individual governments, businesses and communities.

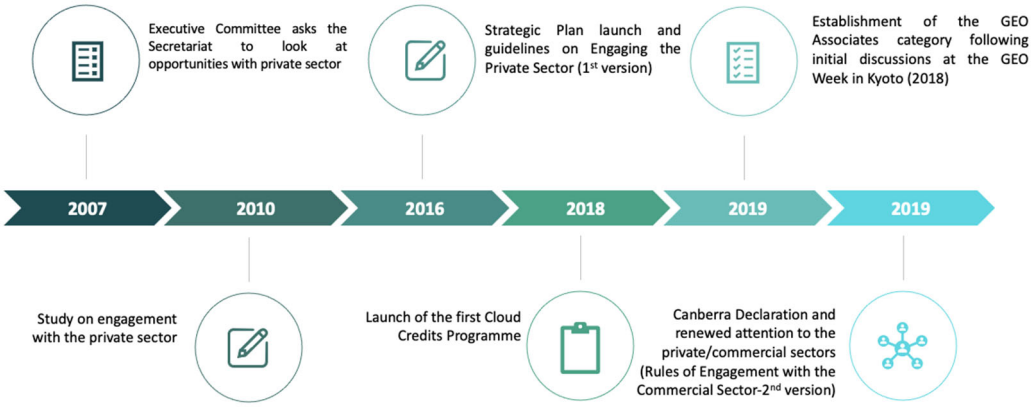


Figure 23. Timeline of GEO Engagement with the Private Sector

Source: created by the MTE Team

As part of its commitment to increasingly engage with the private and commercial sectors, GEO has created in 2019 the Associates category for different entities including commercial, non-governmental, non-profit and civil society organizations that have been substantively involved with GEO for at least two years and whose contribution is self-funded and sustainable. For now, GEO has seventeen Associates, and eighty-four commercial organizations are known to have been involved with GEO in the period 2017 to 2019. In 2018, the GEO Secretariat negotiated an arrangement with Amazon Web Services (AWS), in which AWS cloud credits would be offered to successful applicants taking part in a competitive proposal submission. Building on this initial arrangement with AWS, the GEO Secretariat issued a broader *Commercial Sector Engagement Opportunity* in 2019 to invite proposals from companies that provide cloud-based geospatial processing platforms for the development of applications using Earth observations and developed more programmes to provide licenses, grants, technical and financial support to the GEO community with GEE and Microsoft AI for Earth. These resulted in the establishment of the Cloud Credits and License Programmes, to which the GEO community was invited to participate through an open call for applications.

The following section will provide an overview of GEO's engagement with the private sector to later focus on the Cloud Credits Programme and engagement with SMMEs.

3.6.2 Evidence from Current Evaluation

To date, there have been positive remarks on GEO's increasing involvement with the private sector, however, there are indications that additional steps may be needed to convince the entire GEO community of the value of this engagement and to gain further engagement from the private sector. Additional steps include better defining the value proposition and structure of the engagement so that it can be extended to companies from different geographies, sectors and sizes.

3.6.2.1 GEO and the Private Sector

As regards private sector engagement in GEO, data gathered highlights that even though engagement may be increasing, there remains a lack of awareness GEO and its role as an

emerging leader in the field of Earth observations within the private sector, and that private sector representatives would like GEO to engage and involve them more:

- 32% of community survey respondents mentioned they have engagements with the private sector in their area of expertise,
- 17% said they do not,
- 33% do not know,
- the remaining 17% did not answer the question.

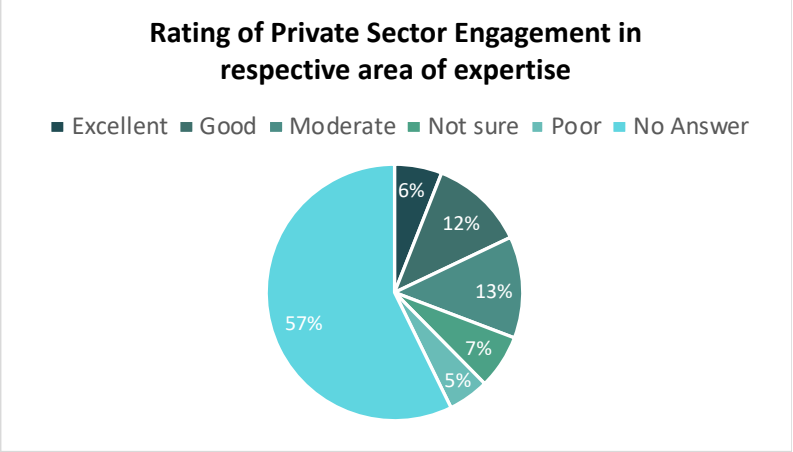


Figure 24. Rating Engagement with the Private Sector in respective areas of expertise

On the level of engagement with the private sector, Figure 24 shows 31% of respondents think engagement with the private sector is excellent, good or moderate, while the majority did not answer the question, showing there is still little awareness on these topics. Private sector actors with which respondents say GEO has more engagement include GEE, AWS, Microsoft AI for Earth, Environmental Systems Research Institute (Esri), European Association of Remote Sensing Companies (EARSC) and OGC, among others.

Analysing more closely the private sector view by identifying answers from private sector representatives allowed the evaluation to gain a closer perspective on their engagement with GEO. Overall, 8% of respondents to the community survey, in total 10 respondents out of 117, are from the private sector, four of them come from Europe, four from North America and two come from Africa. Given the small size of the sample of private sector respondents, the MTE Team integrated results from the community survey with those from key informants and targeted interviews that it conducted to draw conclusions for the purpose of making clear recommendations on engagement with the private and commercial sectors going forward. Most (90%) of respondents that declared being representatives of the private sector have very little or little engagement level with GEO. The SBAs they are involved with the most are Disaster Resilience for 30%, Biodiversity and Ecosystem Sustainability for 13%, Water Resources Management for 13%, Sustainable Urban Development, Public Health Surveillance, Infrastructure and Transportation Management and Food Security and Sustainable Agriculture, each with 9% of the preferences. Less than a half (40%) say that GEO has engagement with the private sector in their area of expertise, 40% say it does not and 20% do not know. The data analysis conducted on this limited sample showed that there are definitely more opportunities to expand GEO's engagement with the private sector.

The majority of key informants described the engagement with the private sector as positive and as having increased in recent years. However, many believe that GEO should better integrate the views of this sector by involving it at an earlier stage of development of

projects that will require their participation. The majority of private sector interviewees have also expressed a willingness to participate more actively in the design phase of the GEO Work Programme. This would contribute to increasing the value that the private sector derives from participation in GEO as one of the gaps highlighted in the interviews was the need to better define GEO's value proposition for this sector. Moreover, even though private sector engagement is seen positively, 18 out of 36 key informants believe that this engagement should not only be pursued on an *ad hoc* basis, but rather be based on a long-term approach aimed at establishing lasting partnerships relying upon the definition of specific rules of engagement. Key informants noted that the rules of engagement should cover specific areas and principles including:

- Access to data, which should remain free and open,
- The creation of a competitive environment where GEO's existing rules on IPR are revisited through a more comprehensive approach, also providing for certainty on patents,
- Potential perceived risks for privacy and data ethics, including practices for collecting, analysing and processing data. It was suggested that GEO should make considerations on the use and re-use of data, which at the moment remains uncovered, but possible ways forward are presently under consideration by the Data Ethics Subgroup of the Data Working Group in GEO,
- The need for the creation of opportunities for all the commercial sector organizations willing to get involved with GEO, by addressing the barriers to engagement which SMMEs may encounter in their engagement with GEO because of their limited availability of resources.

In the course of the Mid-Term Evaluation, the MTE Team appreciated that GEO is already aware of the existence of the above-mentioned challenges and that it has developed Rules of Engagement with the Commercial Sector in 2019 with the aim of addressing some of these issues. Such Rules of Engagement are provided as Annex C to the GEO Rules of Procedure and the fact that only a minority of informants were aware of their existence points to a significant gap in communication in this area. This is in line with other examples previously presented that point to the lack of **systematic communication across the organization.** Two elements which are currently not directly covered in Annex C on the Rules of Engagement with the Commercial Sector and have been identified as crucial by many interviewees are the protection of privacy and IPR. In the Rules of Procedure, IPR are partially addressed, even though not specifically in relation to the commercial sector. However, this section of the Rules of Procedure already addresses some of the concerns expressed by the GEO community and could, as such, be used as a basis for further consideration. Moreover, GEO is currently using Creative Commons Licenses to regulate its engagement with the commercial sector, which waves IPR on both sides and ensures that data sharing remains free and open. The Data Working Group is also looking at these themes and working to identify best practices for, legal, ethical, privacy, intellectual property, and other related concerns.

One of the major concerns that emerged from the interview with key informants is that currently there is an imbalance between GEO's engagement with multinational technology companies and SMMEs, with many interviewees calling for the establishment of a level-playing field. Some expressed the view that engagement with the private and in particular commercial sector might shift GEO's priorities but, **in general, the majority has noted how engagement with this sector has become more and more relevant for GEO.**

Overall, the MTE has shown that calling for the establishment of a **level-playing field does not take into consideration the structural issues** that some companies may experience in their engagement with GEO. Rather than establishing a level-playing field which may be impossible to establish given different resources companies have access to, GEO should try to create opportunities based on varying types of private sector partners it engages with and be better able to identify possible ways to engage. For example, SMMEs' structural barriers to engagement with GEO include fewer opportunities for engagement and limited resources. To engage with companies of all sizes, GEO should aim to address and remove some of these barriers and consider reviewing its existing rules of engagement to include principles favouring engagement and addressing IPR, privacy and other concerns expressed by the GEO community in more detail. Interviewees suggested that depending on the nature of the partnership that GEO wishes to establish, GEO should consider what would be the most suitable framework to regulate the engagement, taking into consideration solutions such as Cooperative Research and Development Agreements (CRADAs), Memorandum of Understandings (MoUs) or a simple exchange of letters in cases where this may be sufficient. However, this should be done with the understanding that a *one-size-fits-all solution* will not work given the varying types of commercial sectors GEO engages with. Some respondents mentioned that by establishing strict legal frameworks for engagement, opportunities to partner might be discouraged, especially in cases where private sector engagement with GEO happens at the level of the GEO Work Programme.

It will be important for GEO to balance the need for clear guidelines for commercial engagement allowing for flexibility to avoid hampering existing activities. GEO will need to consider the scope, frequency, and unique nature of each of these partnerships, and determine based on those factors what standard framework, if any, is required. Engagements made at the GEO Secretariat level versus those that occur through the GEO Work Programme may not require the same uniform framework, hence some flexibility and different approaches should be considered. The Programme Board Private Sector Subgroup and the newly established Data Working Group in GEO may be able to provide potential mutual contributions in this area.

Interviews pointed to the fact that there is only limited awareness in the private sector of the role of GEO in the field of EOs. In particular, key informants believe GEO has not yet been able to formulate a clear value proposition defining benefits that the private sector could derive from engaging and believe that GEO should better market its value added by involving possible partners from the private sector early on in the discussions to identify possible areas of cooperation to which they might wish to contribute. On this point, some commercial sector representatives would like to establish a group within GEO where they can discuss issues relating to them and formulate proposals for their engagement with GEO.

Four possible roles were identified by the GEO community for the private sector in its interactions with GEO as an infrastructure, service provider, data user and/or donor. The MTE showed that while no role is prevalent, private sector representatives also expressed a preference not to be classified within any of these categories, which may limit their opportunities to engage with GEO in different capacities. An overview is provided below of different possible engagements with the private sector that were noted during the MTE's data collection.

A few interviewees noted that with data becoming a commodity, GEO should work with the private sector, maintaining its role in promoting open data sharing, rather than competing with it, as an infrastructure and service provider, especially given that the private sector makes use

of more advanced technologies than GEO. This perspective further reflects the need for GEO to evaluate its approach to the implementation of GEOSS, and to clarify which key areas it should focus on moving forward, especially in light of a rapidly changing technology landscape. A clear perspective regarding to what extent GEO should focus on prioritizing data infrastructure, acting as a convener, or provider of user services did not emerge based on the MTE's findings. However, it is evident that these three pillars of GEO's current work are challenging to maintain and fully develop with GEO's present resources.

Some interviewees noted that the commercial sector may provide GEO with access to advanced technologies and its unique expertise in the field of Earth observations through in-kind contributions to the GEO Work Programme. This has already been demonstrated to a certain extent with the Cloud Credits Programmes and existing commercial sector engagement in the GEO Work Programme, however, possible contributions could be developed further and expanded. Additional funding may also be obtained via philanthropies and other private sector entities. These funding resources may complement funds from member countries.

On multiple occasions, it has been highlighted by key informants and in targeted interviews that GEO needs to strike the right balance in its engagement with the private sector, considering all the potential benefits and risks involved including implications which may derive from the acceptance of private sector funding. Private sector contributions have been in kind so far and, even though contributions to the Trust Fund were always allowed, there have been none from this sector up to this point. Some informants have expressed the view that being over reliant on the private sector for funding might affect GEO's autonomy and independence. However, this risk seems to be already addressed by the rules GEO has in place to engage with the commercial sector asking that the Secretariat informs the Executive Committee prior to entering in any form of agreement with the commercial sector and that all commercial sector financial and in-kind contributions to Secretariat operations are reported individually in GEO financial reports, registered and also reported annually to the GEO Plenary[47].

In order to suggest possible ways for GEO to structure private sector engagement going forward, below are some examples of best practices by the United Nations Office for the Coordination of Humanitarian Affairs (UN OCHA), UNEP and the United Nations Children's Emergency Fund (UNICEF) that look at how these organizations have regulated funding and partnerships engagements with the private sector. Similarly to GEO, **these organizations have a voluntary funding model and they also engage with the private sector.** For UN OCHA, only 5% of its budget is financed by the United Nations, while the rest is made up of voluntary contributions, including from the private sector. The organization has established OCHA-managed pooled funds to receive financial contributions from all types of donors. These reduce transaction costs and allow for prioritization of assistance. In addition, it accepts in-kind contributions that have to be need-driven and do not have to imply additional costs over local purchase alternatives.

In 2019, UNEP launched a new strategy for engagement with the private sector, which adopts a multi-layered approach requiring a full due diligence analysis for private sector organizations with which it establishes partnerships. UNEP also sets clear guidelines on reporting, monitoring and evaluation to be carried out on a continuous basis, especially for those projects that entail the establishment of partnerships and funding engagements.

[47] GEO (2019). Rules of Procedure, pp. 21-22.

Lastly, in the case of UNICEF, the private sector contributes almost 20% of UNICEF's funding. This has been made possible through the establishment of National Committees, which are independent local non-government organizations that serve as the public face of UNICEF in 33 countries, rallying support from donors, national and local governments, the media, and especially the private sector. UNICEF finances investment in private sector fundraising from two sources: Private Fundraising and Partnerships (PFP) investment funds and direct investment by National Committees and country offices. PFP investment funds are used to support fundraising initiatives that are beyond the resources of National Committees or country offices alone. In 2017, pledge giving remained the most important driver of funding from the private sector. UNICEF's experience points to the importance of having national branches to maintain relations and mobilize resources at the national and subnational levels, showing there would be a potential to have Regional GEOs play a similar role. All these examples would be interesting for GEO to consider, should it decide to further develop its engagement with the private sector, by exploring more actively potential funding opportunities. In section 3.5.2.2., it was discussed how Regional GEOs could play a role in fostering involvement and engagement with the private and commercial sector, in particular SMMEs, and in exploring opportunities for funding from different sectors at the regional level.

Table 6. Best practices on funding engagements with the private sector

Best Practices on Private Sector Engagement	
UN OCHA	● UN OCHA managed pooled funds to receive financial contributions ● Lower transaction costs ● Prioritized assistance ● Need-driven in-kind contributions
UNEP	● Multi-layered and targeted approach requiring full due diligence for partners ● M&E of engagements with partners
UNICEF	● National Committees to serve as face of the organization, rallying support and funds at a local level

Source: created by the MTE Team using information available on the three organizations' websites

Lastly, regarding the private sector's role as a user of GEO data, only a few interviewees touched upon this point, noting that SMMEs might be interested in accessing data through the GEOSS platform, however, this would not be a value driver for other private sector entities, which do not look at GEO as a data provider.

3.6.2.2 The Cloud Credits and License Programmes

This section is dedicated to reviewing GEO's engagement with the commercial sector through the analysis of the Cloud Credits and License programmes. **In 2018, GEO launched the Cloud Credits programme with AWS and in 2019 it launched a Cloud Credits and License Programme with Microsoft and Google Earth Engine to provide cloud-based space for the development of applications using Earth observations to developing countries.**

The majority of key informants agreed that the Cloud Credits and License Programmes carried out in partnership with GEE, AWS and Microsoft AI for Earth were a positive example of engagement with the commercial sector. These programmes provided a clear value added in terms of access to computing power, grants, licenses and credits to the participants, and access to the GEO network to the providers. However, some interviewees noted that these were short-term, potentially stand-alone pilot projects and that, even though some of the companies did not seem to rule out the possibility of a future follow on, they would like to see GEO translating these projects into long-term engagements. In their view, GEO should consider the establishment of an incubator for technology development and to favour transition to operations of small-scale projects.

In terms of the selection process to participate, interviewees reported that it was transparent, and that GEO initially received 10-15 responses from interested companies. GEE, AWS and Microsoft were selected to participate as they met all the criteria. There were other companies that initially offered a smaller number of credits, which were considered too small to participate given the scale of the program. The GEO Secretariat suggested to unite such credits into a single offer, which is the approach that Sinergise took with Microsoft to participate in the programme. It seems that because of the structure of the programme, it was easier for larger companies to participate, while SMMEs found those terms harder to meet and consequently faced a degree of structural barriers that limited their ability to engage.

Lessons learnt from this project underlined the need for capacity building on the use of Earth observations in developing countries, where the expertise gap among different participants in some cases had not been anticipated, and this required more efforts to provide assistance to these groups to allow them to benefit from the programme. **The programme showed that some users may need technical assistance to use the capabilities provided and there was only partial awareness of this issue in the first round of the programme.** Also, in the comments to the community survey, it was mentioned that GEO should work on providing capacity development opportunities on the use of the tools offered by the commercial sector such as the cloud credits, licenses and grants offered by GEE, AWS and Microsoft AI for Earth and to a limited extent Esri to developing countries. While the Capacity Development Working Group was established after the beginning of the Cloud Credits and License Programmes and for this reason it was not involved in the process of review of the applications and support in the operational phase of the programme; in the future, it would be important to involve this group as it could provide a useful perspective on how to integrate the Cloud Credits and License Programmes with GEO's work on long-term capacity development.

The programme gave the chance to exchange best practices and create an active community of all the participants involved. At the same time, long-term sustainability was highlighted as a potential issue that GEO is trying to address. The programs illustrated that these collaborations can be mutually beneficial. The credit providers or commercial partners can participate with the possibility of developing future commercial opportunities, while GEO can look to its role in securing long-term sustainability of the results generated by connecting participants with other entities or organizations that have an interest in continuing these programs. In this way, GEO can act as an incubator for innovative applications and technologies, and as a broker facilitating collaboration among multiple parties.

Some of GEO's Work Programme activities were directly involved in the Cloud Credits and License Programmes, and the future goal, as also pointed out in some of the

interviews, is to establish additional links between these programmes and GEO's activities. Some participants from the GEO Work Programme noted that the Cloud Credits Programme enabled them to establish contacts with commercial sector partners, which would not have been possible through their own network. The data collection and analysis phase revealed that not all activities have a clear strategy to engage with the commercial sector yet, though some have found different avenues to engage with this sector, as for example through EU joint projects. In general, the programmes analysed in this section provided a good opportunity for engagement.

3.6.2.3 Engaging Small, Medium and Micro Enterprises

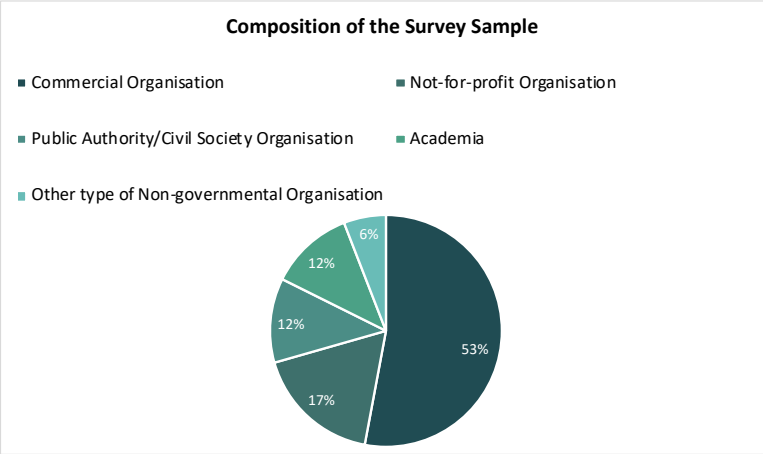


Figure 25. Commercial Sector and Associates Survey Composition

This section is dedicated to reviewing GEO's engagement with the commercial sector and Associates, with a specific focus on small, medium and micro enterprises and what can be done to improve engagement with these latter. Although the Cloud Credits and License Programmes are the most known to the GEO community that were initiated at the Secretariat level, other companies of different sizes and to a lesser extent engage with GEO at the Work Programme level. The survey to Commercial Sector and Associates aimed at collecting views from these companies and GEO Associates. It gathered 17 answers, the majority of which, as shown in Figure 25, were from commercial organizations. 71% of respondents were SMMEs and 12% were multinationals. Also, 8 of the 9 commercial sector organizations that took the survey constituting the bulk of respondents defined themselves as SMMEs and 1 out of these 9 was a multinational. Even though the number of answers was not particularly significant, the survey contributed to showing that:

- 53% of the 17 respondents believe GEO has not formulated a clear value proposition for engagement,
- 29% believe it has,
- the remaining 18% did not answer the question.

Also, 18% of respondents rate GEO's engagement with their organization as excellent or good, 24% rate it as moderate, 24% as poor or very poor, 18% are not sure and the remaining 18% did not answer the question or are not sure. This data, together with views gathered through the interviews, suggest that GEO has a gap in terms of SMMEs engagement, even though efforts have been made in this area, in particular in the last two years.

In terms of what GEO could do to help SMMEs as well as multinational companies engage across all of GEO's regions, respondents to the survey suggested that GEO should formulate a

clear value proposition, establish a commercial division and have a point of contact or entry point for communication and engagement with the commercial sector playing the role of matchmaker and broker of relations between companies and GEO activities. On GEO's side, lack of communication has been identified as the main barrier to engagement. Instead, for the companies, limited opportunities and resources represent the main barriers to engagement.

In 2019, the Canberra Declaration laid the foundation for GEO's increased involvement with the private sector and in particular SMMEs. However, in further developing this engagement, it has been suggested that GEO should develop a more nuanced action plan, which should look at several elements:

- Outline how GEO can engage with companies from different geographies and with different sizes with clear objectives and a specific value proposition targeted to each category/type of company,
- Establish an increasingly important role for Regional GEOs and the GEO Secretariat as matchmakers, putting commercial sector companies interested in contributing to GEO in communication with the relevant GEO Work Programme activities,
- Highlight opportunities and provide examples of the benefits of open access to Earth observation data for SMMEs. Given the need to explore alternative models to engage SMMEs taking into account their structural barriers to engagement, GEO may consider adopting an incubator function of the type provided by Copernicus and the Forum for Innovation and Research in European Earth Observation to see what its contribution to SMMEs active in the downstream segment of the value chain would be to transition research into more operational services and to service delivery/evolution,
- Consider different ways and tools to engage with commercial sector companies including SMMEs that would fit the different nature and sizes of the companies it engages with. In this case, frameworks such as CRADAs might be useful in cases where GEO is more directly engaged but may not be needed in situations where GEO is a connector, not directly engaged in managing the activities in question.

GEO should also explore more opportunities for contributions from SMMEs to its capacity development efforts, where SMMEs might be interested in providing assistance and might have a better knowledge of local needs and pre-existing capacities.

3.6.3 Synthesis and Findings

Majority of informants see engagement with the private sector as having increased in recent years, and there is overall agreement on the need to continue partnering with the private sector. While specific engagements with commercial sector companies as represented by the Cloud Credits and License Programmes have been successful, there is also a need to better define opportunities for engagement for different types and sizes of commercial sectors. Also, there is little awareness within the GEO community of the existence of Rules of Engagement with the Commercial Sector, as well as IPR guidelines for GEO as a whole, which provide an overarching framework for engagement fostering innovation and dynamism. Moreover, the majority of the GEO community that was involved in the MTE process was not aware of the existence of such rules showing they have not been communicated clearly throughout the organization.

A key element that deserves further attention is the need to define a clearer added value proposition looking at what GEO can offer to the private sector and conversely, what it can gain from the engagement, fostering the creation of a fertile ground for innovation and

economic growth. This includes consolidating the value proposition for the Associates category and all the other companies engaging with GEO.

Rather than a full-fledged strategy, which may lead engagement with the commercial sector to become rigid and less dynamic than it currently is, GEO could consider the establishment of an **action plan** for the long-term aimed at promoting the diversity and inclusiveness, but also sustainability of engagements with the commercial sector. This action plan should also aim at defining on a case-to-case basis what would be the best way to establish and regulate engagements with the commercial sector, potentially taking into consideration solutions such as CRADAs, MoUs or more informal set-ups. While GEO should not aim at structuring all engagements with commercial sector companies in the same way, it should better define its value proposition for the commercial sector, target its value proposition for companies of different sizes and geographies, aim to remove structural barriers to engagement, in particular for SMMEs, considering for example the establishment of an incubator and allowing Regional GEOs and the Secretariat to play a matchmaking role between companies and Work Programme activities.

It may also consider developing a better framework for understanding different types of partnerships, what those entail and how they should, if so, be regulated. This could form a basis for GEO to determine what mechanisms are most suitable and when, while providing a flexible tool to engage all types of companies in joint programmes. All these measures will allow GEO to go beyond the short-term engagements with the commercial sector to allow for the establishment of long-term successful and mutually beneficial partnerships. By doing so, GEO would also be able to leverage engagement with this sector to contribute to its objectives on the promotion of capacity development on the use of Earth observations and its application.

Findings:

11. Engagement with the Private and Commercial Sectors: Engagement with the private sector has increased over the past five years and overall is seen as beneficial and having added to the value of GEO. However, key informants highlighted that lack of the private sectors' involvement or views in GEO's activities such as in designing of GEO tasks or Work Programme and rules of engagement with the commercial sector adopted by GEO, among others, is causing the private sector, in particular small commercial sector companies, to not fully participate or see the benefits of participating in GEO's activities/programmes. In this sense, many noted that GEO should better define its value proposition for the commercial sector and that the GEO Secretariat and Regional GEOs could play a role to help match and broker possible collaboration between commercial sector partners and Work Programme activities. The majority of respondents called for GEO to establish rules of engagement with the commercial sector including integrity, independency, privacy and ethics principles. The majority of interviewees was also not aware of the existence of the Rules of Engagement with the Commercial Sector, which already address some of these items. This points to the existence of a communication gap across the organization. Those who were aware of their existence, noted that these rules currently provide very general principles for engagement that GEO should develop further in the future to address IPR and privacy with a more comprehensive approach. A few informants believe GEO is not engaging enough with the commercial sector, especially those having better resources and technology and they feel GEO is lagging behind in the development and application of technologies compared to the commercial sector.

12. Cloud Credits and License Programmes: The Cloud Credits and License Programmes have been mentioned by the majority as a positive example of engagement with the commercial

sector with a clear value proposition aimed at promoting the use of Earth observations and skills development in developing countries. Informants suggested GEO should look at ways to make this engagement and the benefits derived from it become long-term by ensuring participants can retain and continue developing the skills acquired through the programme and that the programmes should become increasingly tied to the GEO Work Programme. By highlighting a disparity in the capacity levels of different participants, the programmes showed how further work is needed from GEO to support capacity development on the use of Earth observations.

13. Small, medium and micro enterprises: Even though GEO's engagement has increased in recent years, respondents feel that GEO has so far shown little or no satisfactory engagement with SMMEs. GEO is perceived to engage more with multinational technology companies that conform with the GEO rules of procedure or afford the prospects of big grants. SMMEs, on the other hand, cannot compete with what can be offered by bigger companies at the international level and have structural barriers to engagement represented by limited opportunities and resources. Key informants feel that GEO should also engage more with SMMEs, diverse companies from different geographies and with different sizes, particularly in developing and least developed countries, with a clear plan to address structural barriers and equally pursue involvement with all of them. This perception stems from miscommunication more so than a lack of interest on GEO's part to engage with the SMMEs where a lot of the engagement with SMMEs and companies not involved in the Cloud Credits and License Programmes happens at the level of the Work Programme and is not publicised by the Secretariat. Some of the structural reasons limiting SMMEs engagement can be helped by better coordination but calling for a "level playing field" misses some of the structural challenges and does not fully consider all of what GEO attempted to date. However, there is room for improvement, especially where the need to communicate better and clarify existing misconceptions is evident, and to improve coordination through an increased role of the Regional GEOs and the Secretariat.

3.7 The Trust Fund

3.7.1 Overview

The GEO Trust Fund primarily supports the direct and indirect costs of GEO and its Secretariat, as well as related activities. It gathers voluntary financial contributions received from GEO members, Participating Organizations, and other entities. While, in principle, Trust Fund contributions can be collected also from Participating Organizations and other entities, monetary funding from the Trust Fund has come from member states until today. The Trust Fund model is voluntary in nature, and it reflects the principles on which GEO operates of voluntary and open participation, but it also provides the flexible framework enabling GEO's operations and shaping its structure as a coalition of the willing. Contributions can be provided in cash or in kind, including in the form of secondments, grants, donations and funds to the Secretariat by GEO Members, Participating Organizations and other entities involved in Earth observations. GEO's Rules of Procedure currently allow for funding contributions to come from diverse sources including, but not limited to, governments, non-profits, the private sector, and commercial entities[48]. However, in order to ensure financial sustainability, GEO will need to further diversify, enhance, and expand its efforts in mobilizing resources from multiple sources including GEO Members and other stakeholders for the GEO Trust Fund by focusing more on individual members, as well as expanding and diversifying its base of supporters.

[48] GEO (2019). Rules of Procedure, p. 19-20.

Throughout the years, the Trust Fund model saw a preservation of the status quo with a small number of countries representing its main contributors with funding that was primarily dedicated to resourcing operations of the Secretariat. This has led to a situation where a small group of member states steadily contributes to sustain the majority of the Trust Fund. This group of key funding contributors is represented at its core by the Lead Co-Chairs of the Executive Committee that have a primary role in steering the decision-making processes within the organization and a few other countries that are active within GEO and have steadily contributed to the Trust Fund.

The Trust Fund Budget does not cover funds for GEO Work Programme activities and is focused on supporting operating costs of the GEO Secretariat and its supporting functions. Based on the GEO Rules of Procedure, the Executive Committee presents the annual budget proposal, on which it is advised by the Budget Working Group, each year for approval by the Plenary[49]. This process is overall very transparent as the final task of approving the budget lies in the hands of Plenary members. In general, the Trust Fund budget covers the costs of operating the Secretariat, such as staff salaries, travel, and other administrative costs derived from the arrangement GEO has with the WMO. This budget has not varied greatly over the years.

In reviewing GEO's budget over the years along with its steady growth in the total number of members, currently at 113, it can be observed that this continuous increase in the number of member countries that joined GEO has not corresponded to an increase in the number and amounts of contributions to the Trust Fund. Another important source of in-kind contributions is the provision by members of seconded experts, who have supported the GEO Secretariat in key areas. Given GEO's limited funding and staffing, secondments have provided a way for the GEO Secretariat to gain much needed capacity. The challenge, however, as some interviewees pointed out, is that secondments do not offer the same level of institutional stability and continuity as longer-term staffing positions.

The GEO Strategic Plan 2016-2025 was accompanied by the introduction of a voluntary indicative scale of contributions (VISC) in 2017 built following the UN one. Currently, GEO issues invoices accompanied with the VISC and a signed letter to GEO Principals to encourage members to contribute up to the amount calculated based on the VISC[50]. It should be noted that only a fraction of GEO Members contributes to GEO at a level determined by the VISC. While some Members have pledged higher amounts than the voluntary scale, the trend in GEO remains that many members are contributing less than the VISC or not contributing at all to the GEO Trust Fund, which raises challenges in terms of ensuring the future sustainability and relevance of GEO.

While the present high level of dependency on member countries for voluntary funding makes the GEO model flexible and an expression of GEO as a coalition of the willing, it also threatens the long-term sustainability of GEO. In situations where external factors, such as those triggered by the COVID-19 global pandemic, where countries' priorities shifted towards strengthening their health sector, may have adverse impacts on their ability to sustain contributions to the GEO Trust Fund. While these types of events can create potential opportunities for GEO, they can also have destabilizing consequences that can be better addressed by having diverse sources of funding. Lastly, in 2021, GEO launched an online

[49] GEO (2019). Rules of Procedure, pp. 14-15.
[50] GEO (2020). Resource Mobilization for the GEO Trust Fund, p. 1.

public GEO Pledge Campaign to drive commitment to GEO and support the efforts of the Secretariat in delivering GEO's mission. This is aiming to reach 5.5 million Swiss Francs by 2021 and has for now succeeded in collecting almost half of this amount. This is a promising start, which may serve as a means for GEO to expand its funding campaign to other sources.

3.7.2 Evidence from Current Evaluation

3.7.2.1 The Current Model and Alternatives

GEO currently operates on a voluntary funding model where the Secretariat's operations are financed through the Trust Fund. These operations cover:

1. Secretariat management, external relations and outreach, Work Programme coordination, reporting, operations and support; and
2. Coordination of Engagement Priorities.

The GEO Secretariat has an administrative arrangement as part of the Standing Agreement it has with the WMO, where the WMO has independent legal personality instead of GEO. As part of this arrangement, GEO pays a 7% overhead fee to the WMO which manages its bank accounts, payrolls and accounting systems. Presented below is a brief Strengths, Weakness, Opportunities, and Threats (SWOT) analysis of this voluntary funding model that emerged from the analysis of interviews and surveys from the MTE Team.

Table 7. SWOT Analysis of GEO's Voluntary Funding Model

GEO's Voluntary Funding Model	
Strengths	**Weaknesses**
● Attracting contributions on a best-effort basis without preventing countries from participating if they cannot contribute financially ● Flexibility and capacity to attract different forms of contributions from various sources	● Limited funding and operational capacity ● Limited ability to plan ahead for multi-year projects ● Uncertainty in funding
Opportunities	**Threats**
● Encouraging participation of new members that do not have to necessarily contribute to join ● Explore opportunities for the economic and business development of Earth observations value chains in light of the commercial value generated within Earth observation ecosystems and in line with the principles of open access to Earth observation data and products	● Risks losing contributions with shifts in priorities of member states as these are not compulsory ● Being reliant on a limited number of member countries for funding

Source: created by the MTE Team

In general, answers to questions on the Trust Fund show that there is little awareness on how it is structured and operates. Within GEO, there is limited understanding of the fact that

contributions earmarked to Work Programme activities are not the same as contributions to the Trust Fund and that the Secretariat is the body depending on contributions to the Trust Fund. When asked about their opinions on the usefulness of the GEO Trust Fund, only 19% of respondents to the community survey, as shown in Figure 26, said they believe that the GEO Trust Fund Model has been effective in supporting GEO in achieving its mission:

- 4% strongly agree,
- 15% agree,
- 14% is neutral,
- 11% disagree,
- 3% strongly disagree,
- 25% do not know,
- the remaining 29% did not answer the question.

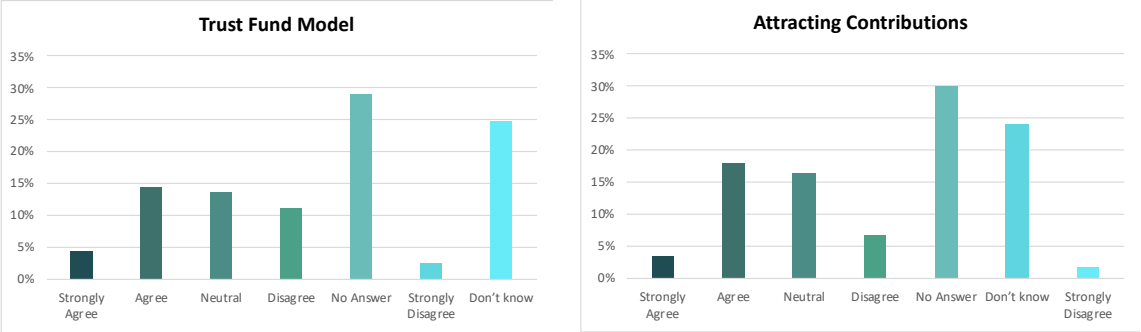


Figure 26. GEO's Trust Fund Model Effectiveness and Capacity to Attract Contributions

The fact that 11 out of 36 key informants decided not to answer the question on the Trust Fund or mentioned they did not know enough about it to answer, further substantiates this claim. A few interviewees remarked that there is a lack of clear communication on how the Trust Fund and earmarked funding function across GEO and that it should be clarified how GEO Work Programme activities can use the Trust Fund as a vehicle to access earmarked funding. In fact, earmarked funding goes directly to a given project and, as there has been some confusion expressed on this point, there may be a need to clarify how external funding can be sent to a GEO activity through the Trust Fund. Moreover, as shown again in Figure 26, only 21% of respondents to the community survey believe that GEO ability to mobilize resources has been successful to attract in-kind and financial contributions to ensure GEO can achieve its vision with a majority of 54% either answering that they do not know or not answering the question. 30% of respondents either strongly agree or agree that GEO has strengthened engagement with current members and Participating Organizations that are not contributing as much as planned to GEO's activities, underlining how there is further space to strengthen this engagement.

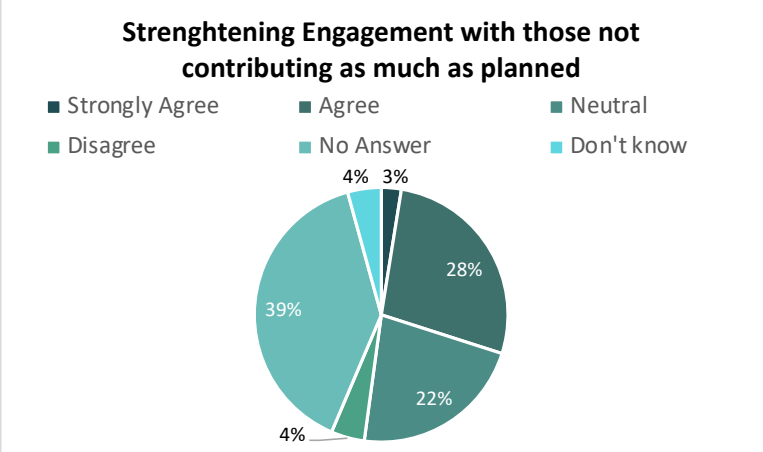


Figure 27. Strengthening Engagement with Member States and Participating Organizations not contributing as much as planned

A minority of the key informants think that the Trust Fund model needs to be changed because it is currently not sustainable. According to them, GEO should require participating member states and/or organizations to contribute a minimum fee. Multiple suggestions have been made as to how this fee should be structured including the option of having member countries commit for an initial period of four years, allowing them to try out the GEO model for two years and then requiring them to contribute on a more continuous basis. Other options may include having a *pay-to-play* clause for participation in the Executive Committee where only paying members would be allowed to sit on the Executive Committee and make decisions on GEO's agenda items. However, this solution would have implications for the equity and inclusivity of the GEO governance structure. Another solution which has been suggested would be that of asking that countries that join GEO contribute by establishing a National GEO chapter. This would be an in-kind contribution signalling their commitment to participate in GEO and may, as such, not help in securing the minimum necessary funding needed for the organization. Having National GEOs established in countries that decide to join might, on the other hand, serve the purpose of connecting more local organizations and potential contributors to the global GEO structure. These options would allow GEO and Work Programme activities to operate on the basis of more secure funding and make longer term plans, contributing to secure long-term sustainability of projects that often struggle to go beyond the grounding phase and set long-term objectives. On the other hand, these solutions might discourage broad and open participation to GEO, which is one of the key traits that have characterized the organization.

Overall, the majority of key informants believe that GEO should maintain the voluntary contributions model for the Trust Fund, but at the same time focus on expanding the base of contributors or increase the amount contributed by actual members according to the VISC which is already being used by GEO. Many of those interviewed through the targeted interviews process echoed this view, suggesting that while the community has different views on this point, the prevalent position is that the GEO voluntary model for the Trust Fund is still the best option available. There is also agreement that this model can be optimized to make the best out of it by encouraging all members to contribute with small amounts or as an alternative, with in-kind contributions. Many also noted that one advantage of this model is its flexibility, which allows all GEO members and stakeholders including the commercial and private sector among others, and not only member states to contribute. This allows GEO with opportunities to further diversify its funding base.

GEO should work to secure funding from countries that are not contributing yet or are contributing less than what is suggested according to the VISC. To encourage countries that are not currently contributing to provide some funding or in-kind contributions, it would be necessary to engage with them more and show them the value added of GEO in terms of delivering benefits such as, providing access to EO-derived products and tools for decision makers, and/or implementing capacity development activities on the use of Earth observation data in their countries. Among contributors to the Trust Fund, only six member states in 2020 contributed the amount suggested by the VISC or more, two of which are members of the Executive Committee[51]. This shows that there is a need for additional effort to encourage members to contribute up to the amount suggested in the VISC and to present them with a convincing value proposition. Other solutions that were suggested to reinforce the voluntary model include looking at current opportunities with other possible donors such as philanthropies, the private and commercial sectors and local institutions in order to diversify GEO's funding sources. This presents an opportunity to increase and leverage connections with Regional and National GEOs, which can provide linkages to possible partners the GEO Secretariat could target for collaboration. Overall, interviewees agree that GEO has done some work on resource mobilization, but this needs to be expanded to include plans on defining potential donors and how to target them with a clear value proposition.

An alternative to cash contributions is represented by in-kind contributions, which are already used by GEO member states and can consist of support to specific Work Programme activities, and/or secondments to the Secretariat. In general, it has been noted that the skills of secondments made to the Secretariat in recent years did not necessarily match the skills that were required in the job advertisement. While some interviewees noted they are supportive of the secondment model as it contributes to bringing new and fresh perspective to GEO's work, others noted this may have implications for the institutional memory of the organization. Overall, secondments are perceived positively and as an opportunity for GEO to benefit from unique skills and different perspectives and ways of working that can be integrated in its model.

Other difficulties in funding the Secretariat are:

- The work of the Secretariat could be perceived as an overhead, given that this body is not directly involved in the execution of Work Programme activities, with the exception of Foundational Tasks. This makes it even more difficult for the Secretariat to access traditional grants and foundations' awards which are geared towards funding projects,
- There has been insufficient focus on showing how the Secretariat's work underpins GEO operations and can bring extra value to it in terms of coordination and communication. The GEO Pledge campaign started to address some of these issues, but it has been launched in 2020 for the year 2021, hence it is not possible to assess whether it has been successful at this point.

Views gathered from the interviews, the community and Secretariat's survey pointed to the fact that Secretariat staffing and funding is inadequate based on the resources that would be needed to carry out its tasks, in particular, given the limited prioritization of activities from the Executive Committee. In general, the view of the Secretariat's on resourcing the Trust Fund assigns a primary responsibility to Executive Committee members to contribute the amount suggested by the indicative GDP scale, but also suggests looking at other potential sources of funding including private sector, philanthropies, foundations and multilateral development

[51] GEO (2020). Proposed 2021 Trust Fund Budget, p. 5.

banks. Overall, the Secretariat's view seems to echo that of respondents that the voluntary model is the best way to resource the Trust Fund, underlining it should not be changed but rather expanded. However, it is important to note that the Secretariat's survey only collected 9 answers and as such, it cannot be considered fully representative of the Secretariat's view.

3.7.2.2 Expanding and Improving the Trust Fund Model

Considering that the existing Trust Fund Model has been identified by the majority of interviewees as the best option for GEO to fund the Secretariat, this section is dedicated to reviewing ways which the interviewees have suggested GEO could use to expand the number of contributors or the amounts contributed.

As suggested in some of the interviews, engaging with the private and commercial sectors could represent a potential funding opportunity for GEO. On the other hand, a few interviewees have highlighted that **the private sector is more likely to contribute directly to the Work Programme activities through cash and especially in-kind contributions as it is already doing rather than contributing to the Trust Fund to resource the Secretariat.** As regards existing rules about receiving donations and funds from the commercial sector, as per the GEO Rules of Procedure, there are currently no limitations to receiving donations from this sector and as such, GEO may wish to consider what would be the best way forward to approach the commercial sector as a potential donor. Another option which has been suggested by a few respondents to the Commercial Sector and Associates survey is that the Secretariat should have a commercial division or point of contact for companies dedicated to managing and developing partnerships with the commercial sector that would become a point of reference for commercial sector engagement. This comment also points to the need for increased staffing resources.

Key to receiving support from the private and commercial sectors is the formulation of a clear value proposition on the indispensable role of the Secretariat within GEO as a managing and coordinating body of Work Programme activities fostering engagement, relations with the different stakeholders and communication across GEO. While GEO should not exclude the opportunity of looking at the private sector as a donor, interviewees seem to agree that this would not represent a steady source of funding for GEO Work Programme activities and funding for the GEO Secretariat. In order to look at how other institutions with a similar voluntary funding model have structured their funding engagements with the private sector, GEO may consider reviewing the practices of UNEP, UNICEF and UN OCHA which were presented in section 3.6.2.1 This may serve as a blueprint for GEO to consider new opportunities for resource mobilization.

A few interviewees also noted that given that the GEO Secretariat requires a fee of around 15%, of which 7% goes to the WMO for administrative costs, to manage earmarked funding through the Trust Fund, it would benefit from an increase in the amount of funds handled through the Trust Fund to GEO Work Programme activities. This is true for covering costs involved in managing those activities, and would help to provide support for that, however, being earmarked funds, they could not be used for other GEO Secretariat operations/staffing, which is why having steady Trust Fund support is so critical. The additional 8% is intended to come to the GEO Secretariat to cover infrastructure and management costs involved in GEO Secretariat management and handling of those funds. The interview process revealed that a lot of respondents are not familiar with this arrangement and that GEO should communicate about it more broadly within the organization. In fact, the Secretariat plays a management and coordinating role of the GEO Work Programme and, as such, it should better market the value added it provides to the work of GEO, to the execution of the GEO Work Programme and in

supporting all of GEO's efforts. A few interviewees agreed that by better marketing its role, it could drive contributions to the Trust Fund and that for this reason, public campaigns such as the GEO Pledge Campaign, which was launched in 2021, was a positive step in this direction.

Lastly, what may contribute the most to increasing cash and in-kind contributions of GEO members to the Trust Fund is a better definition of its value and benefits that each of the members could derive from participation. To this end, it is clear that adopting a targeted value proposition and engaging more with members may lead to substantial improvements in terms of resourcing the Trust Fund. Some comments noted that with the development of the GEO Knowledge Hub, the Secretariat's resources have been recently focused on this task. To this end, the Secretariat should prioritize and balance its activities taking into consideration the need to secure continuous engagement and consistent communication with members to increase their perception of GEO's value added. This point connects with other findings on GEO's need to better define a clear vision and to communicate it within the organization to favour prioritization of activities. What has been seen by interviewees as key to increasing members' financial support for GEO in this case as well, is a better definition of its value added. One issue that has been identified in this context by a minority of interviewees is that historically the majority of GEO Principals came from meteorological services ministries, and that these are not the only beneficiaries of GEO's work. Hence, having a National GEO mechanism for in-country coordination in place might help better coordinate at the national level also on funding matters.

3.7.3 Synthesis and Findings

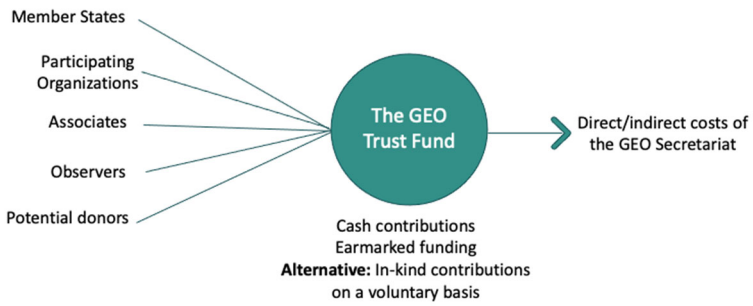


Figure 28. The Trust Fund Model

Source: created by the MTE Team

Addressing the issue represented by lack of steady financing for the GEO Trust Fund lies at the heart of ensuring the long-term sustainability of GEO and for this reason this topic deserves the utmost attention. The surveys and interviews with key informants showed a divided landscape among those thinking GEO should change the Trust Fund Model by asking for a minimum contribution or adding a *pay-to-play* rule to regulate membership to GEO or at least the Executive Committee, and those who believe GEO should maintain the voluntary funding model and optimize it. The view of the second group **gathered more support across the GEO community.** This group indicated that the GEO voluntary funding model should be improved and optimized by either expanding the number of contributors or the contributions of each member to the GEO Trust Fund on the basis of the VISC by stimulating a renewed commitment to the organization's mission. What is seen once again as key to attracting steady contributions is formulating, marketing and delivering on GEO's value proposition on an

ongoing basis to current and potential members. To achieve this, GEO should invest more time and resources in marketing benefits derived from engagement with the organization and the contribution of the GEO Secretariat to the realization of the GEO Work Programme, mission and vision.

Some of the key informants were concerned that having a model based on minimum contributions may lead some GEO members to renounce membership when their budgets are under pressure. For example, the COVID-19 global pandemic was presented as a situation that may divert resources from the GEO Trust Fund. However, even though this was an issue for some activities, it did not affect the Trust Fund Budget. **The suggested VISC and existing initiatives such as the public GEO Pledge Campaign are good measures and initiatives aimed at marketing and better communicating GEO's value, internally as well as outside of the organization.** However, given these have been launched just recently, the MTE Team cannot comment on their degree of effectiveness. Interviewees highlighted that GEO should open up and actively scout new potential funding opportunities and that Regional GEOs, which could play an increased role in encouraging contributions from member states, Principals and National GEOs in the cases where they have more direct communication channels with the latter. In fact, it is clear that GEO should explore potential funding opportunities from donors that have not been actively pursued and engaged yet, including the private sector, in order to diversify the pool of donors on which it depends for funding and contributions.

In securing the sustainability of the Trust Fund, GEO should take into account that major contributors to the Trust Fund come from the most active members within the organization. As such, to encourage further contributions from other members, GEO should work on engaging them better by enabling their full and active participation in the organization. Lastly, enhanced communication on the role of the Trust Fund, the Secretariat and emphasis on the Standing Agreement between the WMO and GEO can help increase awareness on the structure and funding mechanism on which GEO operates.

Findings:
14. Awareness: There is a general lack of awareness on the role of the Trust Fund and how it serves to support the operations of the GEO Secretariat, but also about the Standing Agreement and consequently the administrative arrangement in place between the GEO Secretariat and the WMO. This is demonstrated by the high percentage of respondents who chose not to address the question on the Trust Fund or declared they did not know enough to answer this question. This finding points to the need for systematic and continuous communication within the organization on priorities such as the GEO funding model, its functioning and role which allows the Secretariat to continue its operations.

15. Funding Model: The majority of interviewees and respondents to the surveys are in favour of maintaining GEO's voluntary funding model of best-effort cash or in-kind contributions to the Trust Fund. The majority believes that rather than shifting to a model requiring a minimum mandatory contribution, the current model should be optimized promoting an increase in the number of contributors, in the amounts contributed by each member and the number of in-kind contributions including secondments from member states, Participating Organizations and Associates. This can be done by promoting contributions according to the voluntary indicative scale of contributions, promoting public campaigns of support for GEO, exploring new funding opportunities and by enhancing members' perception of GEO value proposition through continuous engagement and better communication. In fact, it seems that the underlying issue

behind the low level of contribution to the Trust Fund is the need to better define GEO's value proposition.

4. Taking stock of GEO's Strategic Plan Implementation

4.1 Accomplishments and Opportunities

In terms of measuring GEO's progress towards the implementation of its Strategic Plan 2016-2025, GEO has overall shown good progress towards achieving its mission of connecting the demand for environmental information with the supply of Earth observation data and information. The organization is contributing to unlocking the potential of Earth observations globally by making them freely accessible and easily applicable for the purpose of decision-making.

Given that coordinated action and collaboration are needed to respond to the unprecedented challenges societies are facing in terms of food scarcity, water management, biodiversity loss and climate change, GEO can and is showing good progress towards becoming the global leader in coordinating availability, access and use of Earth observations to monitor ecosystem, health, environmental conditions and human impacts for the benefit of humankind.

In the wake of the data revolution characterized by emerging technologies such as, artificial intelligence, internet of things and the increasing importance of Earth observations to provide data on weather, land cover, agriculture, biodiversity and disaster monitoring among others, GEO is described by interviewees as best placed to harness the opportunities represented by the rapid digitalization of societies and the democratization of data access. Given that these represent key aspects of GEO's advocacy, it has the potential to become the umbrella organization **convening and representing the interests** of the different stakeholders active in the field of Earth observations. A flexible and agile structure are key traits of GEO identified through the interview process. As such, GEO should aim to increase its focus on delivering a clear value proposition to current and potential members. These traits also relate to GEO's voluntary model based on best and grassroots efforts, and its structure as a coalition of the willing, which provides everyone with an opportunity to contribute to advance GEO mission. GEO's key features can be enhanced and better presented to members through improved communication of its value proposition, strong emphasis on diversity and inclusion aimed at promoting increased participation of members. Findings suggest that in this manner GEO can remain relevant, with the ability to secure a third mandate after 2025. For the future, possible opportunities would include focusing more on delivering critical Earth observations derived knowledge to users by engaging with different communities and promoting capacity development on the use of Earth observations through the co-development of solutions driven by enhanced interactions at the national and regional level.

4.2 Challenges Facing the Implementation of the Strategic Plan

This section looks at challenges facing GEO implementation and classifies these into two different categories based on whether they depend on GEO itself or are influenced by external factors.

As regards GEO's **internal challenges,** one of the areas identified as a key weakness for GEO is the need to formulate a clearer vision for the organization as a whole. This would allow GEO to set defined goals and prioritize areas of focus for the coming years in view of the renewal of its mandate. Another key challenge that has been identified through the MTE process is the need to improve **communication, which affects both internal workflow and external**

relations. This topic has emerged as a cross-cutting theme across all six focus areas highlighted in this report. Both internal and external communication pose challenges for GEO. Internally, within the GEO community, this has been shown by the lack of awareness of how the Trust Fund functions, on the existence of GEO Rules of Engagement with the Commercial Sector, and by remarks of many GEO members who noted how they would like to communicate on a more continuous basis with GEO. Communication issues also affect coordination among the global and Regional GEOs and the GEO Work Programme activities themselves. These activities would prefer to have more opportunities to exchange views with each other and to participate in GEO's work, but sometimes feel disconnected from the GEO leadership, largely represented by the GEO Secretariat, the Executive Committee and the Programme Board. Communication with stakeholders is negatively impacted by the lack of a clear and targeted value proposition that leads stakeholders to have different expectations towards GEO and to derive unclear benefits from their participation in it.

The main factor identified as an **external challenge** facing the implementation of the GEO Strategic Plan is increased competition from a number of players in this field, which may have access to more advanced technologies than GEO. Given that in 2020, many governments and other institutions emphasized the urgency and importance of addressing the climate crisis represents an opportunity for GEO to show that, now more than ever, Earth observations can represent an invaluable source of knowledge regarding the status of the Earth. Earth observations and derived products will increasingly become a central instrument supporting decision makers and driving policies for a sustainable world. Looking forward, GEO should also be aware of the impacts of the COVID-19 pandemic on global priorities and consider whether these may affect it directly. For this reason, GEO should aim to develop a clear value proposition that could also support improved linkages with public health priorities.

In recent years, and even more in the future, the field of Earth observations will experience increased participation from different actors. For this reason, GEO should seize the opportunity represented by this development to involve, engage and facilitate communication and the establishment of synergies among all the actors present in this field. Even though it has been noted how the GEOSS infrastructure may be less technologically advanced compared to that of other systems, a minority of key informants still believe GEOSS remains central from a scientific point of view, as it represents a common project for the establishment of a system of systems. However, the interviews have shown that there is no common understanding of what GEOSS, the operating principle of GEO, has come to mean to the entire organization, and for this reason, GEO should review the relevance of this concept and its applicability to the current evolution of GEO.

4.3 Addressing the Implementation Gap and ensuring GEO's Sustainability and Relevance

The GEO model seems to be flexible and adaptable, however, especially from a funding point of view, interviewees noted how it lacks sustainability, given its limited base of resources and dependence on voluntary contributions. Overall, it is clear that the model needs to be strengthened, especially with regard to specific areas presented below:

- Improving how GEO defines its key role for the global community and providing a **clear value proposition** to communicate to existing members, Participating Organizations, Associates, potential contributors and other external stakeholders. This would also contribute to attracting steady funding for the GEO's Trust Fund. Also, a key in formulating GEO's value proposition will be looking to better define GEO's role as a convener, provider of services to users, and/or maintainer of data technology

systems, while being aware that it must prioritize and cannot equally pursue all three roles given limited funding and capacity,

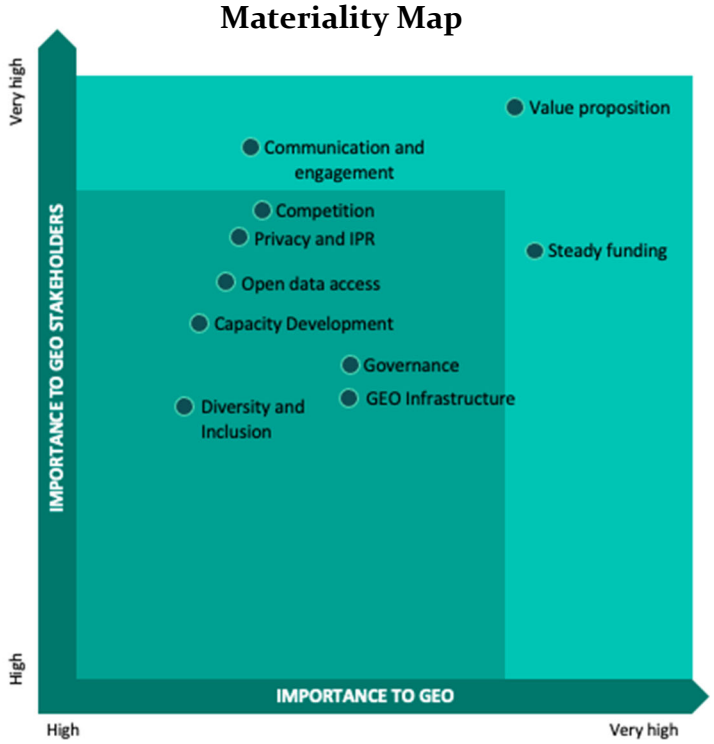
- Improving its Engagement Strategy though continuous and **consistent internal and external communication with current and potential stakeholders** including member states, UN agencies, the private sector, users and IFIs,
- Improving **coordination within GEO by increasing interconnectivity within the Work Programme**, as well as by reinforcing Regional GEOs as key components of the GEO Work Programme that can support in coordinating and enabling communication across the Work Programme. This is where the adoption of a flagship-centered strategy will be imperative in helping to facilitate these connections and build synergy across the organization.

Implementing the changes mentioned above requires GEO to focus on achieving its three Strategic Objectives:

- **Advocate: GEO to continue advocating** for open data policies and principles of data management, stressing the scientific and operational value of Earth observations,
- **Engage: GEO to engage all the actors** involved at each step of the Earth observation value chain by fostering stakeholders' engagement through a clear and tailored value proposition,
- **Deliver: GEO to deliver value** to all its members and communities by promoting best practices, enabling and facilitating uptake of technologies and EO-derived solutions and promotion of economic growth.

By doing better to act on the goals and strategy that is already laid out in the Strategic Plan and Engagement strategy and targeting specific stakeholders, including a renewed focus on existing members in order to encourage their participation and commitment, GEO could benefit from a renewed enthusiasm for its vision and a renewed financial commitment to its mission that would grant its long-term sustainability and relevance. This would also enable GEO to succeed in the achievement of its mission to connect the demand for sound and supply of data and information about the Earth.

Materiality Map



	DEFINITION
Value proposition	GEO's capacity to define and consequently market its value proposition
Communication & engagement	GEO's capacity to communicate clearly internally and externally and engage its stakeholders
Steady funding	GEO's lack of steady funding resources
Competition	Rising competition from both the private sector and other International Organizations
Privacy and IPR	Need for clarification on GEO's IPR/Privacy guidelines
Open data access	GEO's essential contribution to the democratization of data access and role as an open data platform
Capacity Development	GEO's contribution to capacity development in the use of EO and derived products
Governance	GEO's management structure and how this can become more effective
GEO Infrastructure	GEO's infrastructure development including the Knowledge Hub and GEOSS and interoperability standards
Diversity & Inclusion	GEO's capacity to include and represent different communities and geographies

Figure 29. Materiality Map identifying priority areas of action for GEO and its stakeholders as they either represent risks and threats and/or opportunities for the organization

Source: created by the MTE Team (the map has been inferred based on the judgement of the MTE Team based on data from surveys and interviews)

5. Key Findings and Recommendations

FINDINGS	RECOMMENDATIONS
FOCUS AREA 1: GEO Organizational Model	
1. Mission: GEO is making good progress on working towards becoming a world leading organization in coordinating availability, access and use of Earth observations. It is successfully contributing to unlocking the potential of Earth observations by connecting the demand for sound and timely environmental information with the supply of data and information about the Earth, facilitating their accessibility and application to global decision-making within and across many different domains. It has an opportunity to become increasingly recognized as a global convener of different communities including member states, international organizations, data and service providers, users and the private sector in the field of Earth observations given the increasing availability of data, increasing attention towards sustainability topics and the need for information that can support decision-making in this field. It can fulfil the above-mentioned role by leveraging its ability to connect such communities, particularly with a view to covering the downstream of the value chain, providing a platform for collaboration and representing a source of branding, recognition and trust. As regards the GEO-WMO relationship, respondents noted the need to better define and strengthen this relation, highlighting possible areas of complementarity. **2. Value proposition:** A clear gap that is evident across GEO is the need to better define its value proposition. A clearly defined value proposition is missing from messaging to members, but also to external partners, including UN institutions, and partners, such as the private sector.	**1.** GEO should improve the definition, targeting, communication of and emphasis on its value added proposition and benefits derived for external organizations to participate in GEO. Possible ways to do this include stressing GEO's messaging around its value added, its convening role, inclusivity and capacity development to foster greater engagement of all its existing and potential members, Participating Organizations and Associates. While no change is suggested to GEO's legal status and its Standing Agreement with the WMO, this specific relation, which is also administrative in nature, should be reviewed to identify possible areas of cooperation in light of recent improvements, taking into consideration the suggestions provided in the report.

GEO's voluntary nature can be an asset, but this needs to be tempered with a clear organizational vision that is communicated within the GEO community and to potential partners and funders. A part of this clarity will require greater interaction with individual members to better understand their needs and where GEO can contribute and what GEO can offer, for instance in convening, addressing capacity gaps, providing access to open Earth observation data or in the standing up of National GEOs. GEO's struggle to attract new donations to its Trust Fund can be partly tied to the lack of understanding among key stakeholders of the value of GEO coupled with a lack of communication/marketing of the value of GEO to the global community, as well as at the regional and national level. To define its value added, GEO should agree on specific areas of focus where it can deliver, in light of developing technologies relative to its founding goals and its convening function. There is a sense in the GEO community that the next phase of GEO should be more action-oriented on what GEO can deliver and where it can make unique contributions to establish itself as a global leader in Earth observation.	
3. Communication and Engagement: From the surveys and interviews, it was shown that there are inconsistent methods of internal communication and coordination to share information across the GEO Work Programme and to engage both current and potential members and users. This has limited GEO's ability to advance as an organization. There is also a widespread perception that because of this lack of communication and engagement, many members are not involved or contributing as meaningfully as they could to the work and funding of the organization.	**2.** From an operational point of view, GEO should improve internal and external communication, as well as synergies among the different elements of the Work Programme, GEO governance bodies and the Secretariat, and to all of GEO relevant stakeholders, ensuring that frequency and content of communication is consistent across the organization and includes targeted communication on key items and decisions regarding the entire organization.
4. Re-evaluating GEOSS: GEO needs to reassess the concept of GEOSS, what the main goals are, and whether the original concept of GEOSS	**3.** Given that the evaluation has highlighted that the concept of GEOSS and its implementation has come to assume different meanings across the organization,

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.	GEO should consider assessing the concept of GEOSS in light of the recent evolution of GEO. To do so, GEO should consider establishing an Expert Advisory Group composed of external experts, with expertise in Earth observation science, user engagement, as well as socioeconomic and policy domains, and internal members, to explore to what extent the concept of GEOSS is still relevant to the organization as it no longer appears to define the core of GEO's activities as originally defined.
FOCUS AREA 2: Policy and Users' Interface	
5. Relations with the UN and other stakeholders: In the past five years, GEO's engagement with the UN and multilateral environmental agreements has improved consistently. This was largely due to the establishment of the Engagement Priorities that allowed for a better alignment of agendas in the context of the SDGs, the Paris Agreement and the Sendai Framework for Disaster Risk Reduction. However, there are opportunities to further improve relations with UN agencies both at a high policy level and at an operational level by deepening their collaboration with Regional, National GEOs and GEO Work Programme activities. GEO has not made significant progress and it needs to work further to	**4.** GEO has made good progress on developing its relationship with UN institutions over the past five years and should work on strengthening this relationship further at a global, regional, national, and local level. GEO should also work on improving its engagement with International Financial Institutions, statistical agencies and the private sector increasing awareness of its role in the Earth observations field. To this end, GEO would benefit from a clearer value proposition and targeted issue-areas that can help to improve linkages and coordination within the GEO Work Programme, as well as with external stakeholders. It is recommended that GEO's Executive Committee should revisit the

improve its relations with multilateral development banks and statistical agencies. There has been progress in this area over the past five years through Initiatives such as EO4EA and EO4SDGs making advancements, however GEO needs to continue to strengthen and expand these relationships across the organization. Strengthening such engagement would contribute to the establishment of a comprehensive ecosystem approach to the role of GEO in coordinating availability, access and use of Earth observations. Lastly, even though there has been progress in the engagement with the private sector and member states, better results can be achieved through a clearer definition of GEO value proposition.	'flagship-centered strategy' it once proposed as a way to establish clearer overarching priorities that can help to create synergies in the Work Programme and align them with key issue-areas that are relevant to GEO's users and stakeholders.
6. Users' needs: Despite the different approaches adopted to this topic, GEO has not developed a systematic mechanism to report on users' needs and requirements, ensuring that these are identified and addressed, especially when different needs emerge at a regional, national and local level. This situation might vary at different levels of implementation of the GEO Work Programme, where specific activities, in particular Flagships such as GEOGLAM and GOS4M, or some Initiatives as GEO LDN, GEOGloWS and EO4SDGs, may have a better understanding of their users' base. Regional GEOs together with the GEO Work Programme activities: Flagships, Initiatives and Community Activities have been indicated as bodies within the GEO global structure that could play a central role in reporting on users' needs and ensuring that GEO maintains contact with its users' base.	**5.** Reporting on and connecting with users' needs and their translation into requirements for products and services should be embedded in a more cohesive manner across the GEO Work Programme. GEO should consider a more structured way of collecting and consolidating requirements for their user community in a standardised format across the GEO Work Programme activities. GEO Work Programme activities should be expected to be able characterise and document these needs and requirements in a standardised format for their user community, by the time they reach the stage of a GEO Initiative. A greater role should be taken by Regional GEOs in collecting tailored requirements for their regions. The Programme Board should ensure that these needs and requirements are better integrated across GEO's system to guarantee the broad thematic scope of GEO engenders its full potential and to increase their capacity to link national and regional realities with the global GEO. GEO should also clarify how and if GEO activities should progress from a Community Activity to an Initiative to a Flagship. GEO should have greater clarity on the requirements to progress from one stage to the next and also on how many Flagships GEO should have, and when

	activities should remain at their existing level or when the latter should progress. In summary, there is limited guidance on the lifecycle of activities within the GEO Work Programme.
FOCUS AREA 3: Interoperability	
7. Internal processes and connections: The GEO Work Programme, while marked by bottom-up approaches and driven by coalitions of willing communities of practice, needs to be balanced with GEO's ability to maintain a clear vision and focus. The broad GEO Work programme would benefit from better coordination, improved communication and interoperability between GEO's implementation mechanisms. The scale of the current Work Programme makes this more challenging for the Programme Board and the GEO Secretariat to execute. Greater coordination at the thematic and regional level may help to reduce redundancies and improve integration. However, GEO needs to keep in mind that without additional resources (both within the Secretariat and from members) or improved rationalisation of existing activities it will be difficult to further expand the Work Programme while still maintaining its overall effectiveness and cohesion. The Executive Committee and Programme Board need to focus more on overarching thematic areas, and concrete goals for GEO providing more top-down direction, while balancing that with a bottom-up approach. The Societal Benefit Areas structure of the GEO Work Programme should be retained, alongside the Engagement Priorities to allow cross-cutting links. An increasing level of interaction between Regional GEOs should be encouraged. The new Knowledge Hub has a potential role to play in providing information to show how Initiatives, Community Activities, Flagships and Regional GEOs currently connect, placing an emphasis on the value chain of Earth	**6.** GEO would benefit from establishing clearer high-level focal themes that can serve to drive synergies and improve coordination across the GEO Work Programme. That would be done by having them established at the Executive Committee level and then executed by the Programme Board and GEO Secretariat in coordination with the Work programme activities. It would be beneficial for the GEO Executive Committee to establish a team or teams, which can consider relevant international objectives and priorities of GEO's members that can in turn guide the identification of possible focal themes for GEO for a set number of years. This team, which is also encouraged to consult users and external communities, can advise the GEO Executive Committee on four important areas to improve synergies, knowledge sharing and reduce redundancies: i) improving connections between GEO activities that can link to high-level priority areas for GEO; ii) considering how these high-level focal themes will be benefitted by improved knowledge sharing and sharing of experiences using the new Knowledge Hub alongside other coordination mechanisms; iii) providing recommendations concerning the inclusion of further activities, and highlighting any gaps in the GEO Work Programme and the value chain on the use of Earth observation under the GEO Work Programme in consideration of the proposed focal themes; and iv) improved links between Regional GEOs, which will

observation to users and where GEO provides this across its different initiatives.

8. External and technical Interoperability:
Despite recent attempts to improve it, the GEOSS Implementation Plan needs to be reviewed. The GEOSS portal, as described, is unable to meet user expectations in terms of its low technical capability, low performance compared with other global and regional systems, and the lack of good integration of in situ data. This view is supported by the low rates of use of the portal when compared with other global, regional and national portals. Technology advances have significantly changed the original concept for the GEOSS and GEO no longer has the tools, right partners or resources to meet the project GEO had intended in the early years (2005 – 2010) to build a system of systems. GEO would benefit from improved external connectivity with major Earth observation data portals, at all levels. Attention should be paid to links with global, regional and national data systems. Particular attention should be made to improving the availability and integration of in situ observations within the GEO Portal, working with in situ terrestrial, freshwater, coastal, ocean and atmospheric observation systems and new in situ initiatives such as GBON and others. It is believed that the new GEO Knowledge Hub could provide more support to the Earth observation value chain and, although still at an early stage of development, should become part of the GEOSS infrastructure. However, this development needs to be balanced against GEO's other priorities. Recently, the early development of the Knowledge Hub has required a high level of support from GEO Secretariat staff, and this heavy burden is not sustainable in light of other GEO priorities.

also need to be reflected in the proposed high-level focal themes approach.

7. GEO should review the content of the GEOSS Implementation Plan to make sure it i) has good links with key global, regional and national data portals; ii) addresses gaps in the integration and availability of in situ data; and iii) plans for appropriate use of the Knowledge Hub within the GEOSS overarching structure to demonstrate the value of Earth observation to decision makers. In particular, the work of the In Situ Subgroup of the Data Working Group should be strengthened to focus by GEO theme on in situ data gaps and access. GEO should continue promoting data sharing and management principles for in situ data, including how best to provide access to holdings of scientific networks, citizens' observation programmes, and non-government data providers.

FOCUS AREA 4: Regional GEOs

9. Role of Regional GEOs: Interviews with key informants highlighted that Regional GEOs need to become more integrated into the functions of the GEO Work Programme and the overarching structure of GEO itself. The current level of coordination and communication within GEO is insufficient to facilitate better interactions at the local/national/regional level with users and stakeholders. Regional GEOs could play a key role in helping to coordinate GEO Work Programme activities at the regional level and facilitating communication within GEO by serving as an intermediary between the development of the GEO Work Programme, the Secretariat, Working Groups and the Programme Board fostering collaboration and identifying potential synergies among all these bodies. Regional GEOs can also help bolster the implementation of GEO's capacity development strategy by showing where capacity development gaps exist and how GEO's efforts can have the most impact at the institutional level and organizational level. Regional GEOs also have a role to play in promoting exchange on best practices across GEO and upscaling/downscaling successful products, leveraging opportunities for engagement with the commercial sector and exploring funding opportunities at the regional level. **10. Capacity Development:** Regional and National GEOs are in close contact with the users of GEO's EO-derived tools and services and as such these bodies, specifically when from developing economies, are also well-placed to identify and report on users' needs and requirements. These bodies would have a deeper understanding of local capacities and the level of expertise of defined categories of users' communities. Recognizing their role in support of capacity development will be important as GEO moves on to implement its capacity development strategy. Given that Regional GEOs have access to users they can tailor and scale solutions based on	**8.** Given that the MTE has highlighted the need to better integrate Regional GEOs within the GEO overarching structure and Work Programme, GEO should consider possible solutions to promote an increased engagement, coordination with, and contribution of Regional GEOs across GEO's governance structure and Implementation Mechanisms. This increased engagement should not add another governance level, but rather utilize existing mechanisms for improved operations between the regional and global level of GEO. Given the unique characteristics of each Regional GEO, it should also ensure a balanced approach that allows flexibility for members and GEO activities to engage directly with GEO at the global level depending on regional preferences and dynamics. Regional GEOs contributions should be focused in five key areas: - Improving overall communication and coordination across the GEO Work Programme and connection with the GEO Secretariat, - Contributing to the realization of GEO's strategy on capacity development given their unique knowledge of users' needs and requirements based on existing capacities, - Promoting opportunities for exchange of best practices and uptake/scaling of successful products that may be developed at a regional or subregional level, - Leveraging opportunities for engagement with SMMEs at the regional level by brokering relations among the SMMEs, the Secretariat and GEO Work Programme activities, - Exploring opportunities for the mobilisation of resources at the regional, national and local levels. To strengthen the role of Regional GEOs, GEO should consider a role for Regional GEOs that would create synergies with other bodies. Some considerations include having a seconded expert to serve as a point of contact and coordination for Regional GEOs at the Secretariat; holding a regular

local conditions and priorities and have connections with other regional and national bodies.	coordinating call between Regional GEOs; organizing an annual event for Regional GEOs to share best practices or establishing a communication tool/platform that Regional GEOs could use to exchange information, organize virtual meetings, and share materials.
FOCUS AREA 5: The Private Sector	
11. Engagement with the Private and Commercial Sectors: Engagement with the private sector has increased over the past five years and overall is seen as beneficial and having added to the value of GEO. However, key informants highlighted that lack of the private sectors' involvement or views in GEO's activities such as in designing of GEO tasks or Work Programme and rules of engagement with the commercial sector adopted by GEO, among others, is causing the private sector, in particular small commercial sector companies, to not fully participate or see the benefits of participating in GEO's activities/programmes. In this sense, many noted that GEO should better define its value proposition for the commercial sector and that the GEO Secretariat and Regional GEOs could play a role to help match and broker possible collaboration between commercial sector partners and Work Programme activities. The majority of respondents called for GEO to establish rules of engagement with the commercial sector including integrity, independency, privacy and ethics principles. The majority of interviewees was also not aware of the existence of the rules of engagement with the commercial sector, which already address some of these items. This points to the existence of a communication gap across the organization. Those who were aware of their existence, noted that these rules currently provide very general principles for engagement that GEO should develop further in the future to address IPR and privacy with a more comprehensive	**9.** In view of increasing its engagement with the commercial sector, GEO should try to address the needs of different commercial sector players that might be interested in getting involved, considering possible barriers to engagement and differences related to geography and size. To do so, GEO might consider adopting an action plan for engagement with the commercial sector, developing a targeted approach to address partnerships with companies of different sizes, sectors and geographies. While past engagements brokered by the Secretariat with Amazon, Google and Microsoft, and other engagements that developed at the Work Programme level have represented positive experiences, GEO should improve communication about these efforts across the GEO community. It should also increase awareness regarding the existence of Rules of Engagement with the Commercial Sector, that represent a flexible framework for engagement. A minority of the GEO community is aware of the existence of this framework, while many do not realize that this is already established. Given that GEO already has some basic principles laid out on IPR, it should work to make these clearer, develop these further in light of the work of the Data Working Group on IPR and privacy and evaluate how it should engage with different opportunities, given the role it is asked to play in each exchange with the commercial sector. In doing so, GEO may wish to explore, based on the nature of the commercial sector engagement, the use of solutions as memoranda of understanding, or tools such

approach. A few informants believe GEO is not engaging enough with the commercial sector, especially those having better resources and technology and they feel GEO is lagging behind in the development and application of technologies compared to the commercial sector.

12. Cloud Credits and License Programmes: The Cloud Credits and License Programmes have been mentioned by the majority as a positive example of engagement with the commercial sector with a clear value proposition aimed at promoting the use of Earth observations and skills development in developing countries. Informants suggested GEO should look at ways to make this engagement and the benefits derived from it become long-term by ensuring participants can retain and continue developing the skills acquired through the programme and that the programmes should become increasingly tied to the GEO Work Programme. By highlighting a disparity in the capacity levels of different participants, the programmes showed how further work is needed from GEO to support capacity development on the use of Earth observations.

13. Small, Medium and Micro Enterprises: Even though GEO's engagement has increased in recent years, respondents feel that GEO has so far shown little or no satisfactory engagement with the commercial sectors in SMMEs. GEO is perceived to engage more with multinational technology companies that conform with the GEO rules of procedure or afford the prospects of big grants. SMMEs, on the other hand, cannot compete with what can be offered by bigger companies at the international level and have structural barriers to engagement represented by limited opportunities and resources. Key informants feel that GEO should also engage more with SMMEs, diverse companies from different geographies and with different sizes, particularly in developing and least

as CRADAs to ensure the establishment of a set framework to carry out such engagements in a collaborative fashion. Lastly, Regional GEOs and the GEO Secretariat would be best placed to play a key role to foster engagement with the commercial sector by assuming a more central role in brokering engagement and matching potential partners at a regional and global level with GEO Work Programme activities. The potential for an incubator supporting SMMEs active in the field of Earth observations may also be considered.

developed countries, with a clear plan to address structural barriers and equally pursue involvement with all of them. This perception stems from miscommunication more so than a lack of interest on GEO's part to engage with the SMMEs where a lot of the engagement with SMMEs and companies not involved in the Cloud Credits and License Programmes happens at the level of the Work Programme and is not publicised by the Secretariat. Some of the structural reasons limiting SMMEs engagement can be helped by better coordination but calling for a "level playing field" misses some of the structural challenges and does not fully consider all of what GEO attempted to date. However, there is room for improvement, especially where the need to communicate better and clarify existing misconceptions is evident, and to improve coordination through an increased role of the Regional GEOs and the Secretariat.	
FOCUS AREA 6: The Trust Fund	
14. Awareness: There is a general lack of awareness on the role of the Trust Fund and how it serves to support the operations of the GEO Secretariat, but also about the Standing Agreement and consequently the administrative arrangement in place between the GEO Secretariat and the WMO. This is demonstrated by the high percentage of respondents who chose not to address the question on the Trust Fund or declared they did not know enough to answer this question. This finding points to the need for systematic and continuous communication within the organization on priorities such as the GEO funding model, its functioning and role which allows the Secretariat to continue its operations. **15. Funding Model:** The majority of interviewees and respondents to the surveys are in favour of maintaining GEO's voluntary funding model of best-effort cash	**10.** To favour awareness of the Trust Fund, its role and function, and to encourage contributions to it from GEO members and stakeholders, GEO should communicate its value proposition more clearly across the entire organization and highlight the importance of the GEO Secretariat and the role it plays in coordinating GEO's activities. This could be achieved by i) continuing to use public campaigns of commitment to show members' engagement such as the GEO Pledge campaign, ii) encouraging secondments and other in-kind contributions from all GEO members in line with the amounts suggested in voluntary indicative scale of contributions, iii) promoting more the role and value provided by GEO as a leading organization in the field of Earth observations, and by iv) actively exploring potential donors that GEO has not approached yet in order to diversify its donor base.

or in-kind contributions to the Trust Fund. The majority believes that rather than shifting to a model requiring a minimum mandatory contribution, the current model should be optimized promoting an increase in the number of contributors, in the amounts contributed by each member and the number of in-kind contributions including secondments from member states, Participating Organizations and Associates. This can be done by promoting contributions according to the voluntary indicative scale of contributions, promoting public campaigns of support for GEO, exploring new funding opportunities and by enhancing members' perception of GEO value proposition through continuous engagement and better communication. In fact, it seems that the underlying issue behind the low level of contribution to the Trust Fund is the need to better define GEO's value proposition.	

6. Case Studies

6.1 Overview

The MTE Team collected a number of case studies as additional evidence to support the key findings and select focus areas of this report. Summaries of these case studies are added here to provide concrete examples of value chain analyses. Each case study was conducted by the MTE Team. The guidelines that were used to conduct the shared the value chain analysis are included in the Annex 7.4.3, and they were shared with the point of contact for the Flagships, Initiatives and Community Activities that were selected to participate: GEOGLAM, GOS4M, Blue Planet, GEO-CRADLE and DE Africa. The purpose of the questionnaire was to assess, through an Earth observation value chain, the use and value added of Earth observation data and applications in specific use cases across the GEO Work Programme. The questionnaire highlighted four steps in the value chain: 1) Sensing, 2) Data Production, 3) Application, 4) Decision and allowed participants to define the different stakeholders involved at each step and to identify the end users benefitting from the final output of the value chain. The value chain analyses focused on one product/application per activity.

The approach adopted for the analysis of the case studies is a mixed one where a set of similar questions was asked to analyse all of the case studies, but also a separate analysis was conducted on each of these to highlight specific elements of strengths and possible areas for improvement related to the specific case studies. At the end of this section, two summary tables are provided highlighting best practices that emerged from the study and lessons learnt for one or more of the activities that participated in the case study. The case studies analysis does not necessarily represent a detailed analysis with thorough input from all the representatives involved in the development of the Flagship, Initiative and Community Activities, and was meant to provide a high-level overview of the Earth observation value chain for GEO.

6.2 GEOGLAM

GEOGLAM aims to increase market transparency and improve food security by producing and disseminating relevant, timely and actionable information on agricultural conditions and outlooks of production at national, regional and global scales by using Earth observations. It was initially launched by the G20 Agriculture Ministers in June 2011 with a clear policy mandate that has contributed to shaping this Flagship's value proposition. GEOGLAM has been selected as a case study as it is recognized by the GEO community as a successful Flagship at an advanced stage of development with both a research and operational component, which seem to be key drivers of its success. They presented their value chain analysis on the Crop Monitor for Early Warning (CM4EW), which has monitored crops that are important for food security by region, generally encompassing countries and regions that are susceptible to food insecurity since 2016.

Questions:

1. **Cross-cutting:** How has GEOGLAM benefitted from the three generic aspects of GEO:
    a. Being a facilitator/convener (has this helped the case study project/activity?);

For GEOGLAM, GEO has enabled engagement by convening the international Earth observations community. For example, GEOGLAM would have never existed in its current form if it had not initially been for the focus GEO put on agriculture as a Societal Benefit Area in the 2000's. In this sense, GEO has contributed to concentrating attention to this issue, which has later led GEOGLAM to obtain a mandate in this area by the G20 Agriculture ministers.

b. Being a provider of a service (information or products);

GEO is providing added value to them by investing in a shared infrastructure that will support the GEOGLAM community and will enhance the integration across sectors (for example, the Food-Water-Energy Nexus). The best example of this is the development of the newly approved GEO Knowledge Hub, and GEO's work to lower the bar on the utilization of cloud services through the implementation of projects such as the AWS Sen2Agri "click and go".

c. Access to data through GEO portal / platform

GEOGLAM does not seem to use GEO as a platform to access data but sees GEO's role as a provider of information and products through the Knowledge Hub.

1. **Sector specific:** Has this case study been affected by the issues in each of the six Focus Areas highlighted in the GEO MTE report? For example, has the case study project / initiative / flagship been impacted by:
   a. Engagement with Policy interfaces, or as a user?

Involvement with GEO helps GEOGLAM engage with the policy and users' interface as they have the same emerging priorities: Climate, Disaster Risk and the SDGs. In this context, they are in the process of defining Essential Agricultural Variables and developing strategies for the community to operationally produce these variables in response to the three main policy drivers represented by Climate, Disaster Risk and the SDGs. In the context of the CM4EW, they have 16 external partners including international and regional organizations, partners are both contributors and clients to the report and they are involved in the data production phase. In fact, they have monthly meetings when they review information and reach a pivotal consensus on the report which is being released. They also work closely with the decision makers that apply the information towards timely policy and program response. They are well-connected with end users, which include international organizations, regional and national ministries responsible for food security response. In recent months, they have also begun working more with the insurance/reinsurance sector to develop information products to support small-holder farm insurance products. The information is also used by commodity brokers and national food agencies to inform their interaction with food commodity markets.

b. Internal or external (technology) interoperability issues?

Looking at internal interoperability, they benefit from direct support from the GEO Secretariat and think this is an approach that should be extended to all GEO Work Programme activities as they have received clear benefits from it. In terms of external interoperability, they work closely with many public space agencies and strive to coordinate their interaction with them through our CEOS-GEOGLAM Working Group. Together they have published sensor agnostic, and mission linked data requirements which are used to drive the agency response both in the future in terms of mission agnostic links and the present in terms of linkages to current missions, including an understanding of their continuity.

c. Private Sector engagement within GEO?

In recent months, in the context of CM4EW, they have also begun working more with the insurance/reinsurance sector to develop information products to support small-holder farm insurance products. The information is also used by commodity brokers and national food agencies to inform their interaction with food commodity markets.

d. GEO Fund access?

The GEO Secretariat until 2020 managed earmarked funding destined to financing the figure of a GEOGLAM Coordinator. This funding in 2019 was provided by Germany. The GEOGLAM Secretariat also receives direct support from the GEO Secretariat to its activities.

e. As part of a Regional GEO activity?

Among the partners of CM4EW, there are both international and regional food security organizations and the report includes reference to regional factors such as pests, diseases and conflict that impact crops production. The users of the product also include regional entities with a responsibility for food security response and in recent years, they have increasingly worked with least developed countries to develop their own crop monitors, and these have been seen to have great impact which is also testified by GEOGLAM's work with many of the Regional GEOs.

Case Study Analysis

The key factors representing strengths in the case of GEOGLAM are:
1) its need-driven nature which is related to its policy mandate and a strong correlation existing for example in CM4EW between contributors and clients where often the two correspond. In fact, consensus of partners is essential for the monthly report to be released meaning the process through which the product is approved allows to continuously integrate and take into consideration users' requirements,
2) its ability to cover the entire value chain from the design of data requirements for space agencies to the integration and strong connection to end users which is due to the fact that the service was born to directly address an identified issue and that they update their requests for data to space agencies based on users' needs,
3) its two-fold model revolving around both a research and an operational component that are tightly linked and synergetic and provide a sound scientific base for the development of operational/preoperational products,
4) its global role and capacity to scale solutions up and down to the global, regional and subregional level through the involvement of key stakeholders and local partners in the implementation phase.

6.3 GOS4M

GOS4M aims to develop a global network for mercury in the atmosphere as well as in water and biota. It serves as a platform of reference for the existing networks and initiatives working in this area and it directly supports the Minamata Convention on Mercury. This Flagship, as GEOGLAM, also has a clear policy mandate, deliverables and it adopts a multi-disciplinary approach involving the mercury modelling community to produce validated tools for assessing the effectiveness of different socio-economic-policy scenarios. GOS4M was selected as a case study as it represents another case of well-developed Flagship with a strong focus on the in situ data component, which has been highlighted as an area of weakness for GEO in the report. The value chain analysis of GOS4M focused on the activity that it had developed for the GEO Flagship GOS4M, the HERMES application.

Questions:

1. **Cross-cutting:** How has GOS4M benefitted from the three generic aspects of GEO:
   a. Being a facilitator/convener (has this helped the case study project/activity?);

GEO has been accepted as an Observer at the Minamata Convention on Mercury. Its interaction with the Secretariat can start the accreditation process of the GOS4M as a reference entity in the effectiveness evaluation of the Convention. In this sense, GEO provides the link for connection with international conventions, fora and initiatives and the credibility, branding and

recognition needed by GOS4M to become recognized as the reference entity for the effective evaluation of the Minamata Convention on Mercury.

b. Being a provider of a service (information or products);

GOS4M has developed a GOS4M Knowledge Hub, which is now also part of the GEO Knowledge Hub. The GOS4M Knowledge Hub is an integrated solution of high-quality observational data, model outputs and digital tools to respond closely to the needs of Minamata Convention on Mercury assessment, addressing major knowledge gaps. It brings end users into a decision on policy implementation and cost-benefit evaluation in the light UN agenda 2030.

c. Access to data through GEO portal / platform

GOS4M does not seem to use GEO as a platform to access data but sees GEO's role as a provider of information and products through the Knowledge Hub. In fact, the Knowledge Hub developed by this Flagship has been included in the GEO Knowledge Hub.

1. **Sector specific:** Has this case study been affected by the issues in each of the six Focus Areas highlighted in the GEO MTE report? For example, has the case study project / initiative / flagship been impacted by:
   a. Engagement with Policy interfaces, or as a user?

On one side, GOS4M engages with 1) researchers that provide Hg QA/QC datasets (in-situ monitoring) and Hg deposition scenarios (model runs) as well as a large number of other atmospheric and socio-economic data sets; 2) developers that provide advanced web services and decision makers with whom services are co-designed and to whom the findings and results of policy-driven co-designed scenarios are provided / addressed to; 3) decision makers and Parties to the Minamata Convention on Mercury which includes the UN bodies, countries, stakeholders and policymakers at different stage / level of the decision process. GOS4M also double-checks products with its GEO-Flagship community in order to gain important feedback to solve functionality issues and design new features to be included in the application in order to match new requirements that can arise from end users at any institutional level. They are also involved with major global and regional monitoring networks that have the responsibility of providing high-quality observational data that are used by the scientific community to calibrate models and produce scenarios outputs, assess temporal trends of Hg contamination in different environmental settings and matrix. Major institutions involved are national ministries, UN bodies like UNEP and regional /national governments.

b. Internal or external (technology) interoperability issues?

In terms of internal interoperability, they relate with Global Observation System for Persistent Organic Pollutants (GOS4POPS) as both activities are finalized to the integration of real-time monitoring of persistent pollutants derived from different platforms into an advanced interoperable data infrastructure for data sharing and web services release in support of International Conventions implementations.

c. Private Sector engagement within GEO?

This activity does not relate to the topic of private sector engagement with GEO.

d. GEO Fund access?

GOS4M does not benefit from access to funding resources through GEO. However, it receives resources from the ERA-PLANET project aimed to strengthen the European Research Area in the Earth observation domain in coherence with EU participation to GEO and Copernicus and E-SHAPE aimed to implement a coordinated and comprehensive Earth observation data

exploitation initiative through collaboration amongst the European GEO Members and Participating Organizations in order to accelerate the users' uptake of open Earth observation data and information for the benefit of Europe. GOS4M also provides a link to the Global Mercury Observation System, which was established through the EU – FP7 project.

e. As part of a Regional GEO activity?

They are heavily engaged with Hg regional monitoring networks which provide high-quality observational data used by the scientific community to calibrate models and produce scenarios outputs, assess temporal trends of Hg contamination in different environmental settings and matrix. For this reason, GOS4M also works on providing technical assistance and promoting capacity building initiatives for setting up new monitoring sites in areas where no mercury monitoring facilities and expertise are available yet (at the regional and local level).

Case Study Analysis

The key factors representing strengths in the case of GOS4M are:
1) its need-driven nature which is related to its policy mandate and direct contribution to the Minamata Convention on Mercury for which GEO has received an Observer status and GOS4M aims to become the reference entity for the evaluation of its implementation,
2) its ability to cover the entire value chain from the design of data requirements for space agencies to the integration and strong connection to end users through the work they do to double-check that users' needs and requirements are being met,
3) its capacity to integrate and connect with a broad number of stakeholders and communities across all the steps of the value chain. In particular, as Hg observation requires access to in situ data, they work with regional and subregional networks to provide that integration and are also well-connected with the socio-economic and statistics community developing models to assess the policy scenarios and related costs to ensure the uptake of cost-effective solutions.

6.4 Blue Planet

GEO Blue Planet is a network of oceans and coastal observers, social scientists and end users' representatives from a variety of stakeholders' groups. The aim of Blue Planet is to ensure sustained development and use of ocean and coastal observations for the benefit of society. Blue Planet is representative of GEO's transition and evolution from being a science-oriented organization to becoming a user-oriented one. Blue Planet itself was initially born as a Community of Practice and recently shifted to producing services for users and this is one of the main reasons why it was selected as a case study. It is particularly relevant as its work is related to the UN Agenda and the UN Decade of Ocean Science for Sustainability. In the value chain, they illustrated one of their activities, which was to develop a methodology for chlorophyll sub-indicators for SDG 14.1.1a (Index of Coastal Eutrophication) for UN Environment that uses global data products.

Questions:

1. **Cross-cutting:** How has Blue Planet benefitted from the three generic aspects of GEO:
   a. Being a facilitator/convener (has this helped the case study project/activity?);

To move beyond SDG reporting, Blue Planet will need to incorporate aspects from other GEO activities from the GEO Work Programme. For this reason, coordination among the different elements of the GEO Work Programme will contribute to the efficiency of their Initiative and the product they are developing. GEO, in general, provides great flexibility into bringing new actors/stakeholders into various stages of the value chain to interact with each other. This is a major strength of GEO in their view, and it can be summarized as the ability to bring different

groups together and continue to co-develop products and bring in additional actors/stakeholders depending on identified user needs.

b. Being a provider of a service (information or products);

They do not benefit from GEO as a provider of information and products. Rather, they rely on NOAA and ESA to maintain the base products used for the indicators. Esri, instead, is committed to sustained analysis of the data products for future reporting years and will maintain additional visualizations/applications that are developed as a result of engagement with member countries.

c. Access to data through GEO portal / platform

They do not benefit from GEO as a provider of data access through the GEO portal. In fact, they have identified NOAA, ESA/Copernicus and Esri as key organizations for providing data and analysing data. They specifically chose these products and institutions based on their ability to sustain the products.

1. **Sector specific:** Has this case study been affected by the issues in each of the six Focus Areas highlighted in the GEO MTE report? For example, has the case study project / initiative / flagship been impacted by:
    a. Engagement with Policy interfaces, or as a user?

The activity they illustrated produces two sub-indicators for chlorophyll for SDG indicator 14.1.1a: Sub-indicator 1: chlorophyll-a deviation modelling and Sub-indicator 2: intra-annual EEZ chlorophyll-a anomalies. This activity was particularly aimed at supporting the GEO engagement priority of the SDGs. They are also planning to move this activity beyond simply assisting UN Environment with their required methodology development and reporting and integrating other data to enable decision-making by member countries. In fact, they would like to gather more in situ, remote sensing and satellite data as well as socio-economic data to further meet downstream aspects of the value chain and integrate this data with the sub-indicators to support further decision-making on eutrophication mitigation by member countries. They are expecting UN member countries to use information about chlorophyll hot spots in their region to target their in situ nutrient analysis and also to use mapping information to identify potential eutrophication sources that can be targeted for mitigation. Many countries are lacking information about nutrient pollution in their coastal zones and this effort will help countries target action.

b. Internal or external (technology) interoperability issues?

Regarding organizational interoperability, in order to move beyond the use of the product for SDG reporting, they will need to incorporate aspects from other GEO Work Programme activities such as identifying land use and agriculture changes, riverine inputs, mapping of human activities. For this reason, improved internal coordination across the GEO Work Programme will be important for efficiency in this case.

c. Private Sector engagement within GEO?

This activity does not relate to the topic of private sector engagement with GEO.

d. GEO Fund access?

This activity does not relate to the topic of access to funding through the GEO Trust Fund.

e. As part of a Regional GEO activity?

Researchers and environmental managers in UN member countries also at the regional level will make use of this information for decision-making related to additional research that needs to be done to determine eutrophication status, to identify sources of eutrophication and to take action to reduce nutrient pollution. The product has thus a potential to be scaled and taken up at a regional level, especially when current data used will be coupled with more socio-economic, in situ and remote sensing data to be applied for decision-making on eutrophication mitigation by member countries.

Case Study Analysis

This case study shows that Blue Planet is particularly engaged at stage 3 Apply and 4 Decide of the value chain thanks to its central role in connecting different communities and providing access to the stakeholders who have an interest in adopting this product in relation to decision-making on eutrophication mitigation. In fact, to the contrary of what we saw in other case studies, Blue Planet is not the developer of the main application as this role is played by Esri using the processing methodology developed by UN Environment, but is heavily engaged in the downstream segment of the value chain. Stakeholders providing the data for this application are all members of the Blue Planet Community of Practice, hence, the role of Blue Planet is essential to develop the application in terms of providing a unique convening capacity, even though its value proposition would need to be better articulated. The case also shows how Blue Planet would benefit in the development of this product from increased integration across the GEO Work Programme that would contribute to making the product overall more efficient and to increase its uptake.

6.5 GEO-CRADLE

GEO-CRADLE is the GEO Initiative for capacity building in the Middle East, North Africa and Balkans region. It was born in 2016 as an H2020 project and then became one of GEO's Initiatives. Its scope is that of coordinating Earth observation activities at the regional level and fostering the operationalisation of Earth observations-based services in support of the three GEO's Engagement Priorities: Climate Change, Disaster Risk Reduction and the SDGs. The focus of this Initiative is on assessing the level of maturity of Earth observation activities to contribute through capacity building activities to increase countries' capacity to use Earth observations and derived products. It has been selected as a case study as it has a focus on both the regional and capacity development components that emerged as key areas of focus from the report, and it will be analysed together with DE Africa to explore similarities and differences among the two activities. GEO-CRADLE presented the case study on NextSENSE, a system for solar radiation/energy forecasting and energy management. The system provides past, nowcasted and forecasted information for solar radiation applications dealing with solar energy, health, agriculture.

Questions:

1. **Cross-cutting:** How has GEO-CRADLE benefitted from the three generic aspects of GEO:
    a. Being a facilitator/convener (has this helped the case study project/activity?);

The application described here has been funded from EU GEO-CRADLE and EU e-shape GEO applications for Europe, projects. GEO provides the funds and capacity building towards maximizing the use of ESA and Copernicus data in the first place. In addition, it provides tools and possibilities of integration with partners that are experts in the link among step 3 and 4. From their point of view, this is the most difficult part for the sustainability of each application.

    b. Being a provider of a service (information or products);

In their case, they are the developers of the main application and are responsible for the sustained production of the needed product. As a source of data, they rely on EU data and there can be no assurance of it, and this could be an issue for sustainability.

c. Access to data through GEO portal / platform

The data they use are not provided by GEO, but by other services and normally are retrieved on other platforms than GEOSS such as Copernicus.

1. **Sector specific:** Has this case study been affected by the issues in each of the six Focus Areas highlighted in the GEO MTE report? For example, has the case study project / initiative / flagship been impacted by:
    a. Engagement with Policy interfaces, or as a user?

GEO provides possibilities to integrate with partners that are experts in making the necessary link between step three and four of the value chain, the Decision and Application phase. This is particularly important as the sustainability of the application highly depends on this. This application also has linkages with EO4SDGs as it contributes to the goals of SDG 7, 11 and 13 and others. It has also been used by the Government of Egypt to produce a solar energy Atlas of the country, showing actual possibilities for uptake by governments.

b. Internal or external (technology) interoperability issues?

They did not mention having issues related to communication with the GEO Secretariat and recognized their role in putting them in communication with the partners linking the steps 3-Application and 4-Decision of the value chain. No interoperability issues were mentioned.

c. Private Sector engagement within GEO?

The application could also be used by private tourism related companies using UV data for public awareness on skin protection from UV rays in the summer. Also, private energy transmission and distribution operators could potentially make use of the information provided by this application. It could also be used by private health and agricultural related private bodies.

d. GEO Fund access?

They mention that GEO has provided funds to develop the application and use of ESA and Copernicus data.

e. As part of a Regional GEO activity?

Given the nature of GEO-CRADLE as an Initiative with a specific focus on capacity development, the applications of the service NextSENSE happened mainly at a regional level in Egypt and Greece. The ministry of electricity and renewable energy of Egypt has used the application in order to characterize governmental areas and evaluate the possibility of building photovoltaic parks. The independent transmission operator of Greece is using solar forecasting data in order to optimize the national energy management.

6.6 Digital Earth Africa

Digital Earth Africa (DE Africa) provides an operational service using Earth observations to deliver decision-ready, continental-scale products. DE Africa products aim to enable users in the African continent to develop an ecosystem for innovation across sectors. DE Africa works closely with the AfriGEO community, and aims to respond to the information needs, challenges and priorities of the African continent. It has been selected as a case study as it has a focus on both the regional and capacity development components that emerged as key areas of focus

from the report, but also it represents a successful case among the GEO Work Programme activities of resources and participation mobilization having received $10 Million by the Leona M. and Harry B. Helmsley Charitable Trust and $10 Million the Australian Government Aid Program under the Department of Foreign Affairs and Trade (DFAT). Because it is quite recent, it has been analysed together with GEO-CRADLE, an Initiative with a similar focus, that is already fully operational. DE Africa presented the case study on DE Africa itself as a project demonstrating how and why Earth observations and derived products can support global initiatives across a variety of sectors and involving numerous stakeholders for the benefit of humankind.

Questions:

1. **Cross-cutting:** How has DE Africa benefited from the three generic aspects of GEO:
    a. Being a facilitator/convener (has this helped the case study project/activity?);

GEO provides DE Africa with an international mandate to operate and in particular, through the Regional GEO AfriGEO, it supports and champions DE Africa in the continent. The GEO Secretariat also supports DE Africa from an operational point of view to communicate and connect and they also receive some advice from GEO.

    b. Being a provider of a service (information or products);

DE Africa itself aims to be a service provider in the African continent contributing in particular to the SDGs and the achievement of the African Agenda 2063 and they do not use GEO as a service provider. Rather, it seems that DE Africa is benefitting from its relation to GEO in terms of international relevance and credibility.

    c. Access to data through GEO portal / platform

DE Africa relies on data from Japan Aerospace Exploration Agency (JAXA), USGS, the European Commission (EC) and ESA to develop its products and it does not seem to use the GEOSS platform or GEO to access data needed to develop specific applications.

1. **Sector specific:** Has this case study been affected by the issues in each of the six Focus Areas highlighted in the GEO MTE report? For example, has the case study project / initiative / flagship been impacted by:
    a. Engagement with Policy interfaces, or as a user?

DE Africa is a continental infrastructure that will empower African countries to develop and use EO-derived information and it specifically aims to leverage EOs to support the African Union Agenda 2063 and the SDGs. In this sense, DE Africa was born with a clear policy mandate that allows it to precisely define the policymakers and users it is targeting. However, in the answers to the case study, it has been noted how, while they have a clear understanding of the top part of the value chain, they have a moderate understanding of down-stream actors who have the capability and mandate to apply and use Earth observations. They are working on building knowledge on who the downstream players are in the private sector and will use the knowledge generated to help to guide DE Africa to be an enabler for innovators and the private sector.

    b. Internal or external (technology) interoperability issues?

They do not use the GEOSS data platform and as such have not had any technology interoperability issues and mentioned communicating routinely with the Secretariat without having any issues.

    c. Private Sector engagement within GEO?

They identify the private sector as one of the potential users of their services and mention they want to foster private sector innovation to create new products and information services. They are working on actively building knowledge of the down-stream player in the private sector and will use the knowledge generated to help to guide DE Africa to be an enabler for innovators and the private sector who could apply DE Africa data and capabilities to create value.

d. GEO Fund access?

DE Africa mentioned that the GEO Trust Fund and Secretariat have been key operational mechanisms for this project. DE Africa initially developed thanks to funding support received from the Australian Government and once the project started being developed DE Africa asked the Secretariat to manage earmarked funding, in particular for the years 2019 and 2020.

e. As part of a Regional GEO activity?

DE Africa has a strong regional focus, it is an initiative led and governed by Africans and their products and use cases are all strongly tied to African realities. They also mentioned that AfriGEO is being key in increasing support for DE Africa at a regional level.

Comparison between DE Africa and GEO-CRADLE

These two GEO Work Programme activities have a strong regional focus which is highlighted by the fact that they have some champion users of their products and applications in the region (Egypt for NextSENSE and users in Africa for DE Africa) and champion donors that have supported the development of the activity (the EU for NextSENSE and Australia for DE Africa). DE Africa is also quite involved in the upstream part of the value chain where they are promoting norms responding to the region's actual needs in the provision of data through CEOS (inclusion of Normalised Radar Backscatter as a standard Copernicus product). Both cases show how the most crucial part of the value chain, which is not completely under their control and that they are trying to develop further, is the identification of users from regional organizations that have the mandate and capability to apply Earth observations to address the regions' priorities. It seems that in both cases the sustainability of the value chain will ultimately depend on the: 1) continuous availability of data made openly and freely available by space agencies, 2) the capacity to clearly identify, involve and address the needs of the users of the applications they develop, 3) the willingness to finance the initiatives which is tied to their ability to address a real problem and having uptake at a high level of decision-making and lastly and 4) the need for local technical expertise to develop and sustain the uptake of EO-derived products. GEO-CRADLE, to the contrary of DE Africa, has not taken advantage of the existence of the Trust Fund to ask the Secretariat to manage earmarked funding. DE Africa has done so with funds that were provided mainly by the Australian Government.

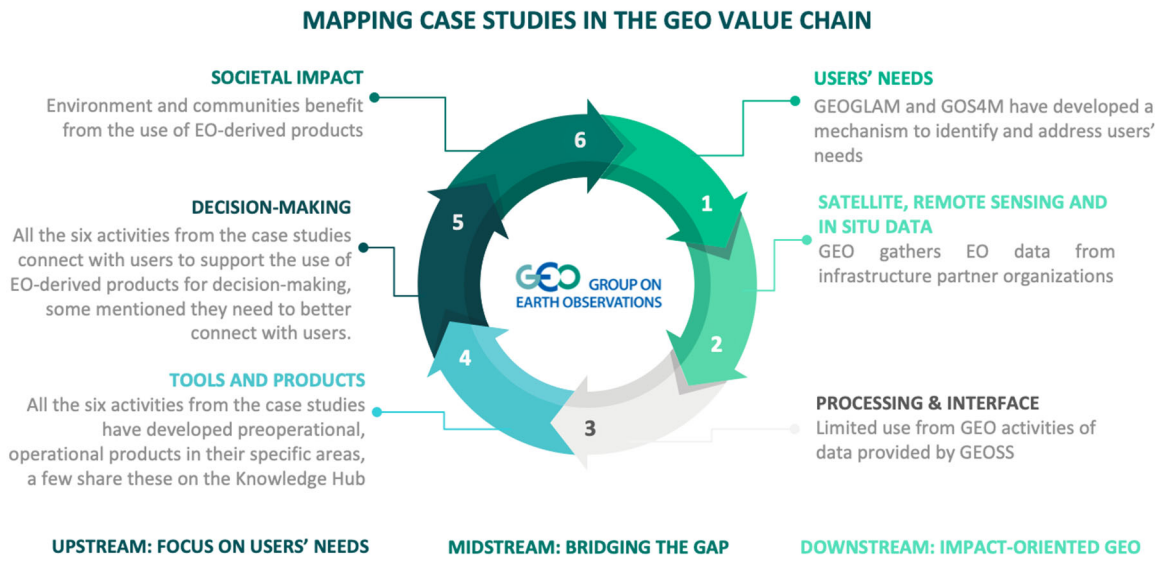


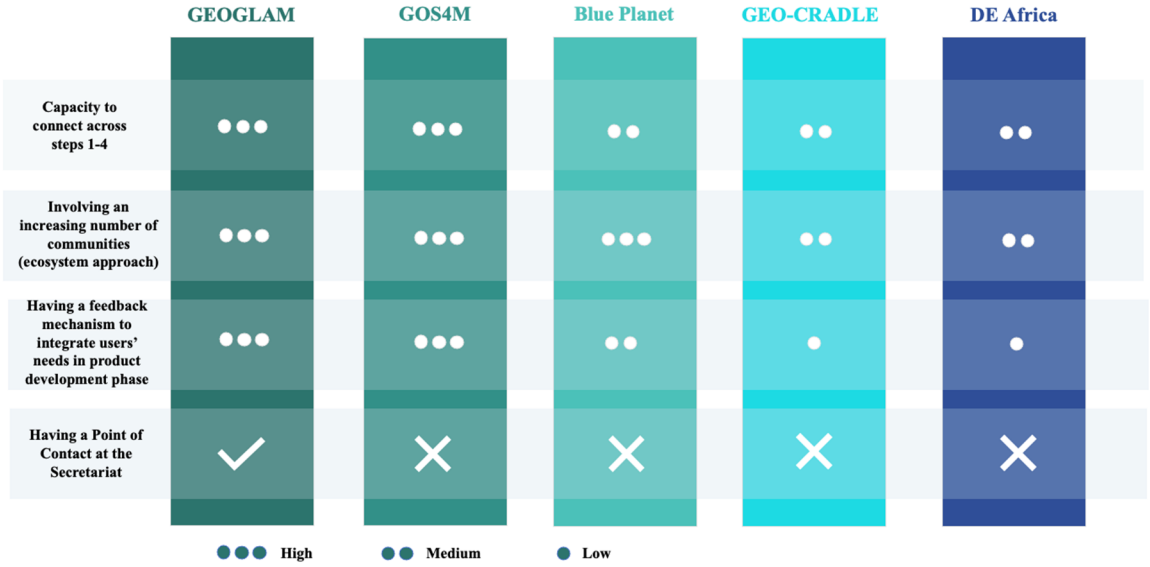
Figure 30. Mapping Case Studies in the GEO Value Chain

Source: created by the MTE Team

6.7 Summary and Key Take-Aways from the Case Studies

In general, the analysis of the case studies highlighted a few best practices, the first of which is the capacity to connect across the continuum of the Earth observations value chain. In particular, DE Africa and GEO-CRADLE noted how the biggest challenge they have is related to the fourth step of the value chain, which depends on a clear identification and connection with the users to address their needs and meet their requirements. As we have seen, Flagships as GEOGLAM and GOS4M have developed a feedback/consensus mechanism to make sure that users' needs and their feedback is integrated in the applications development process, thus enhancing their capacity to connect with the downstream segment of the value chain through the provision of preoperational, operational services. Participation in GEO, which represents a forum and convening organization reuniting key stakeholders active in the field of Earth observations is definitely positively contributing to increasing access to policymakers, scientists and users, among others. As such, it helps establish connections along the value chain. In fact, another key factor of success is the adoption of an ecosystem approach, aimed at involving an increasing number of stakeholders. This approach should however be underpinned by a clear definition of value and of the benefits that can be derived from the participation in the activity by each of these stakeholders The case studies have also highlighted how having a point of contact such as GEOGLAM has at the GEO Secretariat, can be beneficial for the development of an activity. However, the MTE Team is cognisant of the fact that, given limited funding of the GEO Secretariat, this option may not be available for all the activities. This is why increased coordination across all of the GEO Work Programme is seen as an important contribution that would benefit all the activities.

Table 8. Best practices from the case studies



Source: created by the MTE Team

While two activities had a specific geographic focus, also the other noted how they would like to or are already connecting at the global, regional and subregional level. For this reason, all the activities may benefit from increased coordination with the Regional GEOs going forward. On a different note, the case studies analysis showed that only Flagships as GEOGLAM and GOS4M products have already been included in the GEO Knowledge Hub and this suggests that there is potential for increasing the integration of this project with the GEO Work Programme, by also encouraging all GEO Work Programme activities to contribute to it. In fact, showing through a few pilot cases how these have been integrated within the Hub, might encourage others to do the same. Overall, another point which may be of interest also to GEO Work Programme activities is the need to define a clear area of focus, which may help to identify the value added of the activity with a view to linking it to a policy mandate.

Lastly, the analysis of the case studies shed light on a topic of interest to GEO as a whole, which is the cycle of activities included in the GEO Work Programme. If the structure of the Work Programme seems to suggest that all activities should aim to become Flagships and some activities have expressed a willingness to do so, it is unclear to what extent the Work Programme could accommodate more Flagships and whether this is an ambition of all activities. For this reason, GEO should try to formulate a clear strategy on the principles defining this progression. In fact, if, on one hand, the bottom-up nature of the Work Programme should not be stifled; on the other, GEO should make sure the Work Programme develops in a consistent way, in line with its long-term goals and allowing for the establishment of synergies and cooperation among different activities which may be working in similar areas.

Table 9. Lessons learnt from the case studies
The activities for which the boxes are ticked showed through the case studies analysis a need to focus on the highlighted lesson learnt

Source: created by the MTE Team

7. Annexes

7.1 Terms of Reference: Evaluation Questions

1. What results have been realized with respect to GEO's strengthened focus on users and stakeholders; in particular, on working with United Nation institutions, multi-lateral environmental agreements, multi-lateral development banks, statistical agencies, and the private sector?
2. What results has GEO achieved with respect to increasing the use, sharing and availability of Earth observations in implementing GEOSS as stated in the Strategic Plan?
3. What evidence exists for the influence of Earth observation information products and services developed, produced or delivered through GEO Work Programme activities on decision-making (by individuals, organizations, governments, etc.) and what evidence is there of benefits derived from such influence?
4. How has the implementation of GEO Engagement Priorities impacted GEO's work, including on: the GEO Work Programme, the GEO Secretariat, GEO governance bodies (GEO Plenary, Executive Committee, Programme Board, Regional GEOs), relations with GEO Members and Participating Organizations, and relations with other organizations?
5. To what extent have the changes introduced in the GEO Strategic Plan 2016-2025 impacted the effectiveness of the GEO Work Programme, decision flows and interactions amongst GEO governance bodies, and increased mobilization of resources to the GEO Trust Fund?

7.2 Evaluation Methodology

The MTE Team drew data from a number of key data sources which included the analysis of GEO internal and external documents, evidence gathered from surveys, interviews with the GEO extended community and results emerged from key case studies.

7.2.1 Key Data Sources

The GEO Mid-Term Evaluation Team reviewed and analysed various internal and external documents for the purpose of this evaluation, including:

- **GEO internal documents:** Strategic and Implementation Plans, Work Programmes and Work Programme reports, meeting reports from the GEO Plenary sessions, the Executive Committee and other GEO meetings;
- **External documents and literature:** external audits and reviews including program evaluations and external literature including publications mostly making reference to GEO and GEOSS;
- **Community and experts' opinions:** These opinions and views were collected through surveys and interviews.

7.2.2 Data Collection and Analysis Method

The Mid-Term Evaluation approach addressed the Evaluation Questions presented in the Terms of Reference for the evaluation through several methods of data collection and analysis, including surveys, interviews, case studies and literature review.

- Surveys:
  - Web-accessible Community Survey

    A web-based survey was created to gather feedback from the GEO community on the progress made on the Strategic Plan and the implementation of GEOSS. The survey was shared on the GEO website and GEO social media channels. After a first set of answers was obtained, the MTE Team asked the GEO Secretariat to extend the duration of the survey to allow the participation of the broad and diverse GEO community. In fact, the MTE Team decided to extend the duration of the survey until the end of April 2021. The survey obtained a total of 117 answers but given the fact that the exact size of the GEO community is unknown, it was not possible to determine whether the sample size was suitable for quantitative analysis. Data analysis using Microsoft Excel was conducted once the survey was closed and for open-ended questions, responses were grouped into recurring themes. Trends and patterns of opinion were extracted to support findings in the report where appropriate. The survey employed a variety of question types including pre-determined response selection, and free responses. The analyses of these various question types allowed some trends to be reported numerically but restricted others to qualitative results.

  - Web-accessible GEO Secretariat Survey

    A web-based survey was created to gather feedback from the GEO Secretariat on the progress made on the Strategic Plan and the implementation of GEOSS. The survey was shared via email to current and some of the past Secretariat staff. The survey obtained a total of 9 answers out of 17 recipients the link was sent to. The sample size in this case was known as the Secretariat accounts for a total of fifteen members of staff. However, the MTE Team believed the sample size is limited to draw firm conclusions on the results of the survey. Data analysis using Microsoft Excel was conducted once the survey was closed and for open-ended questions, responses were grouped into recurring themes. Trends and patterns of opinion were extracted to support findings in the report where appropriate. The survey employed a variety of question types including pre-determined response selection, and free responses. The analyses of these various question types allowed some trends to be reported numerically but restricted others to qualitative results.

  - Web-accessible Commercial Sector and Associates Survey

    A web-based survey was created to gather feedback from the GEO commercial sector stakeholders and Associates on the progress made on the Strategic Plan and the implementation of GEOSS. The survey was shared via email with all of GEO Associates and a selected list of companies that are known to have worked with GEO over the past years. To allow for more participation, the possibility to participate to the survey was extended until the 9th of April, when the survey was closed. The survey obtained a total of 17 answers but given the fact that the exact size of the GEO commercial sector community is unknown, the MTE Team analysed the results being cognisant of the fact that these may be only partially relevant. Data analysis using Microsoft Excel was conducted once the survey was closed and for open-ended questions, responses were grouped into recurring themes. Trends and patterns of opinion were extracted to support findings in the report where appropriate. The survey employed a variety of question types including pre-determined response selection, and free responses. The analyses of these various question types allowed some trends to be reported numerically but restricted others to qualitative results.

- Interviews

To gain further insight into how the Earth observation community views the implementation of the GEO Strategic Plan and of GEOSS, the MTE Team conducted interviews with key informants, including staff of the GEO Secretariat. After the first round of interviews has been concluded, the MTE Team realized it would have liked to receive more specific information on key areas and for this reason, conducted a second round of targeted interviews on Budget, the private/commercial sector and Associates, GEOSS, the implementation of the Work Programme, Equality, Diversity and Inclusion and Capacity Development. During the second round, the Team also conducted targeted interviews to increase representation of underrepresented regions. To ensure balanced representation, the MTE Team made every effort to identify interviewee candidates from as many GEO member countries as possible. However, it was difficult to achieve complete global coverage with limited resources and time, given the impact of the COVID-19 pandemic on the evaluation. In total, 62 interviews were conducted online. Potential interviewees received an email interview invitation from one of the MTE Team members. A copy of the interview guide including questions and links to key GEO documents for easy reference was included in the email interview invitation. Interviewees were informed of the purpose of the interview and how their responses would be used in the evaluation. The Interview Guide used by the Team can be found in Annex 4. Although personally identifiable information was collected, all data recorded during the interview was held in complete confidence. No names were associated with individual interview responses and paper documents containing identifiable information were destroyed following finalization of the report. The Team grouped open-ended responses into recurring concepts and themes using Microsoft Excel and evidence from the interviews was used to support findings in the report.

- Case Studies

The Team selected a small group of case studies for a value chain analysis. The GEO Work Programme Activities selected for the case studies were chosen based on a number of criteria that aimed at selecting case studies that would be in line with the key results that had emerged from the different focus areas of the report. The MTE Team solicited feedback from activities points of contact and gave its availability to answer any of the questions that the activities point of contact may have. The MTE Team decided to extract main points from each of the case studies through a mixed approach that would allow to ask the same set of questions for the analysis of each case study, but also to highlight key points/issues of interest for each of these.

- Literature Review

Bibliographic search tools were used to generate a list of GEO and GEOSS related literature. MTE Team members suggested the inclusion of literature items throughout the report writing period. For a full list of literature reviewed during the midterm evaluation, see Annex 3. All completed question guide forms were reviewed in the writing of the report. Where appropriate, examples from the literature were cited as evidence to support the MTE Team's evaluation of GEO's Strategic Plan Implementation progress.

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7.3.3 Images

No external images were used in the report. All the images used in the report were created by the MTE Team.

7.4 Data Collection Tools

7.4.1 Survey Questionnaires

7.4.1.1 Community Survey

A) TELL US ABOUT YOURSELF

Questions for survey

1) Which area of the GEO Work Programme do you currently engage with?

a) Flagship (b) Initiative (c) Community activity (d) Regional GEO (e) Independent User (f) Other, please specify : _____

2) What is your main role in Question No.1?
   a. GEO staff
   b. Task point of contact
   c. Task lead
   d. Task contributor
   e. Member of a board
   f. User
   g. Other/ more than one, please specify _____

3) In which country is your institute based in?

   _____

4) Which of these terms best describes your Institution?
   a) Government
   b) Non-Government Organization
   c) Inter government Body. Please specify _____
   d) Private / commercial sector

e) Academia / Research Institution
f) Community activity
g) Other, please specify _____

5) How active do you consider your current role in GEO?

1. Very active (>50% work effort)
2. Active (30-50% work effort)
3. Moderate (20-30% work effort)
4. Little (5-20% work effort)
5. Very Little (<5% work effort)

6) Which of the followings GEO benefit area(s) do you most work with?

1. Biodiversity and Ecosystem Sustainability
2. Disaster Resilience
3. Energy and Mineral Resources Management
4. Food Security and Sustainable Agriculture
5. Infrastructure and Transportation Management
6. Public Health Surveillance
7. Sustainable Urban Development
8. Water Resources Management
9. Other, please specify _____

ASSESSING GEO'S PERFORMANCE ON ENGAGEMENT WITH USERS/STAKEHOLDERS

TOR NO.1

What results have been realized with respect to GEO's strengthened focus on users and stakeholders; in particular, on working with United Nation institutions, multi-lateral environmental agreements, multi-lateral development banks, statistical agencies, and the private sector

Questions for survey

1) Do you perceive GEO to be more user centric since the adoption of the 2016 - 2025 strategic plan? 1. YES
   2. NO
   3. Don't know

2) How often does GEO actively engage with you to help meet <u>your user needs and requirements</u>?
   1. 75 – 100% of the time (always engaged)
   2. 50 – 75 % of the time (engaged most of the time)
   3. 25 – 50% of the time (moderately engaged)
   4. 0 – 25% of the time (not engaged)

3) Are you satisfied with the engagement and assistance GEO provides to <u>you as a user</u>?

1. Very satisfied
2. Satisfied
3. Neutral;
4. Dissatisfied
5. Very dissatisfied

4) Please provide a specific example of your engagement with GEO?

5) During 2016 – 2019, has GEO systematically documented user needs associated with the GEO benefit area you work in?
YES / NO/ Don't know

If "NO" what changes would you recommend?_____

Additional comments (optional):_____

6) In your area of expertise, does GEO have good engagement with UN bodies and multilateral environmental agreements?

YES / NO/ Don't know

If "YES", please list the most significant bodies / agreements (up to 3):_____

If 'NO' what changes would you recommend?_____

7) If "YES", how do you rate GEO in engaging with UN bodies and multilateral environmental agreements in your area of expertise?
1. Excellent
2. Good
3. Moderate
4. Poor
5. Not sure

Additional comments (optional):_____

8) In your area of expertise, does GEO have good engagement with multi-lateral development banks, statistical agencies?
YES / NO/ Don't know

If "YES", please list the most significant banks / agencies (up to 3):_____

9) If "YES" how do you rate GEO in engaging with multi-lateral development banks, statistical agencies in your area of expertise?
1. Excellent
2. Good

3. Moderate
4. Poor
5. Not sure

Additional comments (optional):_____

10) In your area of expertise, does GEO have engagement with the private sector?
YES / NO/ Don't know

If "YES", please list the most significant private sector bodies (up to 3):_____

If "No" additional comments (optional):_____

11) If "YES", how do you rate GEO in engaging with the private sector in your area of expertise?
1. Excellent
2. Good
3. Moderate
4. Poor
5. Not sure

Additional comments (optional):_____

12) In your area of expertise, does GEO need to strengthen its relationships with complimentary global and / or national Earth Observations programmes and organizations?
YES / NO

IF "YES" Please specify (Top 3) _____

Additional comments (optional):_____

13) How do you rate GEO's achievement in the following?

a. GEO engagement with users/stakeholders
Rating: 1. Excellent 2. Good 3. Moderate 4. Poor 5. Not sure

b. GEO's visibility among users/stakeholders
Rating: 1. Excellent 2. Good 3. Moderate 4. Poor 5. Not sure

Additional comments (optional):_____

14) The GEO Engagement Strategy (2017 – 2019) provides a set of comprehensive guidelines for the EO community in interacting within GEO and other external stakeholders.

a) Has the GEO Work Programme activity (Flagship, Initiative, Community Activity or Regional GEO) you are most involved with taken into account and used the GEO engagement strategy and guidelines?
1. YES
2. NO
3. Don't know

Additional comments (optional):_____

b) If "YES", how has the GEO engagement strategy and guidelines benefitted your role and your organization?
   1. Very Good benefit
   2. Good benefit
   3. Moderate benefit
   4. Poor benefit
   5. Very poor / no benefit

Additional comments (optional):_____

c) Do you think this strategy has helped GEO to engage at a high / senior level with target organizations listed in the Strategy?
   1. YES
   2. NO
   3. Don't know

Additional comments (optional):_____

15) Do you have any evidence that GEO's activities through their focus on the importance of Earth observations, facilitation of access to EO data, and user engagement have promoted Digital Economic development by using Earth Observation Data?
1. YES
2. NO
3. Don't know

If "YES", please give additional comments or examples_____

C) ASSESSING GEO'S PERFORMANCE ON DATA/INFO UTILIZATION, SHARING AND AVAILABLITY IN IMPLEMENTING GEOSS

TOR NO.2

What results has GEO achieved with respect to increasing the use, sharing and availability of Earth observations in implementing GEOSS as stated in the Strategic Plan?

Questions for survey

1) As a User, how often do you use the GEO Data Portal?
   1. Always
   2. Sometimes
   3. Rarely
   4. Never

   If you answered (2), (3) or (4) what other EO data access portals do you use (please specify, and how often)?

   _____

2) If you do use the GEO Data Portal, does it meet your user needs?

YES / NO

Additional comments (optional):_____

3) Do you find the GEO Data Portal user friendly and easy to use?
   1. Very Easy
   2. Easy
   3. Acceptable
   4. Difficult
   5. Very difficult

   If "Difficult" or "Very Difficult", how can the GEO Data Portal be improved?
   Please elaborate:_____

4) How do you rate GEO's achievements in the following?

   a) GEO Data Sharing: particularly GEOSS Data Collection of Open Resources for Everyone (Data CORE) and Open Data?

   1. Very Good
   2. Good
   3. Average
   4. Poor
   5. Don't know

      Additional comments (optional):_____

   b) GEO Data Management Principles, including the need for common standards, discoverability, accessibility, usability, preservation, curation and interoperability arrangements.

   1. Very Good
   2. Good
   3. Average
   4. Poor
   5. Don't know

      Additional comments (optional):_____

5) How would you describe the GEO Data portal based on your experience?

6) How do you think that GEO can improve with respect to increasing the use, sharing and availability of Earth Observations?

7) Does the GEO Data portal integrate / interoperate with other significant EO global and regional data access portals?

YES / NO/ Don't know

If "YES", please provide an example

If "NO", how can GEO improve data portal integration and interoperability?

D) ASSESSING HOW GEO'S PRODUCTS AND SERVICES IMPACTING/BENEFITING USERS ON DECISION-MAKING

TOR NO.3

What evidence exists for the influence of Earth observation information products and services developed, produced or delivered through GEO Work Programme activities on decision-making (by individuals, organizations, governments, etc.) and what evidence is there of benefits derived from such influence?

Questions for survey

1) How often do you access the GEO webpages?
   1. Daily
   2. Weekly
   3. Monthly
   4. Less than once a month
   5. Very rarely / never

2) Are you accessing Earth observation (EO) data, or products and information provided by GEO?
   1. EO data
   2. Products and information

3. Both

3) As a user of GEO products and information, do you find the products and information services helpful in your work, particularly helping to inform decision-making?
   1. Very helpful
   2. Helpful
   3. Neither helpful or unhelpful
   4. Not helpful

4) Can you provide an example of where GEO products and information services have provided benefit in decision making?

5) Can you provide any evidence of the benefit to decision-making from accessing GEO products and information?

6) Would you like to see additional products and information sources available through GEO? YES / NO/ Not Sure

If "YES" please suggest up to 3:

E) GEO ENGAGEMENT PRIORITIES AND ITS IMPACTS TOWARD GEO

TOR NO.4

How has the implementation of "GEO engagement priorities" impacted GEO's work, including on: the GEO Work Programme, the GEO Secretariat, GEO governance bodies (GEO Plenary, Executive Committee, Programme Board, Regional GEOs), relations with GEO Members and Participating Organizations, and relations with other organizations?

Questions for survey

1) To what extent has GEO achieved its Engagement Strategy aims in the following:

a) On broad open data policies and practices

1. Very good progress
2. Good progress
3. Reasonable progress
4. Poor progress
5. No progress
6. Don't know

Additional comments (optional):_____

b) Promoting GEOSS as a global reference for Earth observation systems, data and information.
   1. Very good progress
   2. Good progress
   3. Reasonable progress
   4. Poor progress
   5. No progress
   6. Don't know

   Additional comments (optional):_____

2) How is the GEO Engagement Strategy being applied to your work?
   1. Very well
   2. Well
   3. Neutral
   4. Poor
   5. Very poor
   6. Don't know

   Additional comments (optional):_____

3) How is the GEO Engagement Strategy being applied within the GEO Work Programme?

   1. Very well
   2. Well
   3. Neutral
   4. Poor
   5. Very poor
   6. Don't know

   Additional comments (optional):_____

4) Please choose which of the following GEO's engagement priorities best describes your involvement. Choose only one as the best fit. Give your rating on its achievement and provide one example of programmes or work being carried out.

   a) 2030 agenda for sustainable development.

      1. Very good progress
      2. Good progress

3. Reasonable progress
4. Poor progress
5. No progress
6. Don't know

Example: _____

b) Climate change - greenhouse gas monitoring. Rating on achievement:__ (choose 1,2,3,4,5 or 6)

Example: _____

c) Disaster risk reduction. Rating on achievement:__(choose 1,2,3,4,5 or6)

Example: _____

d) Resilient cities and human settlements. Rating on achievement:__(choose 1,2,3,4,5 or 6)

Example: _____

e) Ecosystem accounting. - .Rating on achievement:__(choose 1,2,3,4,5 or 6)

Example: _____

f) UN Ocean sustainability decade. -Rating on achievement:__(choose 1,2,3,4,5 or 6)

Example:_____

g) Has the introduction of the GEO Engagement Priorities impacted your area of work?

YES / NO If "YES" can you provide an example of this impact?

5) What recommendation would you offer to GEO regarding the future application of these engagement priorities to the GEO Work Programme: a) Generally; or specifically for b) UN Sustainable Development Goals, c) Paris Climate Agreement, or d) Sendai Framework for Disaster Risk Reduction?

*** Text box for completion *** a) Generally: b) UN Sustainable Development Goals: c) Paris Climate Agreement: d) Sendai Framework for DRR:

F) Impact of Changes Introduced in the GEO Strategic Plan 2016-2025

TOR NO.5

To what extent have the changes introduced in the GEO Strategic Plan 2016-2025* impacted the effectiveness of the GEO Work Programme, decision flows and interactions amongst GEO governance bodies, and increased mobilization of resources to the GEO Trust Fund?

Questions for survey

1) Has GEO strengthened engagement with current Members and Participating Organizations that are not contributing as much as planned to GEO's activities?

   1. Strongly agree
   2. Agree
   3. Neutral
   4. Disagree
   5. Strongly disagree

*** Can you provide an example? *** Additional comments (optional):

2) How do you view GEO's Implementation Mechanisms (Community Activities, Initiatives, Flagships and Foundational Tasks) as a framework for enabling the broad GEO community to work together?

3) What recommendations would you make to GEO regarding these implementation mechanisms for the 2nd half of the Strategic Plan implementation period?

4) How do you view changes* made to the GEO Governance bodies in the Strategic Plan (from 2016-2019)?
   *Including the distinction between GEO Flagships, Initiatives and Community Activities, the role of the GEO Programme Board, the concept of Core Functions, revisions to the Societal Benefit Areas, the organization of the Foundational Tasks, and the roles of the Regional GEOs.

   Please elaborate for each of the following:
   a) The GEO Plenary
   b) The GEO Executive Committee
   c) The GEO Programme Board
   d) The GEO Secretariat

a) Plenary:

b) Executive Committee:

c) Programme Board:

d) Secretariat:

5) The GEO Trust Fund funding model currently relies on voluntary contributions from member-states and other partners to fund its operation. Has this model has been effective in supporting GEO in carrying out its mission?
   1. Strongly agree
   2. Agree
   3. Neutral
   4. Disagree
   5. Strongly disagree
   6. Don't know

6) If you answered (3) – (5) to Question 5, what recommendations would you make to improve the GEO Trust fund model?

7) GEO's ability to mobilize resources (2016-2019) has been successful in attracting in kind and financial contributions needed to ensure that GEO can achieve its vision:
   1. Strongly agree
   2. Agree
   3. Neutral
   4. Disagree
   5. Strongly disagree
   6. Don't know

8) If you answered (3) – (5) to Question 7, what recommendations would you make to improve resource mobilization for GEO?

9) What impact has the GEO Strategic Plan (2016-2025) had on the following:
   a) Improved clarity of the GEO Work Programme?
      1. Very high
      2. High
      3. Moderate
      4. Low

5. Very low

b) Improved interaction between governance structures within GEO?
   1. Very high
   2. High
   3. Moderate
   4. Low
   5. Very low

c) Increased participation in GEO activities (Flagships, Initiatives, Community Actions, Regional GEOs, Foundation tasks)?
   1. Very high
   2. High
   3. Moderate
   4. Low
   5. Very low

10) Can you recommend changes GEO should make in order to ensure long-term sustainability of its operations?

*** Insert Text box for completion ***

THANK YOU FOR COMPLETING THE SURVEY!

7.4.1.2 GEO Secretariat Survey

Governance

1) How would you rate the effectiveness of GEO's current governance structure?

(a) very effective, (b) effective, (c) neither effective nor ineffective, (d) not effective, (e) very ineffective

2) What changes, if any, would you recommend to GEO's current governance structure? Please explain_____

3) How satisfied are you with the divisions of roles and responsibilities between the GEO Executive Committee, the GEO Secretariat, the Program Board, and GEO's Implementation Mechanisms (Foundational Tasks, Initiatives, Community Activities, Regional GEOs)?

(a) Very satisfied, (b) satisfied, (c) neither satisfied nor dissatisfied, (d) satisfied, (e) very dissatisfied

Additional comments (optional): _____

4) How is execution of the GEO's core functions impacted by GEO's Implementation Mechanism structure? Please elaborate_____

5) How would you rate the effectiveness of GEO's Implementation Mechanisms in furthering GEO's core functions as described in the Strategic Plan (2016 – 2025)?

(a) Very effective, (b) effective, (c) neither effective nor ineffective, (d) not effective (e) very ineffective

Additional comments (optional): _____

6) What level of benefit do distinctions between GEO's Community Activities, Initiatives, Flagships and Foundational Tasks provide to GEO in its execution of the Work Programme?

(a) very good benefit, (b) good benefit, (c) moderate benefit, (d) Poor benefit, (e) Very poor / no benefit

7) A. How would you characterize the relationship between GEO and its host organization, the World Meteorological Organization (WMO) with respect to administrative service provision? Please elaborate_____

B. How would you characterize the programmatic relationship between GEO and its host organization, the World Meteorological Organization (WMO)?
Please elaborate_____

C. How satisfied are you with the present level of interaction between GEO and the WMO?

(a) very satisfied, (b) satisfied, (c) neither satisfied nor dissatisfied, (d) dissatisfied, (e) very dissatisfied

8) What in your opinion is the main role of the Secretariat in implementing GEO's strategic Plan?

Please explain_____

9) GEO is meeting its objectives set out in the GEO Strategic Plan (2016 – 2025)?

(a) strongly agree, (b) agree, (c) neither agree nor disagree, (d) disagree, (e) strongly disagree

User Engagement

10) Who do you see as being GEO's primary users and stakeholders? Please choose your top three.

a) National Governmental Organizations (National Space Agencies, Weather Bureaus, agencies dealing with environmental resource management, development agencies etc.)

b) Local governments and authorities who rely on EO data
c) Academic and research institutions
d) Nonprofit organizations
e) Private Sector
f) Community organizations
g) Other. Please explain_____

11) Are you satisfied with GEO's present understanding of its user community?

(a) very satisfied, (b) satisfied, (c) neither satisfied nor dissatisfied, (d) dissatisfied, (e) very dissatisfied

12) What steps, if any, would you recommend that GEO takes regarding user engagement in the next phase of its Strategic Plan implementation (2020-2025)? Please specify_____

13) GEO is able to identify user needs and address gaps in the information chain?

(a) strongly agree, (b) agree, (c) neither agree nor disagree, (d) disagree, (e) strongly disagree

14) What impact has the introduction of engagement priorities had on GEO's Work Program activities relationship with United Nations Agencies, Treaties and Conventions?

a) It has led to strengthened partnerships, greater collaboration, and recognition of GEO
b) It has had some positive impacts on partnerships, greater collaboration, and recognition of GEO
c) It had not had any significant impact on partnerships, greater collaboration, and recognition of GEO
d) It has had a negative impact on partnerships, greater collaboration, and recognition of GEO
e) Other. Please explain_____

15) How satisfied are you with the impact of GEO's engagement priorities on partnerships and collaboration with United Nations Agencies, Treaties and Conventions?

(a) very satisfied, (b) satisfied, (c) neither satisfied nor dissatisfied, (d) dissatisfied, (e) very dissatisfied

16) How would you rate GEO's brand relative to its recognition in the EO community and with GEO's stakeholders?

a) GEO is recognized as the leading organization involved with facilitating collaboration, partnerships, and open data sharing of Earth observations
b) GEO is recognized as an important organization involved with facilitating collaboration, partnerships and open data sharing of Earth observations
c) GEO is minimally recognized as an organization involved with facilitating collaboration, partnerships and open data sharing of Earth observations

d) GEO is not recognized as an organization involved with facilitating collaboration, partnerships and open data sharing of Earth observations

Implementing GEOSS

17) How would you define GEOSS and its role within GEO as an organization? Please explain_____

18) Based on your experience, what advances has GEO made in regards to "implementing GEOSS"? Please specify_____

19) What recommendations, if any, would you make with respect to implementing GEOSS in the next phase of GEO's Strategic Plan (2020-2025)? Please specify_____

Funding/Administration

20) How would you rate the ability of the GEO Trust Fund funding model to ensure long-term sustainability of GEO's activities?

a) provides ample resources for GEO's activities, operations, and long-term sustainability
b) provides adequate resources for GEO's activities, operations, and long-term sustainability
c) provides minimum resources required for GEO's activities, operations, and long-term sustainability
d) does not provide adequate resources for GEO's activities, operations, and long-term sustainability

21) In your opinion, what steps could GEO take to maintain long-term sustainability of its key activities?

Please specify_____

22) What changes, if any, should GEO consider with respect to its present funding model? Please specify_____

23) How satisfied are you with GEO Secretariat's present staffing capacity relative to its ability to carry out its operations?

(a) very satisfied, (b) satisfied, (c) neither satisfied nor dissatisfied, (d) dissatisfied, (e) very dissatisfied

Additional comments (optional): _____

24) What modifications could lead to positive impacts on the ability of the GEOSEC staff to carry out their mission with respect to GEO? Please specify_____

25) What recommendations would you make to GEO with respect to its current processes and infrastructure in how it implements the next phase of its Strategic Plan (2020-2025)? Please explain_____

7.4.1.3 Commercial Sector and Associates Survey

1. Which of these best describes your institution?

[Choose among Commercial Organization, Not-for-profit Organization, Public authority / Civil Society Organization, Academia, Other type of Non-governmental Organization]

2. If you are a commercial sector organization, how would you describe your size?

[Choose among Small, Micro or Medium enterprise or Large Enterprise/Multinational]

3. For how long have you been involved / engaged with GEO?

4. Which GEO Work Programme activity have you been involved with?

[Choose among Flagship, Initiative, Community Activity, Regional GEO, Independent User, Other: please specify]

5. Please specify the names of the GEO Work Programme activities you have been involved with

6. If you have been involved with one of the Regional GEOs, please elaborate further on the nature of the engagement

7. What has been your and your organization's role within GEO?

[Choose among Provider of Infrastructure and/or data, Provider of specialized end-to-end services, Provider of bespoke end user services, User of Earth Observations]

8. How has your organization benefited from the engagement with GEO and/or the GEO community? How can GEO benefit from the engagement with your organization?

9. How would you rate GEO's engagement with your organization?

[Choose among Excellent, Good, Moderate, Not Sure, Poor, Very Poor]

10. Do you think that GEO has developed a clear added value proposition for the commercial sector to engage?

[Choose among Yes or No and please explain]

11. What are the obstacles, if any, that prevent your organization from increasing its engagement with GEO?

12. How can your organization contribute to GEO's efforts to support capacity-development in the use of earth observations?

13. What do you think GEO can do to help engage Small, Micro, and Medium Enterprises, as well as big tech companies across all of GEO's regions? In your experience, how can different types of commercial sector organizations participate with GEO?

14. How do you view the establishment of an Associates Category within GEO?

[Please note that the GEO Associates category enables commercial and non-governmental, not-for-profit and civil society organizations to join governments and international organizations as official GEO collaborators]

15. Do you have any additional comments?

16. (Optional) If you would like to provide the name of your organization, you can do so here.

[Please note that this will be used for internal analysis and will not be shared outside of the MTE Team]

7.4.2 Interview Questionnaires

7.4.2.1 Key Informant Interview

The GEO Mid-Term Evaluation (MTE) 2020 team has been given the mandate to review progress realized by GEO since 2016 and to assess the outcomes of implementing the changes introduced in *the GEO Strategic Plan 2016-2025*.

In addition to a survey, MTE is also conducting interviews with a selected number of candidates so as to gauge more information.

Below is a series of interview questions. We would like to remind you that you are not required to answer any questions that you cannot or choose not to address. Just let the interviewer know that you would like to skip the question and she/he will move onto the next one on the list.

Any information you provide will remain anonymous and none of your responses will be associated with you in our evaluation report.

In order to keep track of what has been said, the interviewer will record the meeting or take notes. If you do not wish for the interview to be recorded, please let the interviewer know. All interview notes/recordings will be destroyed at the end of the evaluation. If there is any information that you would prefer not to be documented in our notes, please let the interviewer know.

Personal information:
For how long have you been involved / engaged with GEO?
What has been your role within GEO?

Question 1:

- Do you think that the current GEO model is sustainable? Particularly, when it comes to maintaining and attracting voluntary participation of stakeholders in data/products sharing principles and in funding resources.
- How would you change the current GEO model? / What are the major changes which you would like to bring to the current model?

Question 2:

- In terms of GEO's engagement priorities within/between GEO, its communities and other organizations/stakeholders; how satisfied are you with the engagement and workflows?
- According to you what can GEO do to improve upon this?

- Do you think that GEO has been able to build a stronger relationship with UN agencies and other regional and global organizations particularly with regards to achieving the Engagement priority?
- Do think that GEO had maintained an adequate balance between focus on data infrastructure and access initiatives versus activities on developing societally relevant products and applications and the user interface?
- Based on your experience, is GEO recognized as a global leader in coordinating availability, access, and use of Earth observations (EO) for the benefit of the planet and humankind? Why or why not?

Question 3

- How would you define GEOSS?
- Do you think GEO is on the right track as far as 'implementing GEOSS' is concerned? If not, what concrete steps can be taken to address this?

Question 4:

- According to you, what are the 2 main internal factors still limiting GEO's efficiency and/or effectiveness?
- What are the root causes limiting efficiency and effectiveness on these two main factors?
- Can you think of any potential solutions which may be implemented?
- We would like to hear your views on the existing GEO trust model. Do you think this model is sustainable? What changes, if any, would you like to see to improve the effectiveness of GEO?

Question 5:

- What emergent opportunities are on GEO's horizon?
- What emergent threats should GEO be aware of?
- Has involvement with the private sector increased over the years? Do you see this as beneficial or does it detract from the core added value of GEO?

Question 6:

To sum up according to you:

- What should GEO keep on doing or do more of?
- What should GEO stop doing?

7.4.2.2 Budget Interview

QUESTIONS

- What has GEO done to date to develop a long-term strategy to ensure sustainability of the Trust Fund? What could be done to further any existing approaches?
- Given that in recent years the number of GEO members has increased while the total amount of contributions to the Trust Fund has remained flat, what do you think GEO should do to increase members' engagement and financial/in kind support?
- Do you think that developing a clearer added value proposition for member states, POs and Associates would attract more funds for the Trust Fund? What additional steps should the GEO Ex-Com and the Secretariat take in its engagement with members to secure their support?
- Is there enough clarity on the role of the Trust Fund model in supporting Secretariat's operations across GEO? Do you think that increased awareness on this topic would in turn contribute to fostering contributions?

- Do you believe the Trust Fund model should remain voluntary and contributions be encouraged on the basis of the indicative GDP scale or do you think that GEO should ask members for a minimum contribution (e.g. fee/secondment/in-kind) or look for another suitable model?
- Would altering the current GEO governance model to allow for more members to participate in the ExCom (instead of the permanent co-chair structure) allow for greater engagement in GEO and contributions to the Trust Fund?
- Do you see engagement with the private sector as an opportunity to attract resources and support for the Secretariat and WP? If so, what should be the principles regulating this funding engagement?
- How can GEO better strengthen its support for the Trust Fund, as well as for GEO's programmatic activities?

FOLLOW-UP QUESTION REGIONAL GEOs

- How would you characterize the role of Regional GEOs over the past five years and in the future in contributing to identifying potential funding and collaboration opportunities at the local level?

7.4.2.3 Capacity Development Interview

QUESTIONS

- Do you think that the GEOSS Implementation Plan successfully addressed capacity development and users' needs? Do you think the Knowledge Hub will represent a positive development in terms of favouring the uptake of EO data and products in developing countries?
- Do you think GEO should develop a long-term strategy for capacity development on the use of Earth Observations? What has it done to date to develop such strategy?
- In terms of identifying users' capacity needs, do you think GEO has developed a systematic way to report on users' requirements and gaps and consequently address them?
- How would you characterize the role of Regional GEOs over the past five years and in the future in contributing to strengthening GEO's efforts and contributions to capacity development, especially at a local level?
- What is your perspective on the private sector's contribution to GEO's efforts to support capacity development in the use of earth observations?
- Did the Cloud Credits Programmes represent a positive example in terms of increasing developing countries capacity to use Earth Observations? And how can GEO support these results in the long-term by favouring local ownership?

7.4.2.4 Data and GEOSS Interview

QUESTIONS

- How would you define GEOSS? Do you think GEO is on the right track as far as 'implementing GEOSS' is concerned? If not, what concrete steps can be taken to address this?
- Do you think GEOSS has become more user friendly throughout the years and that GEO successfully identifies and addresses users' needs? If not, what should be done to make sure it does?
- Should GEO become more user friendly? Is that an important role for it, and if so which types of users?

- Do you think GEOSS provides good connectivity both internally among the different regional, national and Flagships, Initiatives' platforms and externally among different EO systems?
- Do you think enough efforts have been made to improve the quality of in situ data made available by the GEO Platform? What more can be done to improve the availability and quality of this data component?
- Do think that GEO has maintained an adequate balance between focus on data infrastructure and access initiatives versus activities on developing societally relevant products and applications and the user interface?
- What do you think can be the contribution of the private sector and commercial data providers to implementing GEOSS?
- Has GEO developed a good engagement procedure with the privates sector? How can it be improved?
- What further steps should GEO take to be recognized as a leader in EOs? Do you think the Knowledge Hub represents a positive step towards facilitating the uptake of knowledge derived from GEOSS, especially in developing countries, and having GEO recognized as a leader in the EO field?
- Has the Knowledge Hub been designed to interoperate with the GEOSS infrastructure taking advantage of potential synergies and complementarities? If not, what can be done to make sure it is?
- Given that the definition of the role of GEOSS in GEO can be a bit confusing, do you think that this might need to be clarified or rebranded going forward in order to better articulate GEO's value proposition to the global community?

7.4.2.5 Equality, Diversity and Inclusion Interview

QUESTIONS

- Do you think that principles of equality, diversity and inclusivity are fully considered and embedded within GEO's decisions and the activities of its governance bodies and Work Programme? If not, what can GEO and the EDI Subgroup do to make sure that these principles are adopted and implemented throughout the organization? What kind of impact would that have on GEO as an organization?
- Considering the voluntary nature of GEO, how can the organization work to address knowledge gaps and possible barriers to participation (experience, funding, time and travel constraints) that might affect gender and geographic balance? Do you feel that addressing those barriers can help to improve engagement across GEO?
- How would you characterize the role of Regional GEOs over the past five years and in the future in contributing to the equality, diversity and inclusiveness of GEO? Do you think that Regional GEOs need to have more participation, leadership and goals setting coming from developing countries in addition to the developed countries?

7.4.2.6 Private Sector Interview

QUESTIONS

- Do you think GEO should develop a long-term strategy for engagement with the private sector? What has it done to date to develop such strategy?

- What are the main items that should be addressed by such strategy and are the principles set out in Annex C on Rules of Engagement with the Private Sector that are part of the GEO rules of procedure approved in 2019 enough to regulate the engagement[52]?
- Do you think that GEO has developed a clear added value proposition for the private sector and that, conversely, GEO can benefit from this engagement or that it detracts from its core added value? What additional steps should GEO take in its engagement with the private sector to ensure success?
- How has the private sector engaged across the GWP, and are there any examples that you can highlight of best practices for GEO's engagement with this sector?
- Do you think the Cloud Credits Programmes represent a successful example of engagement with the private sector? If so, what are key lessons learnt and how can GEO make sure that this does not remain a standalone project?
- What do you think GEO can or should do more to secure the establishment of a level playing field to equally engage Small, Medium and Micro Enterprises and big tech? In this context, do you think the selection process for both companies and applicants to participate to the Cloud Credits Programmes was fully transparent and how could it be improved?
- Which subsector within the private sector you think would be a strong or better fit for GEO to engage with (e.g. big tech companies, heavy industries)?
- What do you think could be the private sector contribution as a data and infrastructure provider to the implementation of GEOSS?
- From a financial perspective, do you see engagement with the private sector as an opportunity to attract resources and support for the Secretariat and WP? If so, what should be the principles regulating this funding engagement?

FOLLOW-UP QUESTIONS REGIONAL GEOs & CAPACITY-BUILDING

- How would you characterize the role of Regional GEOs over the past five years and in the future in contributing to strengthening GEO's engagement with the private sector especially at a local level?
- What is your perspective on the private sector's contribution to GEO's efforts to support capacity-building in the use of earth observations?

7.4.2.7 Associates Interview

QUESTIONS

- What are the reasons that initially encouraged you to engage with GEO? Also, how did you first engage with GEO, was it through the Secretariat or one of GEO Work Programme activities?
- Would you say that GEO has developed a clear value proposition to encourage the commercial sector to engage? If not, what are the additional elements that GEO should address that are not currently part of its value proposition?
- What do you think should be the principles regulating the engagement among GEO and the commercial sector, if any? Do you think that these principles suffice or should be more comprehensive than the Rules of Engagement with the Commercial Sector that have been published as an Annex to the GEO Rules of Procedure in 2019?

[52] Some of these principles include standards of ethics and integrity, the need for GEO to be impartial and provide equal access to all commercial organizations and the need for the relation to be transparent, see: http://www.earthobservations.org/documents/GEO_Rules_of_Procedure.pdf

- How would you describe GEO's engagement and communication with your organization? What has worked well and where do you think that improvements could be made?
- Given the multiple types of commercial sectors engaging across GEO, do you think that GEO needs to differentiate among different types of commercial sectors and tailor its engagement to specific communities?
- What do you think a) of the current contribution of the commercial sector to the implementation of GEOSS, and b) of future opportunities and potential commercial sector contribution to the implementation of GEOSS?
- Based on your experience, do you feel that SMME engagement in GEO is limited at present? If yes, what do you see as the factors limiting this engagement and what can be done to make sure that large companies and SMMEs can both engage in GEO?
- How do you envision commercial engagement with GEO at the centralized/global level and how do you envision it at the Regional GEO level and what are the opportunities with each?
- What do you think can be the role of the commercial sector in ensuring data quality and favouring an increasing role for citizen science to fill some of the data gaps of non-profit providers?

7.4.2.8 Interview to Participants in the Cloud Credits Programme

QUESTIONS

- What are the reasons that initially encouraged you to apply to participate in the Cloud Credits Programme?
- What would you say were the benefits that you/your organization derived from participating in the Cloud Credits Programme, and could you give examples?
- Would you say that the Cloud Credits Programme was successful? What worked well in the programme, and what would you suggest should change for future programmes?
- Do you see the Cloud Credits Programme as a priority for GEO? How do you think GEO can make sure that the Cloud Credits Programme does not remain a standalone project and that benefits derived from it are retained in the long-term by participating organizations?
- Has the Cloud Credits Programme contributed to supporting capacity development in the use of Earth observations within your organization? How would you characterize the level of assistance you received during the implementation phase?
- Do you believe Regional GEOs and the private sector can play a role in strengthening GEO's contributions to capacity development, especially at a local level?
- How do you envision engagement with GEO at the centralized/global level and at the Regional GEO level going forward and what are the opportunities with each?
- Do you have any additional comments?

FOLLOW-UP QUESTIONS GEO AND THE COMMERCIAL SECTOR

- What do you think should be the principles regulating the engagement among GEO and the commercial sector, if any? Do you think that these principles should be more comprehensive than the Rules of Engagement with the Commercial Sector that have been published as an Annex to the GEO Rules of Procedure in 2019?
- Did you have any other experience with private sector engagement in GEO in addition to the Cloud Credits Programme that may also have involved SMMEs? Could you tell us more about such experiences?

7.4.2.9 Interview to Cloud Providers in the Cloud Credits Programme

QUESTIONS

- What are the reasons that initially encouraged you to participate in the GEO-GEE License programme as a license provider? How did you first learn about GEO as an organization?
- What was the process that you had to follow to apply to participate in the License Programme?
- What would you say were the benefits that your organization derived from participating in the License Programme?
- Conversely, how would you say GEO has benefitted from developing a joint programme with your organization?
- Would you say that the License Programme was successful? What did you find worked well in the programme and what would you address in any future programmes?
- How do you think GEO, by working with your organization, can make sure that the License Programme does not remain a standalone project and that benefits derived from it are retained in the long-term by participants?
- Do you feel that the License Programme contributed to successfully supporting capacity development in the use of Earth observations for the programme's participants?
- Do you believe that the License Programme could create opportunities for engagement with SMMEs at the regional and sub-regional level? If so, how? In particular, could the Licence Programme be expanded to technology SMMEs, and if so, how?
- Do you have any additional comments?

FOLLOW-UP QUESTIONS GEO AND THE COMMERCIAL SECTOR

- In general, do you think that GEO has developed a clear added value proposition for the private sector and what additional steps should GEO take in its engagement with the private sector to ensure success?
- Do you think that GEO should adopt a strategy for engagement that is tailored to different types of commercial sector (e.g. different sizes and geographies)?
- What do you think should be the principles regulating the engagement among GEO and the commercial sector, if any? Do you think that these principles are sufficient, or should they be more comprehensive than the Rules of Engagement with the Commercial Sector that have been published as an Annex to the GEO Rules of Procedure in 2019?

7.4.2.10 Work Programme Interview

QUESTIONS

- Does GEO Secretariat have an adequate balance between bottom-up driven activities, and top-down oversight of the scope, progress, and contributions of these activities in the GWP? Have recent governance changes been able to improve this balance across GEO or are further changes needed?
- Do you think that the Programme Board oversight of the different elements of the Work Programme is enough?
- What is the role of the GEO Secretariat in the implementation of the GEO Work Programme? What role should the Secretariat play in the next phase of GEO? Is additional capacity needed at GEOSEC to implement the GWP?
- How has the private / commercial sector engaged across the GWP, and are there any examples that you can highlight of best practices for GEO's engagement with this

sector? What is the value added of this engagement for GEO, in your opinion, and what additional steps should GEO take in its engagement with various commercial sectors to ensure success?

- Should GEO be more focused in its approach, is the current level of activities too high to maintain and monitor? Does GEO need to be more selective in which activities are included in its GWP? How might this happen: e.g. balance between Engagement Priorities, Initiatives, Flagships, Regional activities, and connections between all of these?
- Considering past evaluations, do you think that GEO has followed up correctly on the recommendations that were made? For example, has GEO become more user-centric versus technology-centric? And has GEO introduced measurable targets and strengthened the implementation mechanisms for all its activities?

FOLLOW-UP QUESTION REGIONAL GEOs

- How would you characterize the role of Regional GEOs in GEO over the past five years and in the future in contributing to the implementation of the GEO Work Programme?
- What is your perspective on GEO's support for capacity-building in developing countries? Do you think that this element will be increasingly included in Work Programme activities going forward?
- Would a stronger focus on enabling Regional GEOs help to engage more members and partners across GEO? Can Regional GEOs help with capacity building?

7.4.2.11 GEO Secretariat Interview

GOVERNANCE

Questions

- How do you think GEO could encourage stronger commitment and engagement from participating organizations and members of the ExCom?
- Is there a role to play for the Secretariat in securing stronger participation and willingness of the members to act collectively? If so, how could it be implemented?

WMO

Questions

- How do you think the programmatic relation between GEO and the WMO can be improved? And how can the Secretariat contribute to improving this relation?

STRATEGIC PLAN AND GEOSS

Questions

- How can GEO improve its understanding of users' communities and better identify users' needs?
- What further steps should GEO take to be recognized as a leader in EOs? Do you think the Knowledge Hub represents a positive step towards increasing GEO's recognition in the EO community and with GEO's stakeholders?

LONG-TERM SUSTAINABILITY

Questions

- What are the changes that you would recommend to the present Trust Fund model to ensure the long-term sustainability of GEO?
- Could you identify two internal factors that for you are or will be limiting the long-term sustainability of GEO? How do you think the Secretariat could act upon these?

FOLLOW-UP QUESTION

Questions

- How would you characterize the role of Regional GEOs in GEO over the past five years and in the future?

7.4.3 Case Study Value Chain Paper

Questionnaire on assessment of Earth Observation Value Chain

The GEO Mid-Term Evaluation (MTE) 2020 team has been given the mandate to review progress realized by GEO since 2016 and to assess the outcomes of implementing the changes introduced in the GEO Strategic Plan 2016-2025.

In the broader context of the GEO Mid Term Evaluation, the MTE Team would like to ask you to fill out the schematic and answer the list of questions presented below. This will contribute to the MTE process by highlighting exemplary practices and stakeholders involved at each stage of the EO value chain for each of GEO's Flagships, Initiatives and Community Activities. The data emerging from this analysis will inform the review process. We want to highlight impacts across the GEO Work Programme and provide recommendations on how GEO can best support products and activities in Earth observations that contribute to meeting societal needs identified by end users and stakeholders.

We would like to remind you that you are not required to answer any questions that you cannot or choose not to address. Any information you provide will remain anonymous and none of your responses will be associated with you in our evaluation report.

1. Objective:

The purpose of this questionnaire is to assess, through an Earth Observation value chain, the use and added value of EO data in specific use cases across the GEO Work Programme. This will allow us to identify existing practices in the four key steps of the EO value chain: 1) Sensing, 2) Data Production, 3) Application, 4) Decision. This questionnaire will also allow you to define the different stakeholders involved and identify the end-users benefitting from the final output of the value chain, for additional follow-up. The questionnaire will be shared with the leads of specific GEO Work Programme activities, i.e. Flagships, Initiatives and Community Activities.

Please find here some indications that might be useful to fill the schematic. If you have developed more than one application, we would like to ask you to submit the questionnaire just for one of these:

1) Sense: What kind of Earth Observations are you looking for and what is/are the data sources for your Flagship, Initiative or Community Activity?

2) Data Production: Do you process the data yourself? Alternatively, what are the data providers or intermediaries you refer to and what are the types of data needed for the development of your products?

By data production and processing we refer to quality control, data integration, data analysis and/or predictive modelling/forecasting.

3) Apply: Where do EO-derived products and tools fit into your decision-making process: i) for long-term policy objectives, planning and preparedness; ii) for shorter-term preparations, response and monitoring; or iii) for longer-term recovery activities?

4) Decide: In which context are EO-derived products and tools used for decision-making and what are the policy objectives and long-term goals they contribute to?

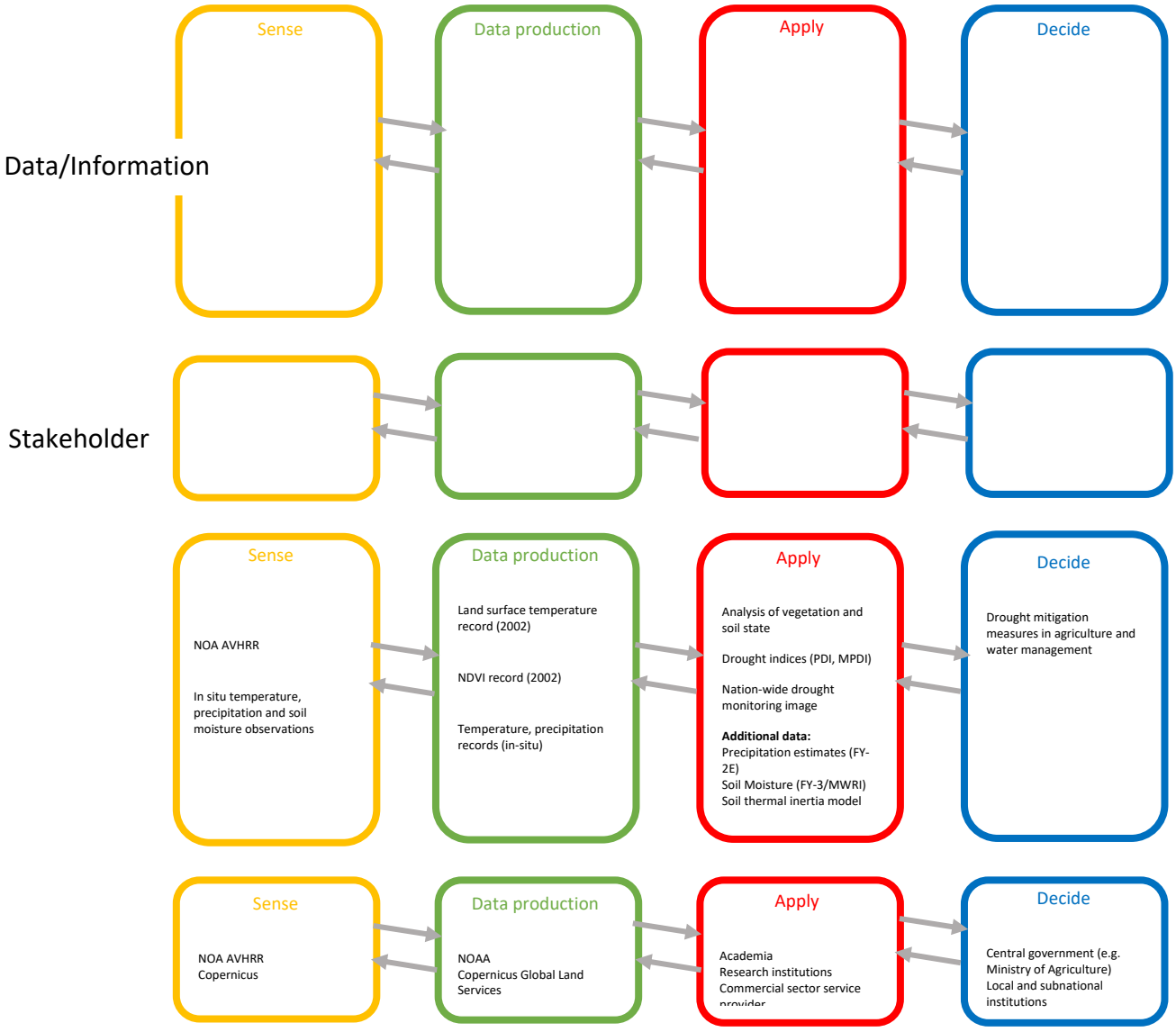
2. Personal Information:

Name: **Surname:**

- For how long have you been involved with GEO?
- What has been your role with GEO?
- What activity are you illustrating in the value chain schematic?

3. Schematic:

[*Could you please fill in the template value chain indicating keywords for the main elements (as in the completed example). Please also indicate in the boxes underneath each pillar the key stakeholder involved at each step of the value chain. If there is more than one application per Flagship, Initiative and Community Activity, we would like to ask you to specify what it is and possibly submit just for.*]



4. Questions:

1. What do you understand by value chain for Earth Observation?
2. Does your activity cover all four steps of the value chain linking with specific data providers and end users/SBAs? If not, where would you position yourself on the value chain based on the Schematic shown above? [If, in your thematic area of interest there are multiple value chains, providing different outputs, please pick one specific for the remainder of the question]
3. Do you have a clear understanding of the other key actors at various stages of the value chain in which you are involved – if so please indicate them in completing the template? (Ex. NOAA in the sensing step)
4. If you engage in application and/or service/products provision, where does this take place for you: at "Data production", "Decide" or "Apply" stage?

I. Decide

1. Starting from the right-hand side of the schematic can you briefly describe the type of actionable information which is expected at the end of the value chain?
2. Can you identify the end-users, e.g. policy and/or decision makers, that make use of this information?

II. Apply

1. If we focus on the application development pillar of the value chain, can you indicate what indicators and application are produced and which models and/or data integration mechanisms are involved?
2. On this application pillar are you aware of which institutions, if any, have the specific role of providing the sustained transformation/service to deliver the needed "application"?

III. Data production

1. Moving to the second pillar on data production, do you have a clear view of the products generated and their requirements? Do you believe that these are fit-for-purpose and responsive to the needs of the downstream aspects of the value chain?
2. Do you have a clear understanding of the institutions who have responsibility for the sustained production of the needed products?

IV. Sense

1. Finally, moving to the first pillar, on sensing i.e., the observations themselves, do you have a clear understanding on the types of observations required, their source and long-term sustainability?
2. Do you have a clear understanding of the key organization(s) providing these observations and making them readily available – if so please name them? Do these entities provide guarantees/assurances on the availability of the observation into the future so that the value chain can be sustained?

V. Follow-up

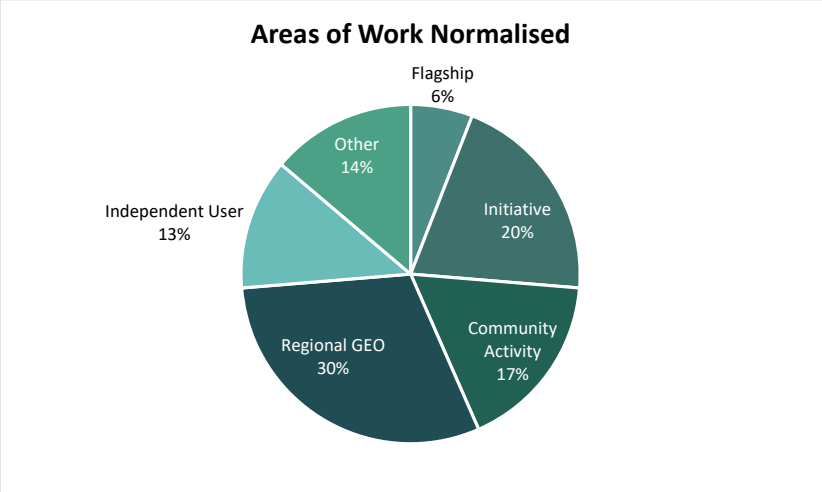
1. What added value do you see in the coordination capability provided by GEO in enabling the effective implementation of the value chain? Does GEO provide the necessary mechanisms to allow the actors/stakeholders at all stages of the value chain to interact with each other?
2. How is the value added your activity provides reflected in the overarching goals of GEO (e.g. contribution to the SBAs and/or the Engagement Priorities)?

7.5 Supplementary Materials

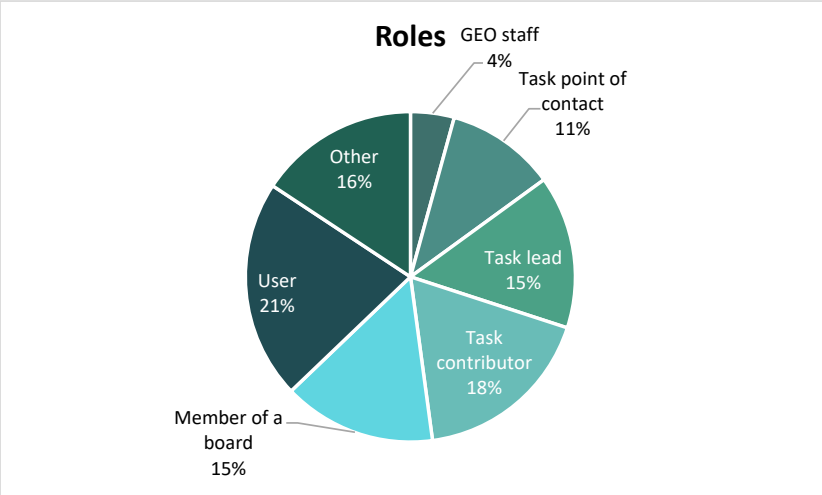
7.5.1 Surveys Analysis

7.5.1.1 Community Survey

1.1 Which areas of work do you currently engage with?



1.2 What is your main role in Question No.1?

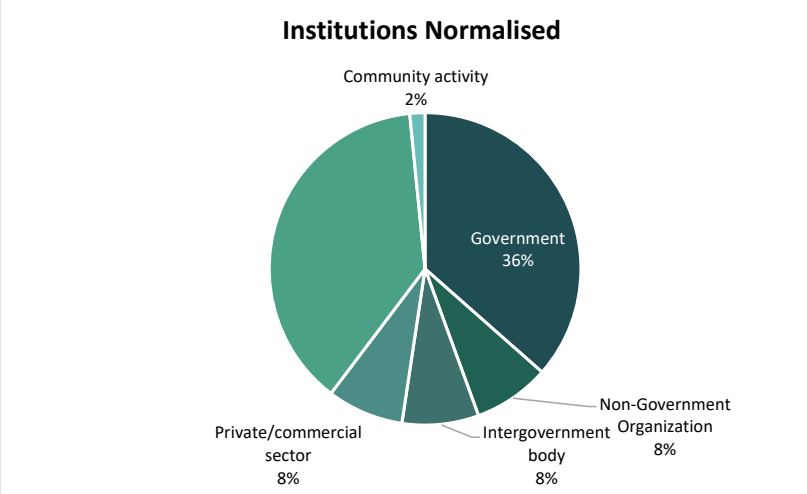


1.3 In which country is your institute based in?[53]

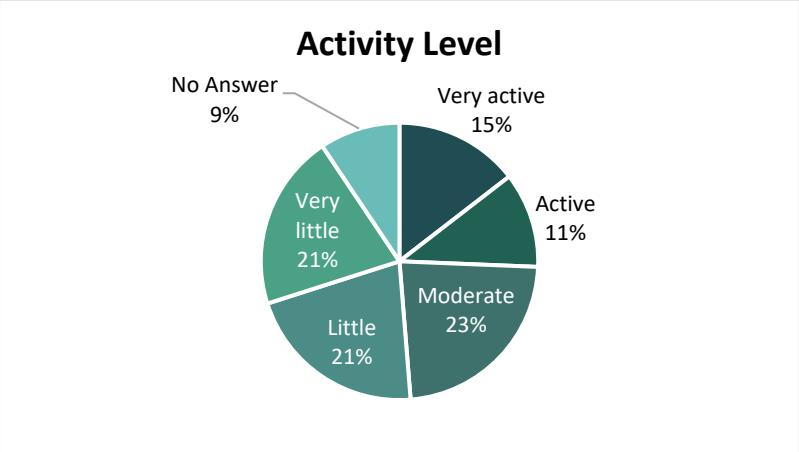
[53] Please note that one respondent answered indicating two countries when answering to the question "where is your institute based in?"

Geographic Composition		
Country	Number	Percentage
Argentina	1	1%
Bangladesh	1	1%
Bolivia	1	1%
Canada	5	4%
China	5	4%
Colombia	1	1%
Ecuador	10	8%
France	3	3%
Georgia	1	1%
Germany	5	4%
Ghana	1	1%
Greece	2	2%
India	3	3%
Ireland	1	1%
Italy	5	4%
Japan	6	5%
Libya	1	1%
Malaysia	1	1%
Mexico	4	3%
Nepal	2	2%
Nigeria	3	3%
Norway	1	1%
Senegal	1	1%
Switzerland	3	3%
Sweden	2	2%
South Korea	3	3%
United Kingdom	2	2%
Ukraine	2	2%
USA	20	17%
Czech Republic	1	1%
Niger	1	1%
Austria	2	2%
Zimbabwe	1	1%
Australia	2	2%
Spain	1	1%
Kenya	1	1%
Uruguay	1	1%
Nicaragua	1	1%
Trinidad and Tobago, Barbados	1	1%
Cameroon	1	1%
South Africa	4	3%
Unknown	5	4%

1.4 Which of these terms best describe your institution?



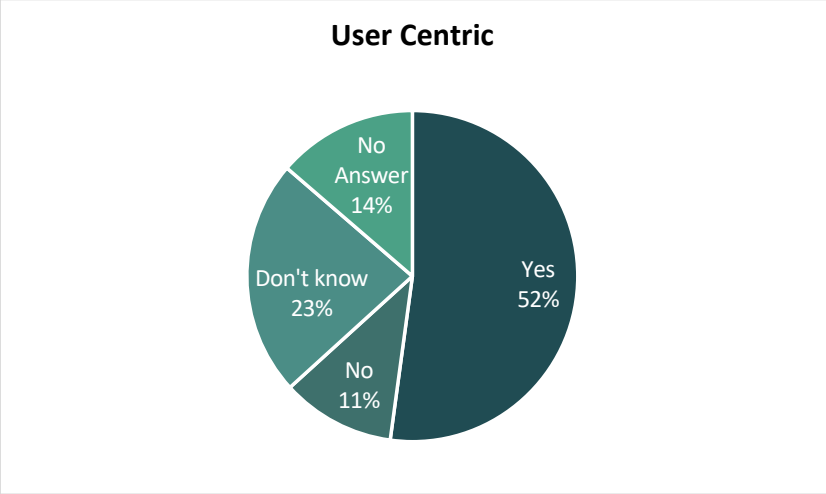
1.5 How active do you consider your current role in GEO?



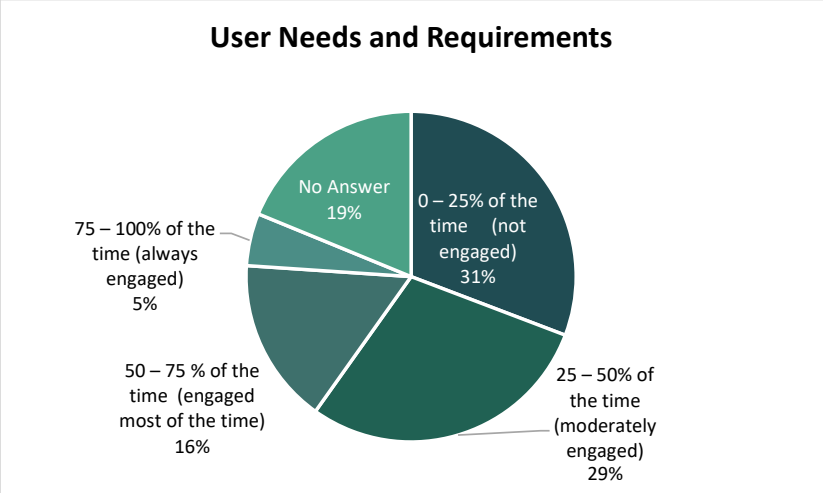
1.6 Which of the following GEO benefit areas do you work most with?

SBAs	Percentage
Biodiversity and Ecosystem Sustainability	20%
Disaster Resilience	23%
Infrastructure and Transportation Management	2%
Sustainable Urban Development	10%
Public Health Surveillance	2%
Food Security and Sustainable Agriculture	12%
Energy and Mineral Resources Management	3%
Water Resources Management	18%
Other	9%

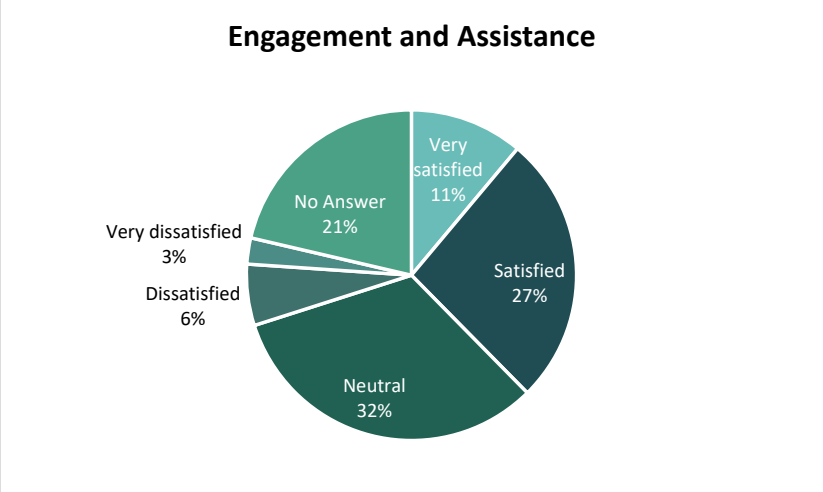
2.1 Do you perceive GEO to be more user centric since the adoption of the 2016-2025 Strategic Plan?



2.2 How often does GEO actively engages with you to help meet your user needs and requirements?



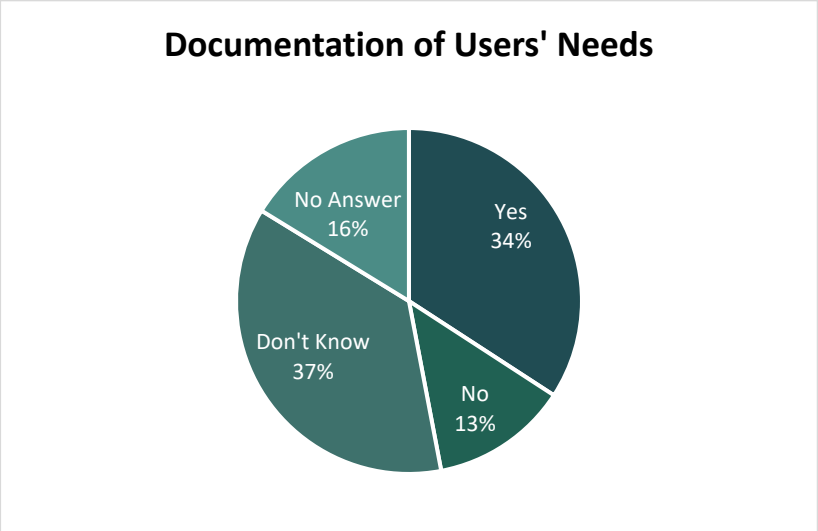
2.3 Are you satisfied with the engagement and assistance GEO provides to you as a user?



2.4 Please provide a specific example of your engagement with GEO

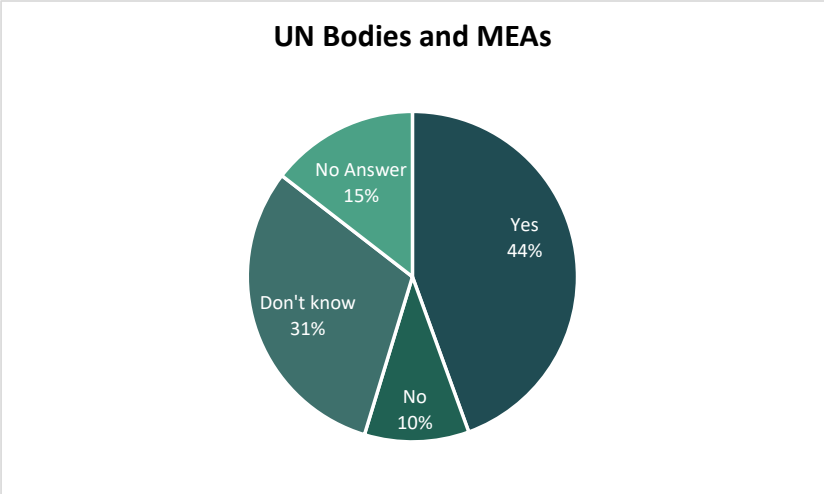
- Through the Work Programme (Flagships, Initiatives, Community Activities and Regional GEOs), events such as the GEO Week and Symposia, Working Groups and through Participating Organizations.

2.5 During 2016 – 2019, has GEO systematically documented user needs associated with the GEO benefit area you work in?



- No systematic documentation of users' needs, suggestion to trace and keep track of users' needs and how these are changing and to improve engagement with users' communities.

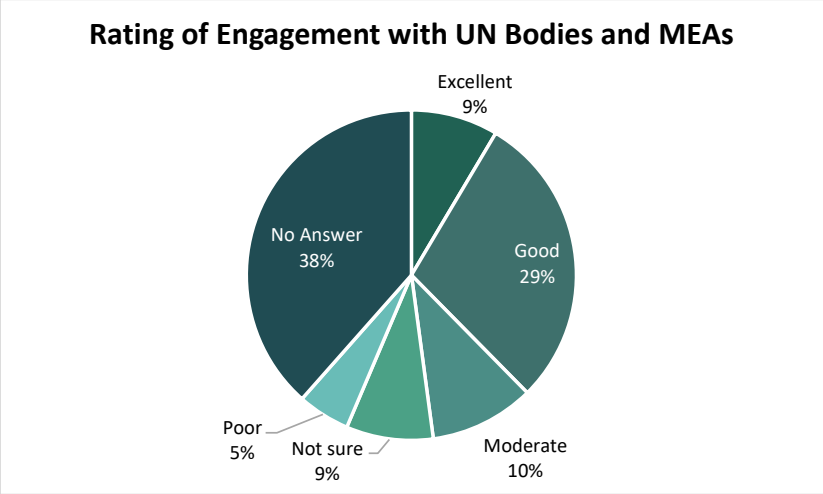
2.6 In your area of expertise, does GEO have good engagement with UN bodies and multilateral environmental agreements?



If yes, list the most significant bodies and agreements:

- UNFCCC, UNCCD, CBD, IPCC, UNGGIM, UNEP, WMO, UNDRR, UNDP, UNECA, UN Habitat, among others.

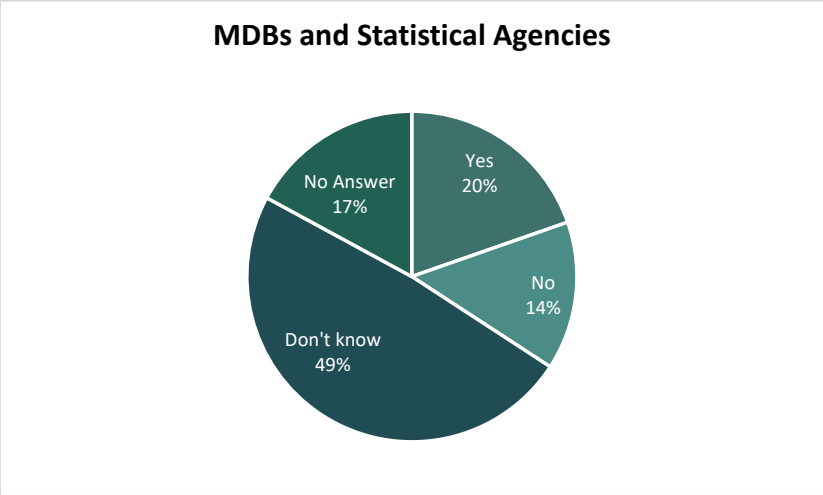
2.7. If "YES", how do you rate GEO in engaging with UN bodies and multilateral environmental agreements in your area of expertise?



Additional comments:

- Some engagements with UN agencies are good, and others need to be developed further (e.g. UNFCCC, IPCC, WHO, ITU).

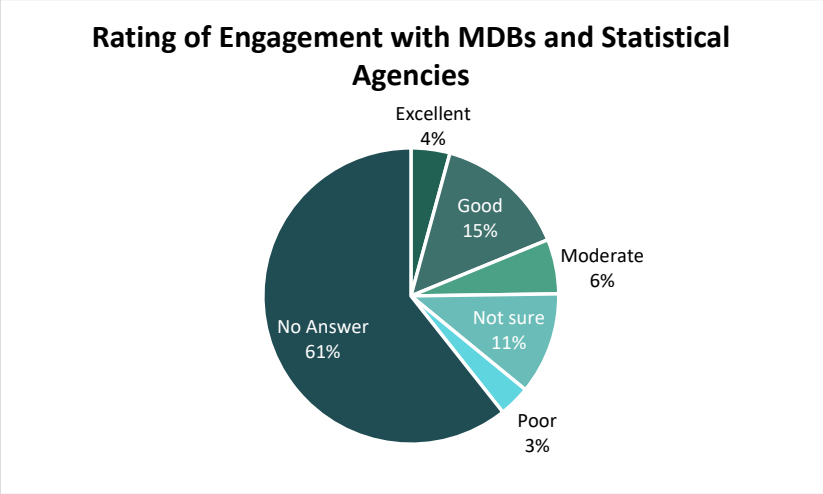
2.8 In your area of expertise, does GEO have good engagement with multi-lateral development banks, statistical agencies?



If yes, please list the most significant banks?

- WB, AfDB, ADB, IDB, WDS, WRI, INEGI, among others.

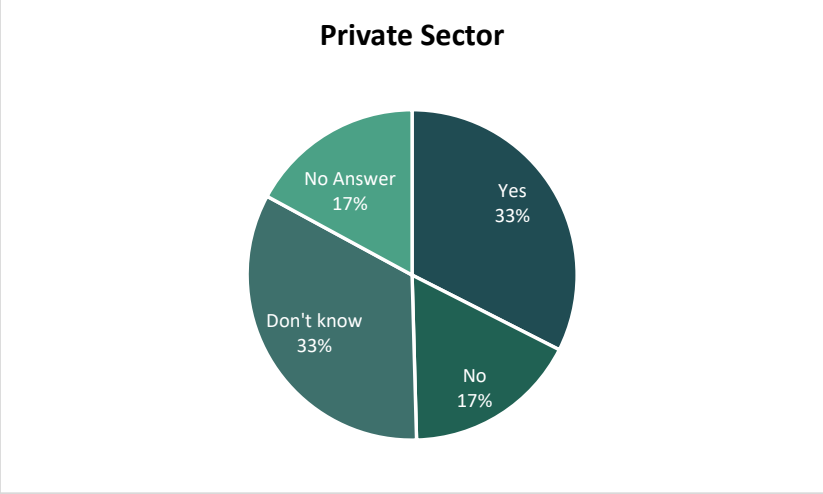
2.9 If "YES" how do you rate GEO in engaging with multi-lateral development banks, statistical agencies in your area of expertise?



Additional Comments:

- The engagement is still limited and needs to be improved

2.10 In your area of expertise, does GEO have engagement with the private sector?



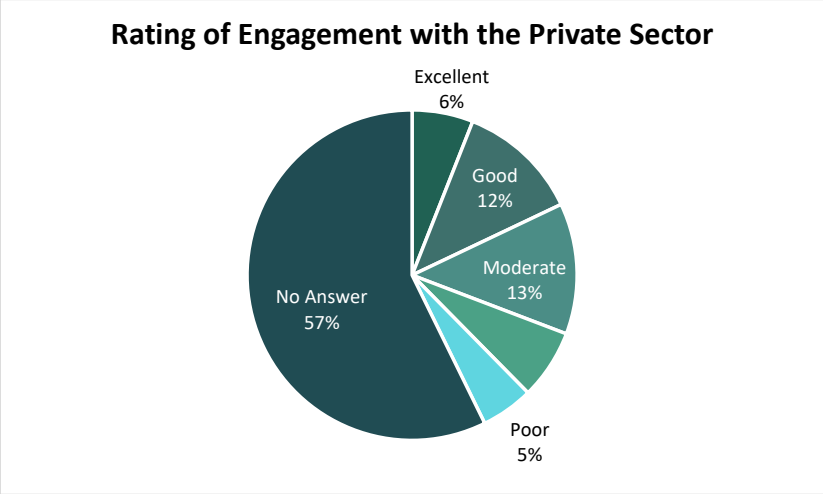
If yes, please list the most significant private sector bodies?

- Google, Amazon, Esri, EARSC, Microsoft, OGC, WEF, among others.

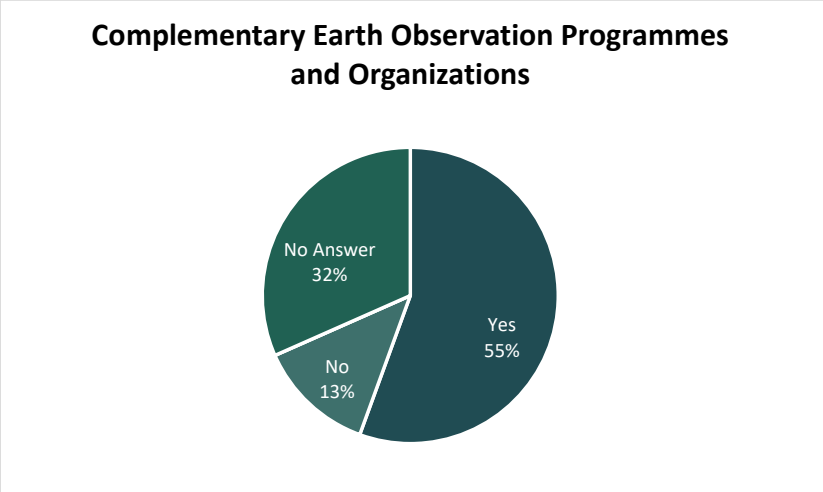
If no, additional comments?

- Engaging more with the private sector would be positive for GEO, but there is still little awareness of GEO at the private sector level and there is a need to establish rules of engagement.

2.11 If "YES", how do you rate GEO in engaging with the private sector in your area of expertise?



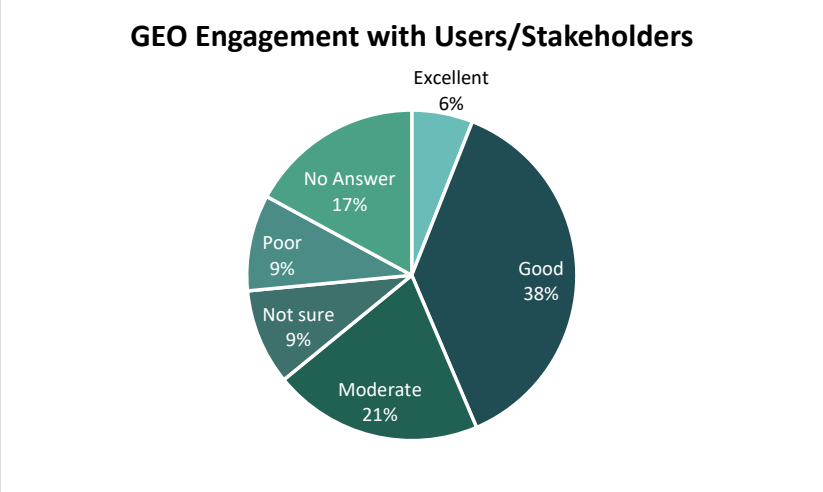
2.12 In your area of expertise, does GEO need to strengthen its relationships with complimentary global and / or national Earth Observations programmes and organizations?



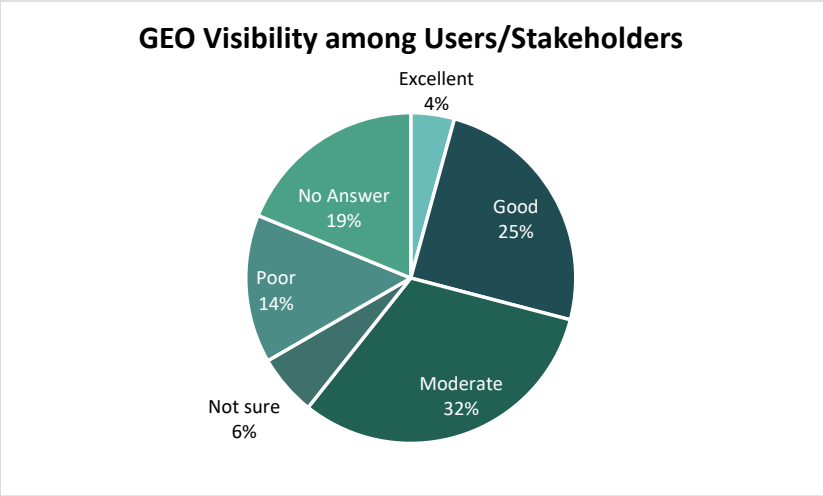
If yes, please specify (top three):

- WMO, UNFCCC, UNSDR, national space agencies, ESA, NASA, Copernicus, CEOS, better integration of the in situ data community in general.

2.13 How do you rate GEO's achievement in the following? [a. GEO engagement with users/stakeholders]



2.13 How do you rate GEO's achievement in the following? [b. GEO's visibility among users/stakeholders]

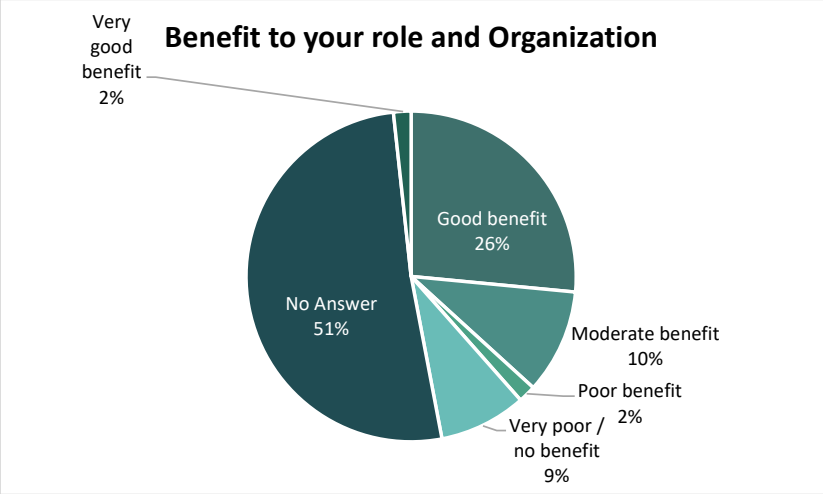


Additional comments:

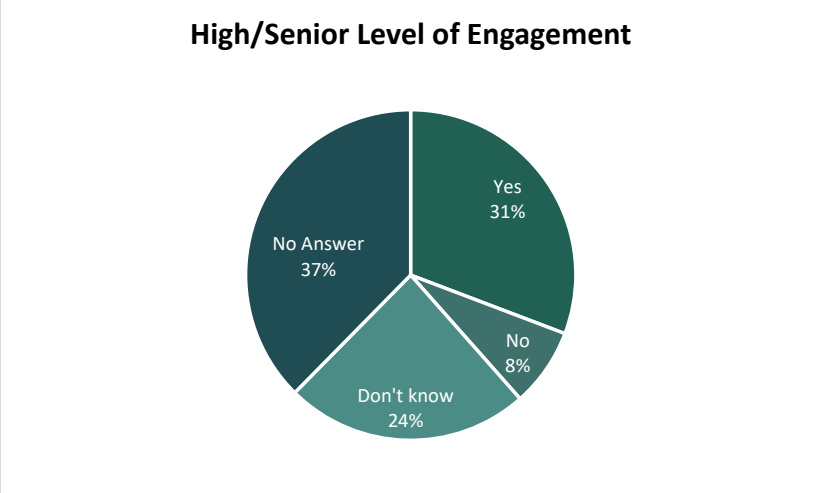
- Good work done by GEO but need to better engage and deliver value to certain categories of stakeholders.

2.14 The GEO Engagement Strategy (2017 – 2019) provides a set of comprehensive guidelines for the EO community in interacting within GEO and other external stakeholders.
a) Has the GEO Work Programme activity (Flagship, Initiative, Community Activity or Regional GEO) you are most involved with taken into account and used the GEO engagement strategy and guidelines?

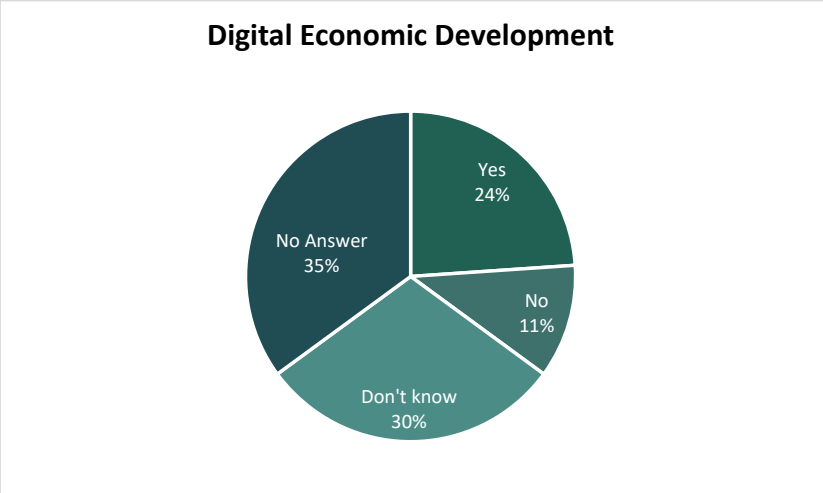
b) If "YES", how has the GEO engagement strategy and guidelines benefitted your role and your organization?



c) Do you think this strategy has helped GEO to engage at a high / senior level with target organizations listed in the Strategy?



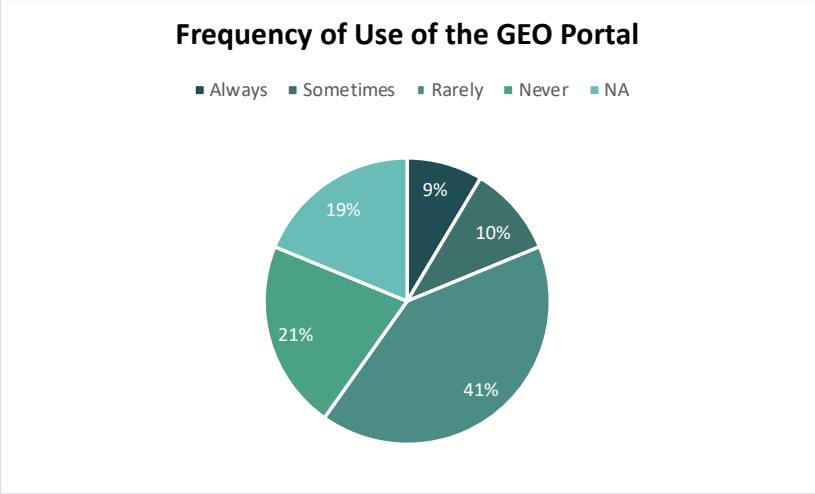
2.15 Do you have any evidence that GEO's activities through their focus on the importance of Earth observations, facilitation of access to EO data, and user engagement have promoted Digital Economic development by using Earth Observation Data?



If yes, please give additional comments or examples?

- Suggestions to work more with indigenous communities to foster use of EO
- Positive example: training and other material made available on the AmeriGEO platform

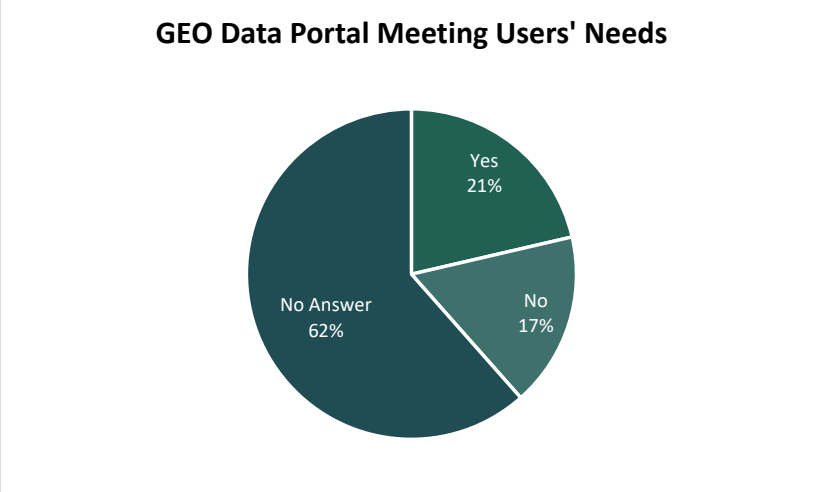
3.1 As a User, how often do you use the GEO Data Portal?



If you answered sometimes, rarely or never what other EO data access portals do you use (please specify, and how often)?

- NASA, ESA, NOAA, Copernicus, USGS, EUMETSAT, JAXA, among others.

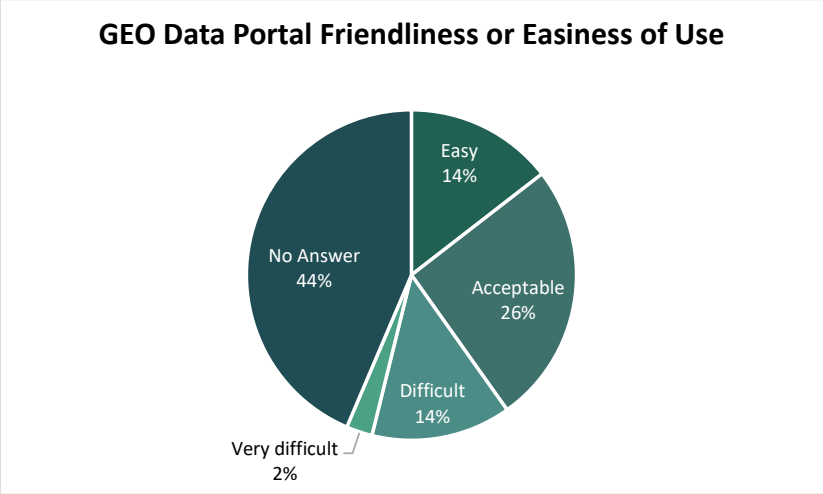
3.2 If you do use the GEO Data Portal, does it meet your user needs?



Additional comments:

- The interface is not user-friendly, and links are often missing
- Users refer to the fact that to find specific information they directly refer to the main source of the data.

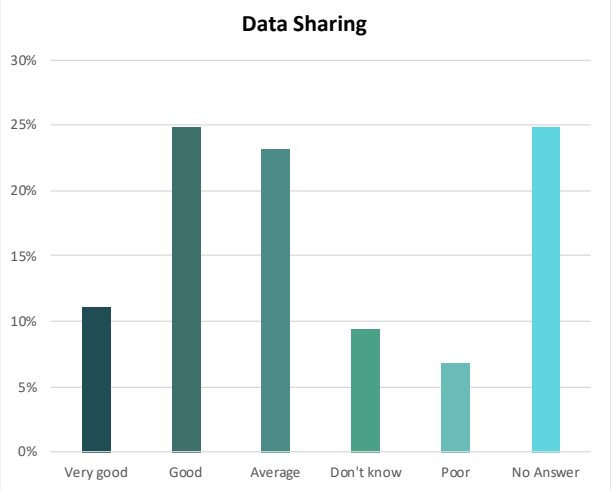
3.3 Do you find the GEO Data Portal user friendly and easy to use?



If "Difficult" or "Very Difficult", how can the GEO Data Portal be improved? Please elaborate:

- Missing access links and the portal is not user friendly, too many datasets are available and this could be confusing, but also there are no visualisation tools to map the data. Suggestions included producing a tutorial on how to use it.

3.4 How do you rate GEO's achievements in the following? [a) GEO Data Sharing: particularly GEOSS Data Collection of Open Resources for Everyone (Data CORE) and Open Data?]



3.4 [b) GEO Data Management Principles, including the need for common standards, discoverability, accessibility, usability, preservation, curation and interoperability arrangements.]

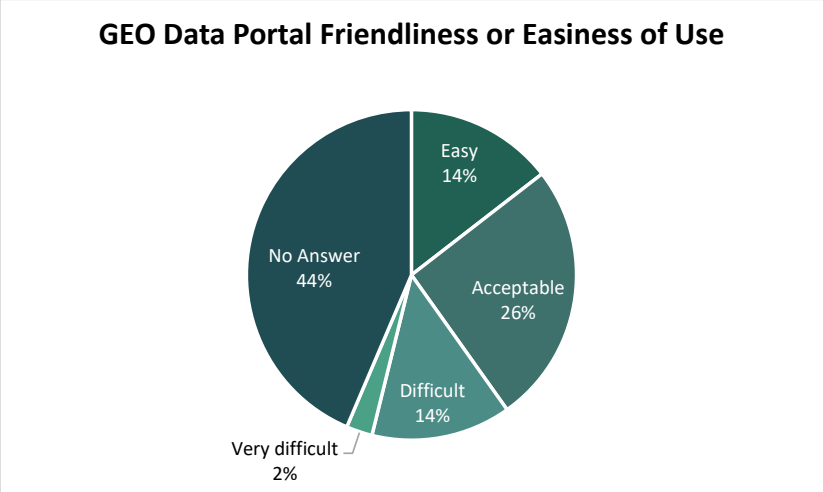
3.5 How would you describe the GEO Data portal based on your experience?

- The portal has improved but the search function still needs further improving and the user interface is not really intuitive, hence it could be made more user-friendly.

3.6 How do you think that GEO can improve with respect to increasing the use, sharing and availability of Earth Observations?

- Carry out more support activities as trainings, joint programs and training modules for the different users' communities on how to use it
- More communication is needed on the Portal, how it can be used and how it is structured
- Consider adopting a more modern conceptual architecture for the Portal.

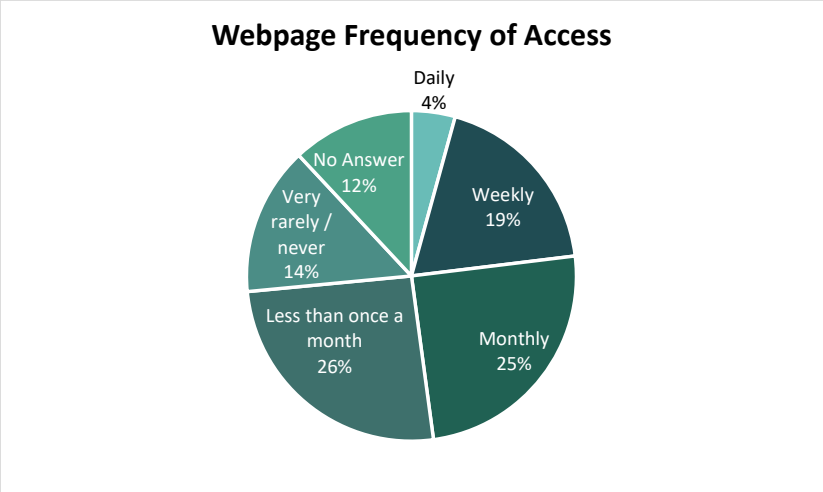
3.7 Does the GEO Data portal integrate / interoperate with other significant EO global and regional data access portals?



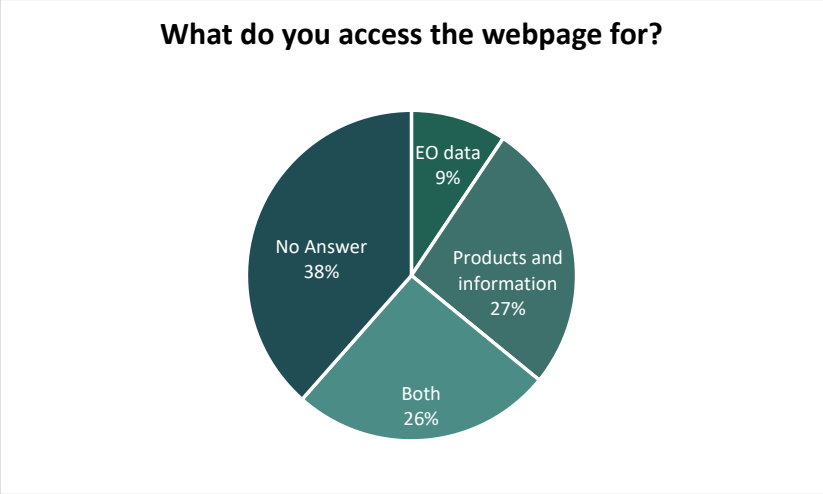
If yes, please provide an example?

- AmeriGEO, NASA, Copernicus, NextGEOSS.

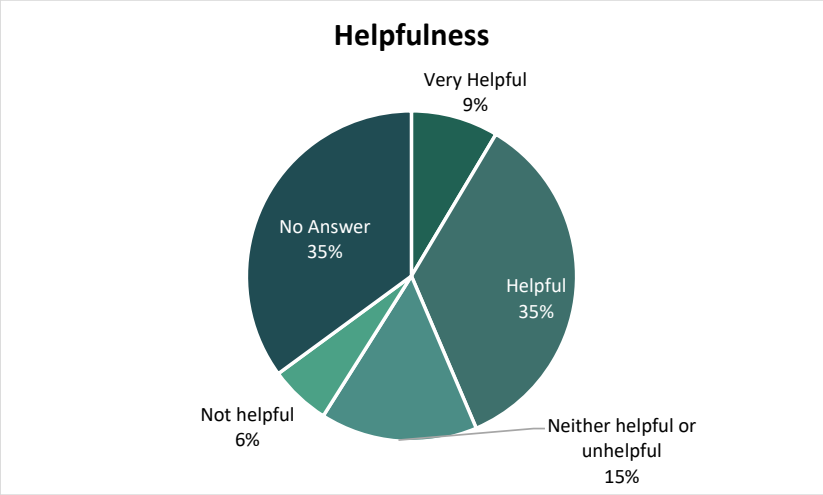
4.1 How often do you access the GEO webpages?



4.2 Are you accessing Earth observation (EO) data, or products and information provided by GEO?



4.3 As a user of GEO products and information, do you find the products and information services helpful in your work, particularly helping to inform decision-making?



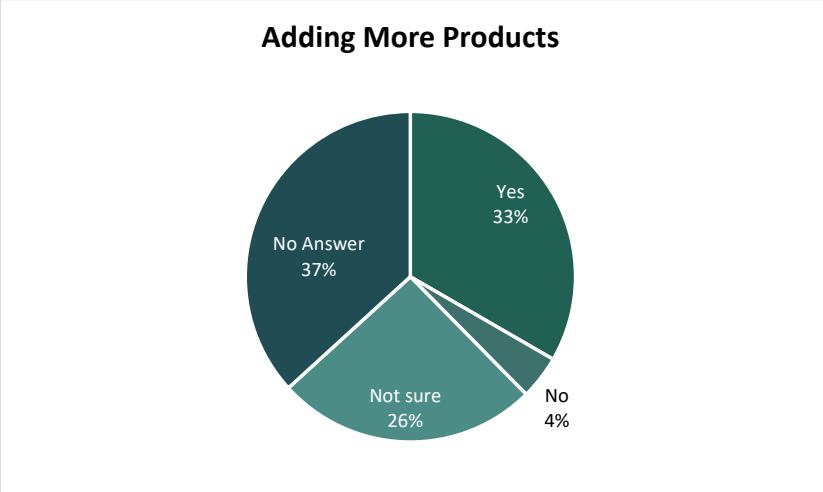
4.4 Can you provide an example of where GEO products and information services have provided benefit in decision-making?

- GEOGLAM monthly reports, GEOGloWS Flood Forecasting Tool, but in many cases, users access the products directly from the Initiatives/Flagships websites.

4.5 Can you provide any evidence of the benefit to decision-making from accessing GEO products and information?

- Information on global food security and global forests, use of early warning reports on food security by governments and decision-makers and of GWIS products.

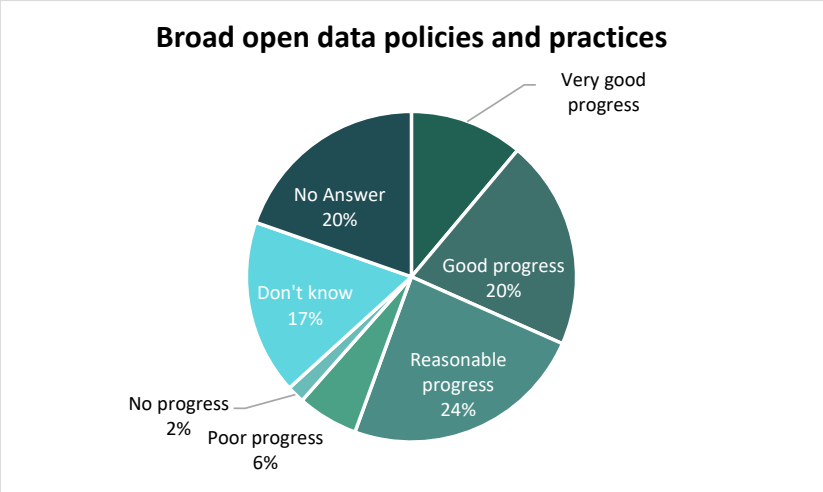
4.6 Would you like to see additional products and information sources available through GEO?



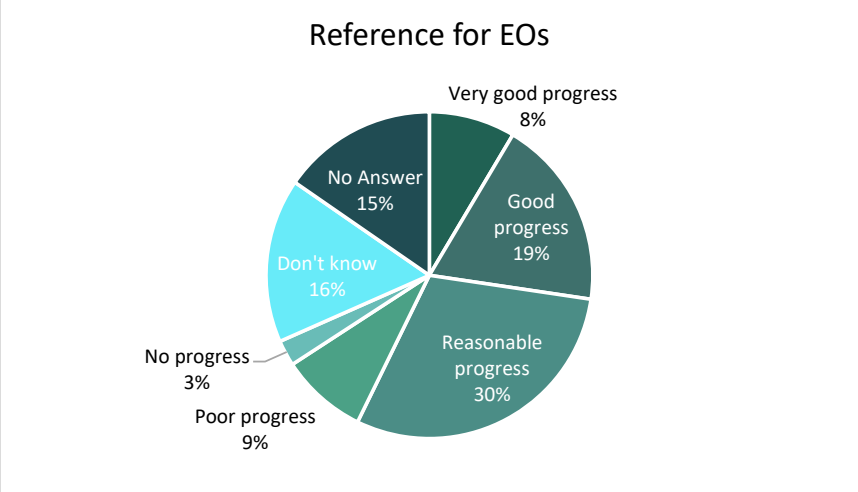
If yes, please suggest three:

- Need to showcase the work of members and good case demonstration more,
- Scale up reports for IPCC use, produce summary of global forests cover, mangrove monitoring,
- Inland coastal elevation,
- Urban data and urban resilience, transport data,
- Disaster monitoring products,
- Geothermal, energy and meteorological data.

5.1 To what extent has GEO achieved its Engagement Strategy aims in the following: [a) On broad open data policies and practices]



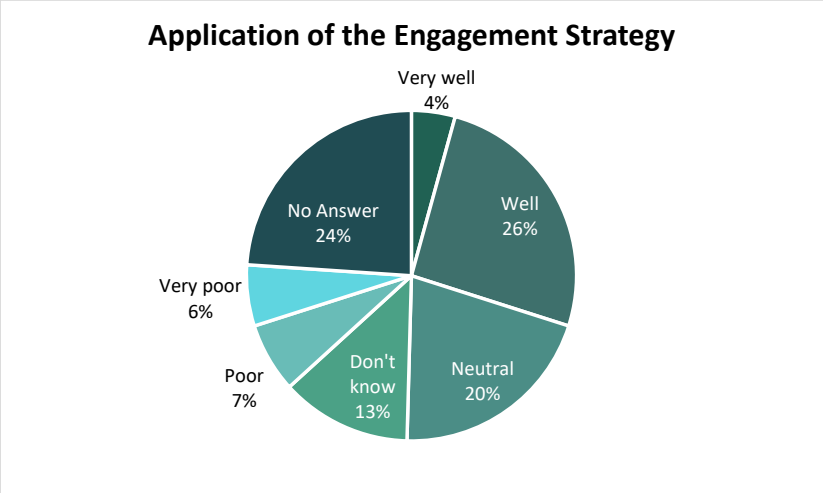
5.1 To what extent has GEO achieved its Engagement Strategy aims in the following: [b) Promoting GEOSS as a global reference for Earth observation systems, data and information]



Additional comments:

- Some are not very familiar with GEOSS and GEO is increasingly focusing on the GEO Knowledge Hub

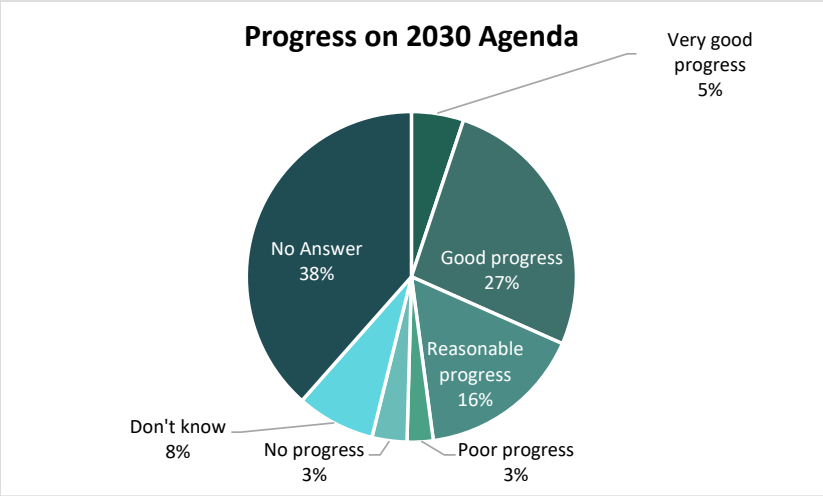
5.2 How is the GEO Engagement Strategy being applied to your work?



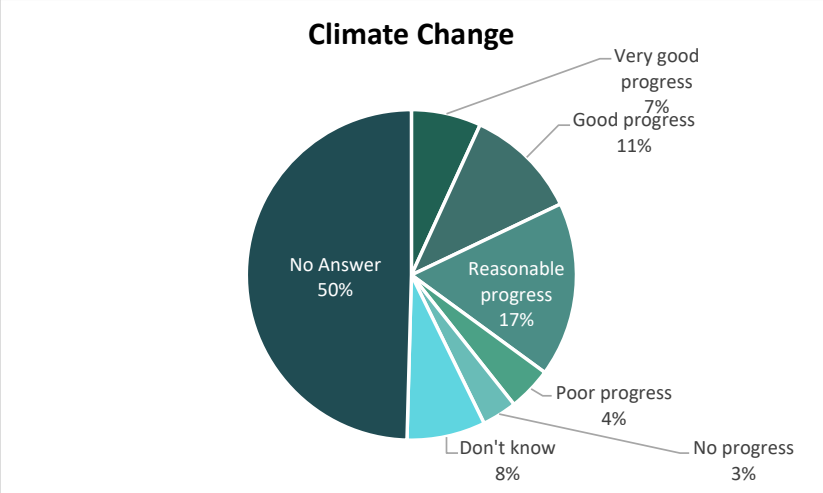
5.3 How is the GEO Engagement Strategy being applied within the GEO Work Programme?

5.4 Please choose which of the following GEO's engagement priorities best describes your involvement. Choose only one as the best fit. Give your rating on its achievement and provide

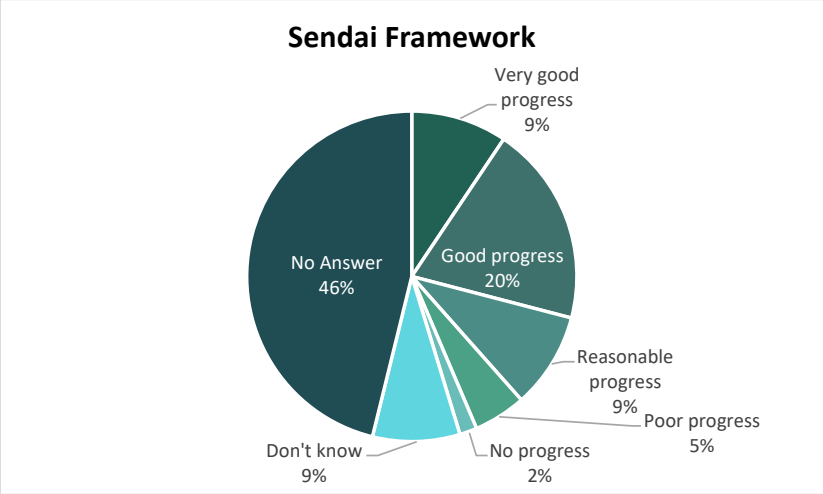
one example of programmes or work being carried out. [a) 2030 agenda for sustainable development]



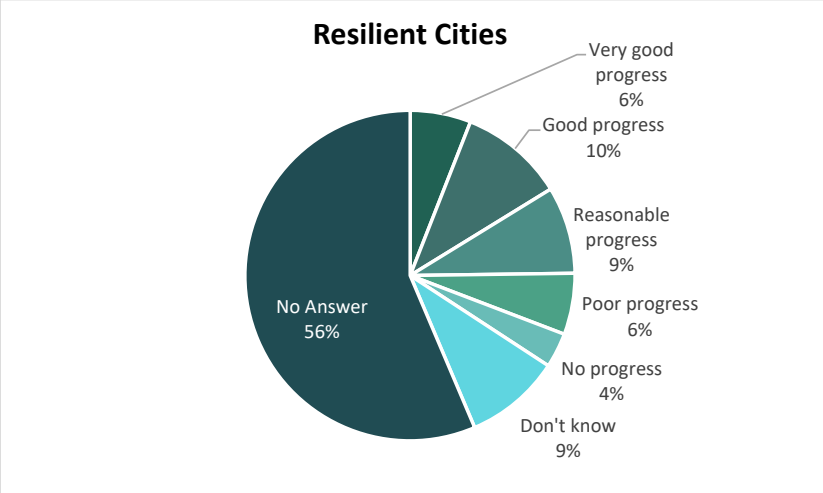
5.4 Please choose which of the following GEO's engagement priorities best describes your involvement. Choose only one as the best fit. Give your rating on its achievement and provide one example of programmes or work being carried out. [b) Climate change - greenhouse gas monitoring]



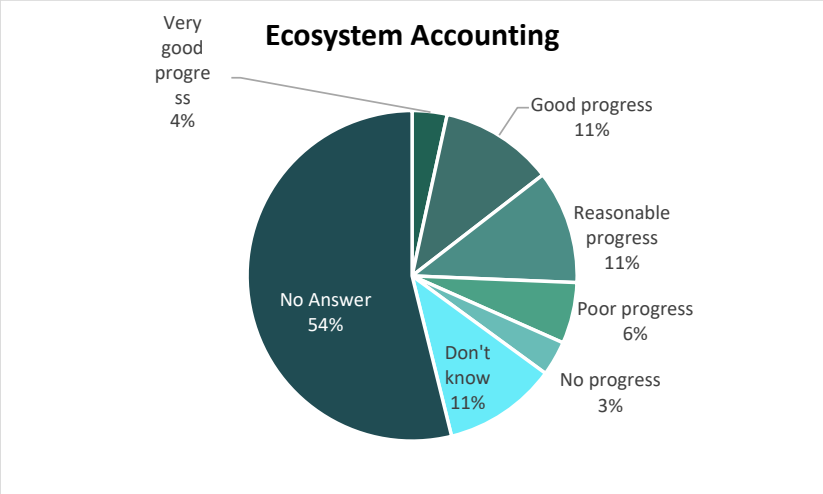
5.4 Please choose which of the following GEO's engagement priorities best describes your involvement. Choose only one as the best fit. Give your rating on its achievement and provide one example of programmes or work being carried out. [c) Disaster risk reduction]



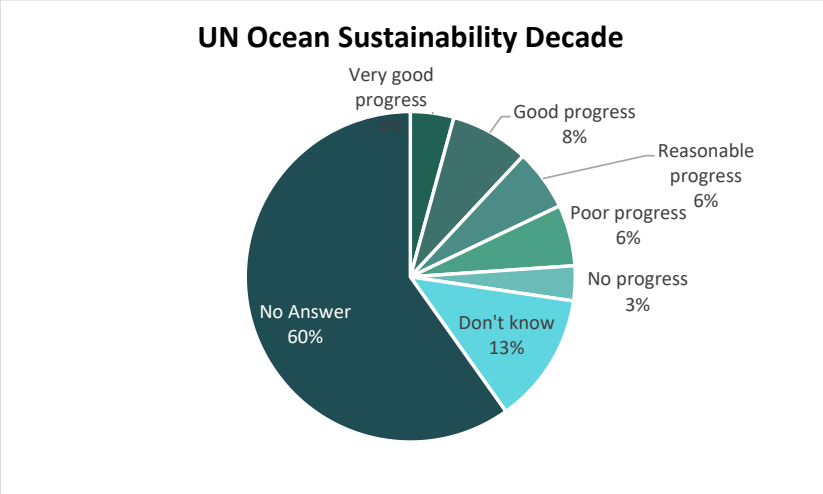
5.4 Please choose which of the following GEO's engagement priorities best describes your involvement. Choose only one as the best fit. Give your rating on its achievement and provide one example of programmes or work being carried out. [d) Resilient cities and human settlements]



5.4 Please choose which of the following GEO's engagement priorities best describes your involvement. Choose only one as the best fit. Give your rating on its achievement and provide one example of programmes or work being carried out. [e) Ecosystem accounting]



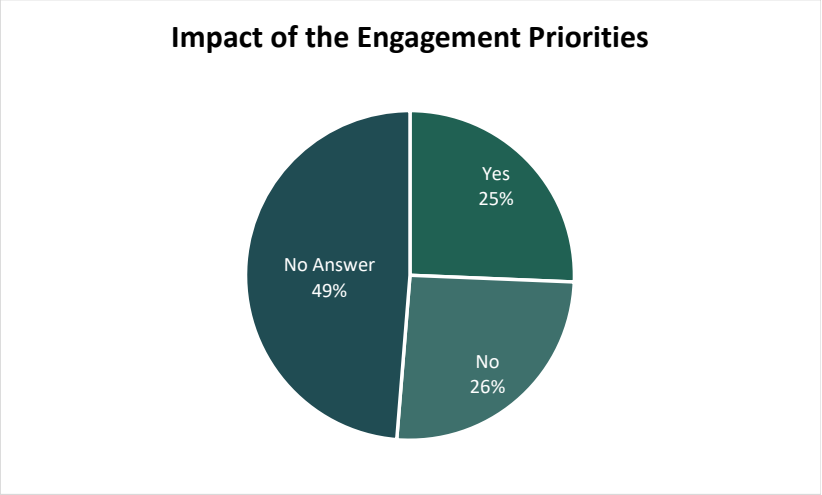
5.4 Please choose which of the following GEO's engagement priorities best describes your involvement. Choose only one as the best fit. Give your rating on its achievement and provide one example of programmes or work being carried out. [f) UN Ocean sustainability decade]



Please provide an example:

- A lot of GEO's work is in support of the SDGs (e.g. SDG 14.1.1: Coastal Eutrophication Product with UN Environment)
- Policies for Disaster Risk Reduction
- Biodiversity and Ecosystems data in line with SDGs 13, 14, 15

5.5 Has the introduction of the GEO Engagement Priorities impacted your area of work?



If yes, can you provide an example of this impact?

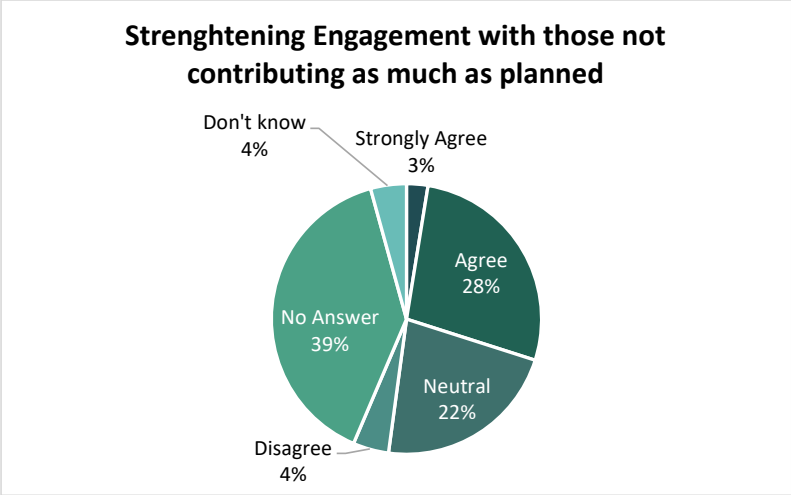
- Increasing momentum and better-defined focus of activities which has helped engage with UN and other entities
- Easier to attract funding thanks to the establishment of these priority areas

5.6 What recommendation would you offer to GEO regarding the future application of these engagement priorities to the GEO Work Programme: a) Generally; or specifically for b) UN Sustainable Development Goals, c) Paris Climate Agreement, or d) Sendai Framework for Disaster Risk Reduction?

a) Generally: report impact systematically, provide training and support material, increase regional and local focus, improve coordination across the GEO Work Programme, Engage more with developing countries, joint and better aligned action with an attention to

implementation. Overall, it is important that in all of these areas, GEO shows what it is doing and what it can actually deliver upon.
b) UN Sustainable Development Goals: cross-cutting coordination of initiatives working on SDGs, need for more top-down direction
c) Paris Climate Agreement: GEO to be more recognized in this space, consider climate change rather than just the Paris Agreement
d) Sendai Framework for Disaster Risk Reduction: need for more impact stories, have a secondee working in this specific area

6.1 Has GEO strengthened engagement with current Members and Participating Organizations that are not contributing as much as planned to GEO's activities?



6.2 How do you view GEO's Implementation Mechanisms (Community Activities, Initiatives, Flagships and Foundational Tasks) as a framework for enabling the broad GEO community to work together?

- The construct works fine overall, but it can be complicated to communicate and can be difficult to track and support, with, possibly, further need for simplification.
- Overall good, but there is a need to address potential overlaps and need for coordination of contributions, also issue of long-term sustainability of activities.

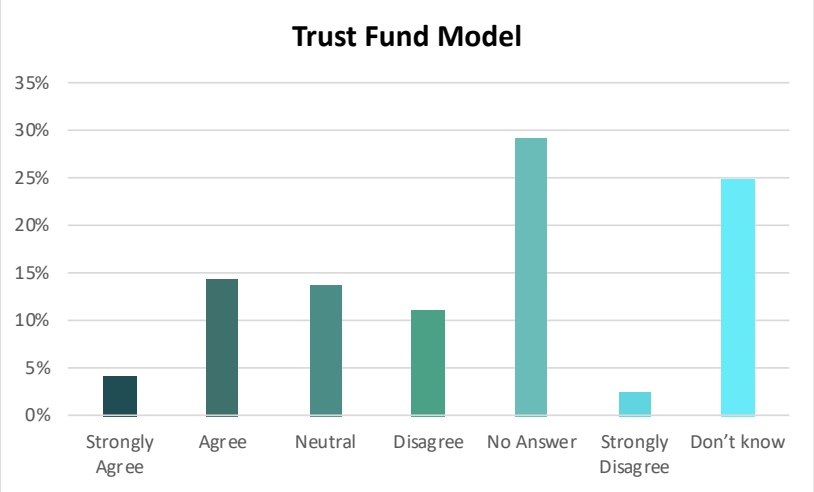
6.3 What recommendations would you make to GEO regarding these implementation mechanisms for the 2nd half of the Strategic Plan implementation period?

- Cross linkages thematic and regional initiatives, more interaction and integration of the GEO Work Programme activities with a more top-down definition of the goals these should contribute to.

6.4 How do you view changes* made to the GEO Governance bodies in the Strategic Plan (from 2016-2019)? *Including the distinction between GEO Flagships, Initiatives and Community Activities, the role of the GEO Programme Board, the concept of Core Functions, revisions to the Societal Benefit Areas, the organization of the Foundational Tasks, and the roles of the Regional GEOs. Please elaborate for each of the following:
a) The GEO Plenary: progress has been made in making the GEO Plenary more inclusive, but sometimes the Principals of certain countries feel disconnected from GEO. It may be good to brief and engage them more, focus on showing benefits of GEO activities at the plenaries rather than just on the commercial sector and procedural items,

b) The GEO Executive Committee: in general, contribution is okay but needs to be strengthened to provide direction,
c) The GEO Programme Board: it has improved in recent times, and it should increasingly welcome members from different countries,
d) The GEO Secretariat: small team performing very well, they have access to limited resources and it may be advisable that they are provided with clear guidance by the Executive Committee.

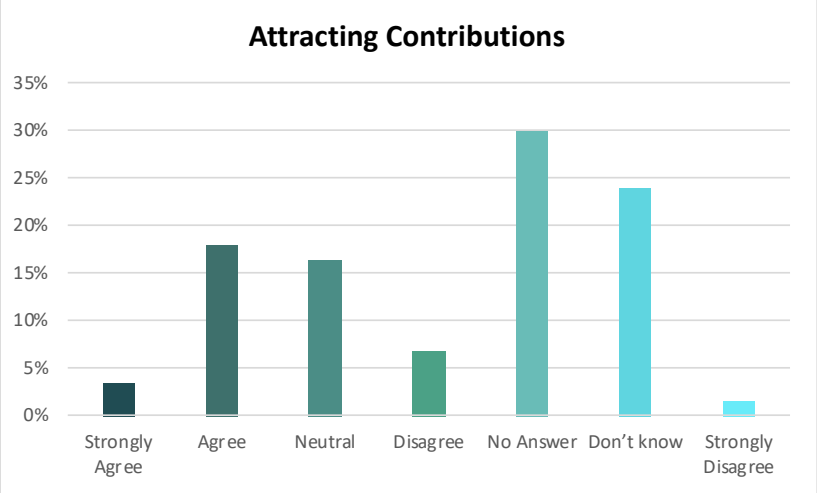
6.5 The GEO Trust Fund funding model currently relies on voluntary contributions from member-states and other partners to fund its operation. Has this model been effective in supporting GEO in carrying out its mission?



6.6 If you answered Neutral, Disagree or Strongly disagree to Question 5, what recommendations would you make to improve the GEO Trust fund model?

- Increase voluntary contributions: better advertise the Trust Fund and show how GEO delivers value to participants,
- Change funding model for a minimum contribution one (e.g. 4 years minimum contribution)

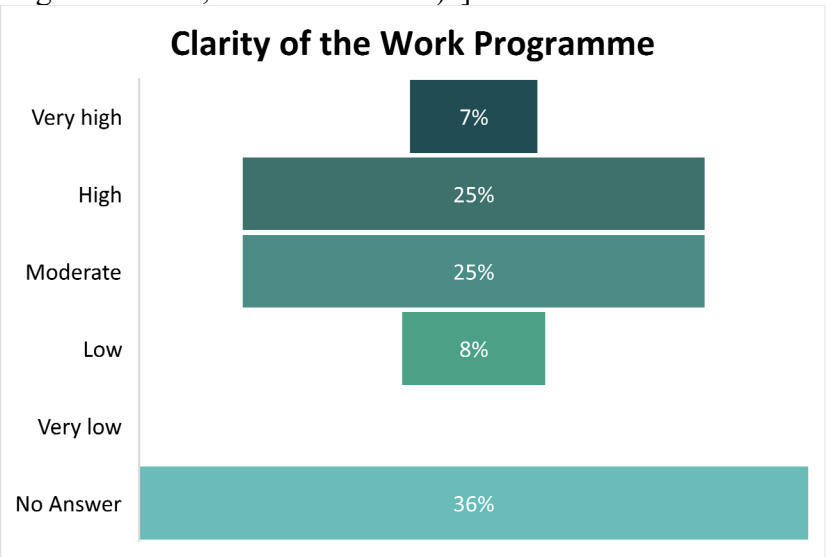
6.7 GEO's ability to mobilize resources (2016-2019) has been successful in attracting in kind and financial contributions needed to ensure that GEO can achieve its vision:

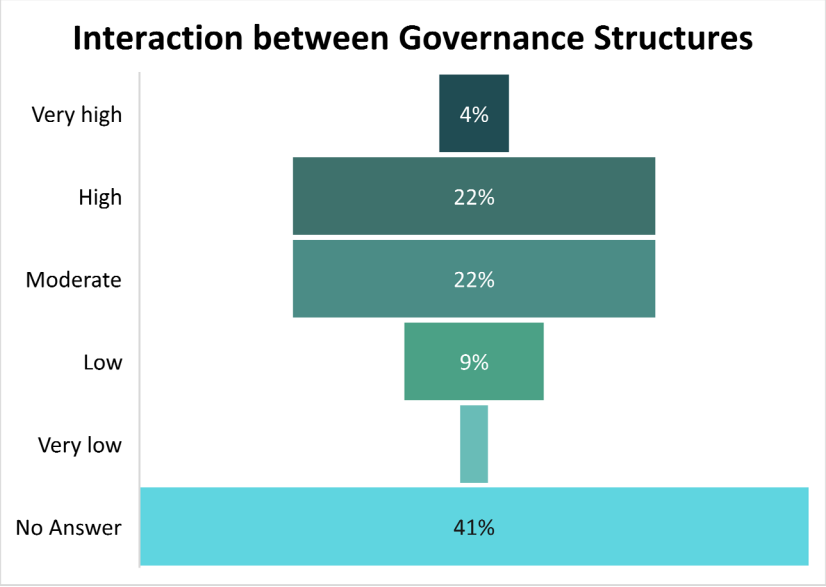


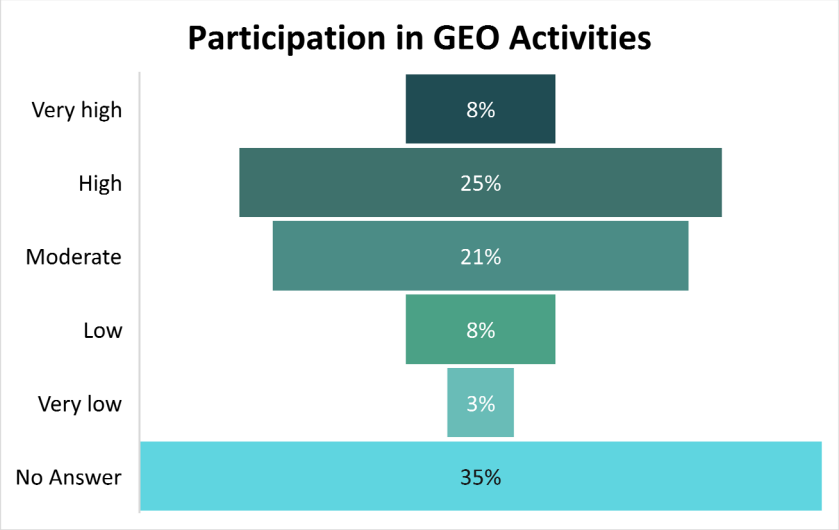
6.8 If you answered Neutral, Disagree or Strongly disagree to Question 7, what recommendations would you make to improve resource mobilization for GEO?

- Find more ways to mobilize resources (engage Principals, consider new avenues of funding such as the private sector and philanthropies)

6.9 What impact has the GEO Strategic Plan (2016-2025) had on the following:
[a) Improved clarity of the GEO Work Programme?]
[b) Improved interaction between governance structures within GEO?]
[c) Increased participation in GEO activities (Flagships, Initiatives, Community Actions, Regional GEOs, Foundation tasks)?]







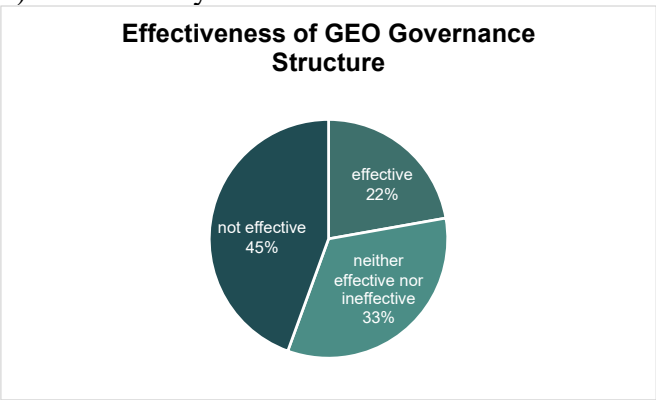
6.10 Can you recommend changes GEO should make in order to ensure long-term sustainability of its operations?

- Deliver clear impact and benefits, formulating a clear value proposition,
- Continuous engagement of stakeholders and in particular, improve relations with the private sector/industry,
- Increase funding and push all members to contribute,
- Need to better define GEO's role going forward and what niche it wants to occupy.

7.5.1.2 Secretariat's Survey

Governance

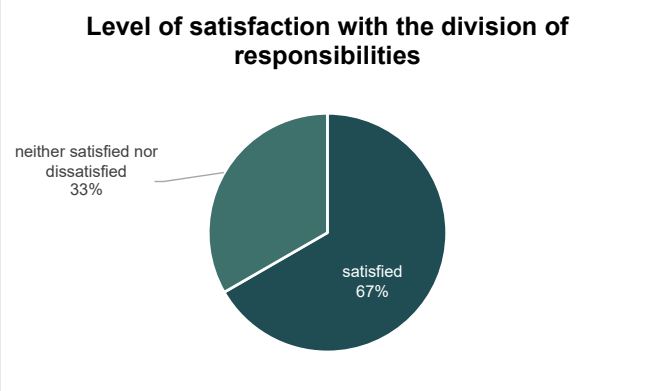
1) How would you rate the effectiveness of GEO's current governance structure?



2) What changes, if any, would you recommend to GEO's current governance structure? Please explain:

- Stronger governance (UN-like) and stronger engagement from members
- Suggestion that Executive Committee members are asked to contribute financially
- Executive Committee and Programme Board to increase engagement of members in the GEO Work Programme

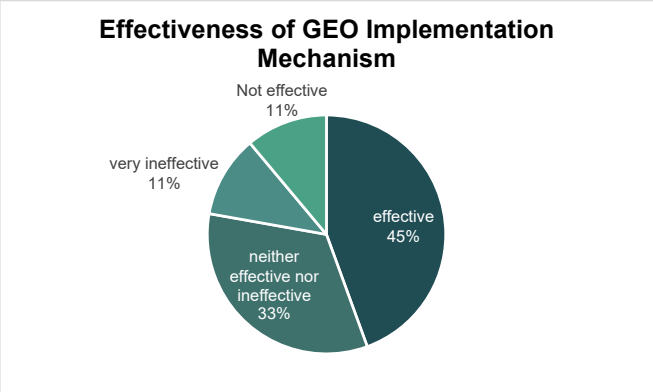
3) How satisfied are you with the divisions of roles and responsibilities between the GEO Executive Committee, the GEO Secretariat, the Program Board, and GEO's Implementation Mechanisms (Foundational Tasks, Initiatives, Community Activities, Regional GEOs)?



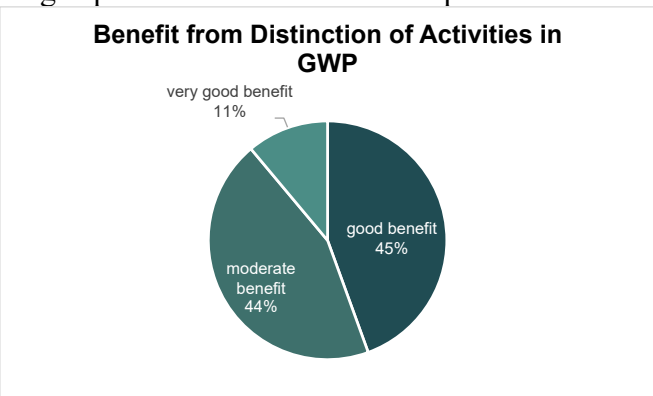
4) How is execution of the GEO's core functions impacted by GEO's Implementation Mechanism structure? Please elaborate:

- Improvement with the latest Strategic Plan, but a more top-down approach to implementation is needed with more strategic guidance being given to the organization as a whole

5) How would you rate the effectiveness of GEO's Implementation Mechanisms in furthering GEO's core functions as described in the Strategic Plan (2016 – 2025)?



6) What level of benefit do distinctions between GEO's Community Activities, Initiatives, Flagships and Foundational Tasks provide to GEO in its execution of the Work Programme?



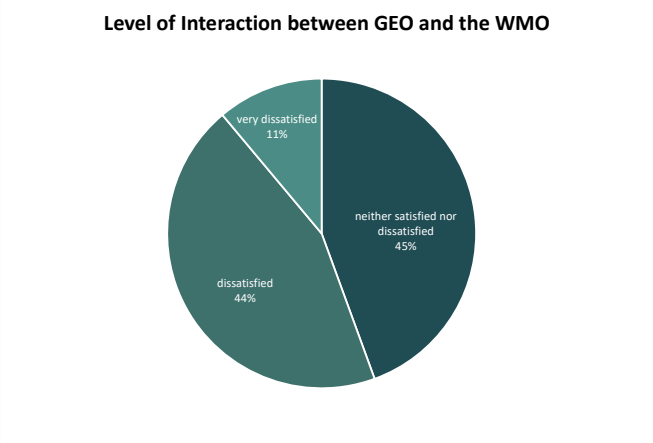
7 a) How would you characterize the relationship between GEO and its host organization, the World Meteorological Organization (WMO) with respect to administrative service provision? Please elaborate:

- UN staff status is valuable to have, but some components as IT and HR could be improved

7 b) How would you characterize the programmatic relationship between GEO and its host organization, the World Meteorological Organization (WMO)?
Please elaborate:

- Misunderstanding of certain stakeholders on GEO's role and status in relation to the WMO
- Need to differentiate mandates, in particular with regards to the climate area
- Consider mechanisms for better coordination

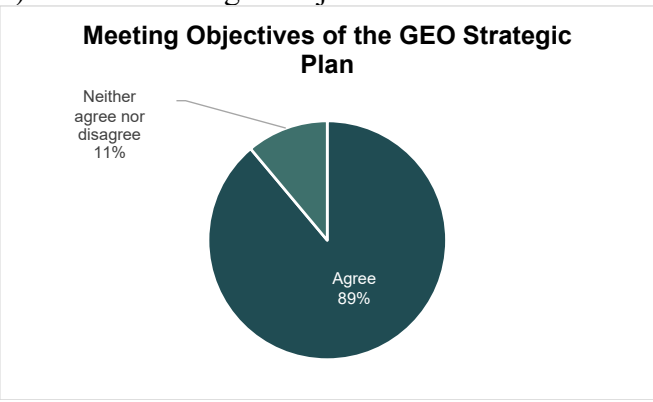
7 c) How satisfied are you with the present level of interaction between GEO and the WMO?



8) What in your opinion is the main role of the Secretariat in implementing GEO's strategic Plan?
Please explain:

- Coordination and support to the Implementation Mechanism
- Implementation of Foundational Task
- Provision of leadership to the organization together with the Executive Committee

9) GEO is meeting its objectives set out in the GEO Strategic Plan (2016 – 2025)?

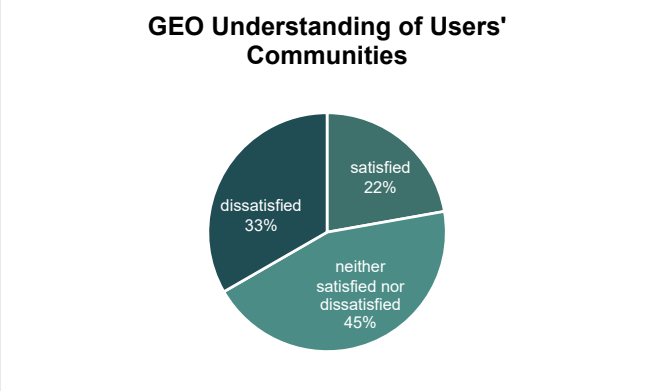


User Engagement

10) Who do you see as being GEO's primary users and stakeholders? Please choose your top three:

- National governments, institutions, academia and research community, local governments, commercial sector and NGOs

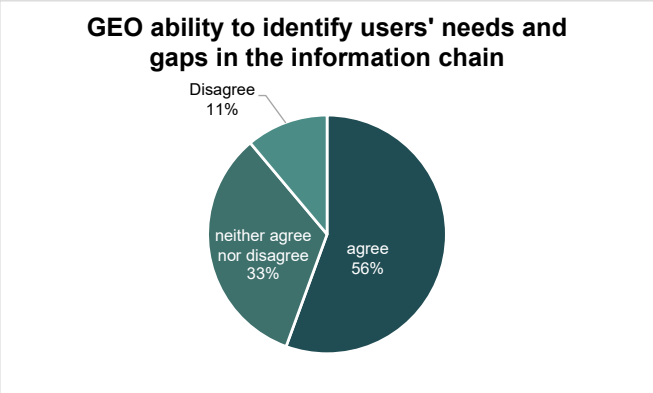
11) Are you satisfied with GEO's present understanding of its user community?



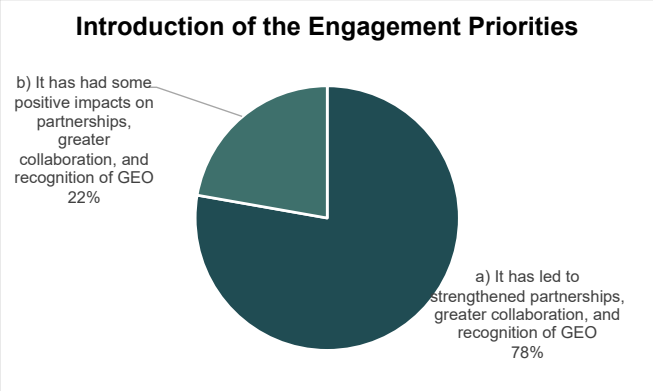
12) What steps, if any, would you recommend that GEO takes regarding user engagement in the next phase of its Strategic Plan implementation (2020-2025)? Please specify:

- Identify users' communities better
- Prioritise action because of limited resources and work more with national governments, relying more on Principals

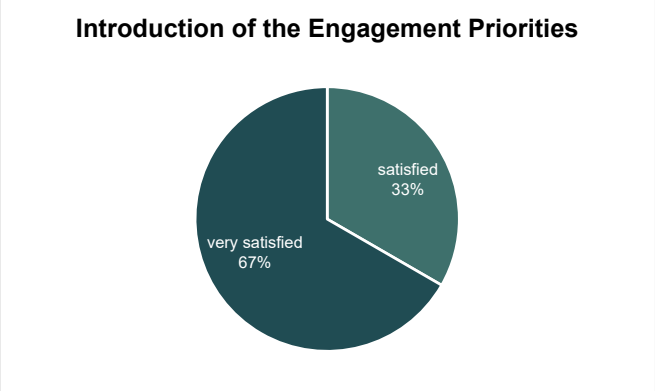
13) GEO is able to identify user needs and address gaps in the information chain?



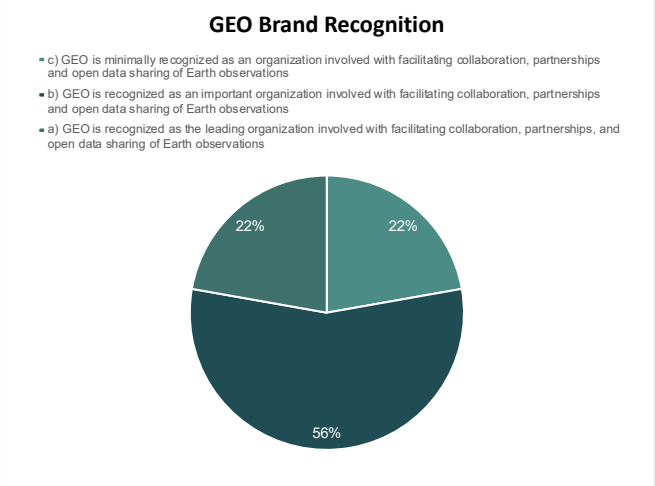
14) What impact has the introduction of engagement priorities had on GEO's Work Program activities relationship with United Nations Agencies, Treaties and Conventions?



15) How satisfied are you with the impact of GEO's engagement priorities on partnerships and collaboration with United Nations Agencies, Treaties and Conventions?



16) How would you rate GEO's brand relative to its recognition in the EO community and with GEO's stakeholders?



Implementing GEOSS

17) How would you define GEOSS and its role within GEO as an organization? Please explain:

- Very theoretical concept, which in some cases may limit or affect engagement with other organizations
- The Knowledge Hub development will help address this issue

18) Based on your experience, what advances has GEO made in regard to "implementing GEOSS"? Please specify:

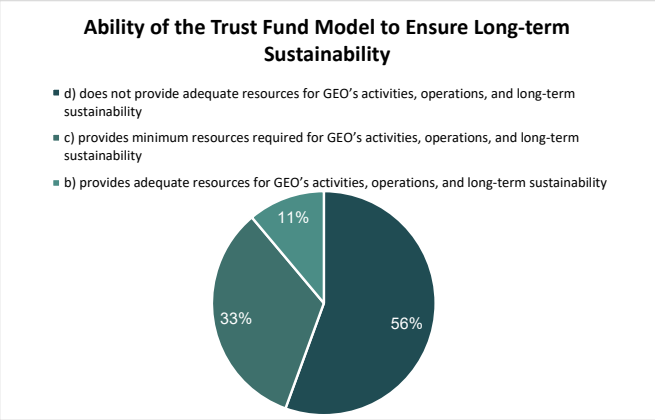
- The full vision for an integrated Earth System remains a challenge, however the Knowledge Hub is a positive development, same as the strategy to make GEOSS results-oriented.

19) What recommendations, if any, would you make with respect to implementing GEOSS in the next phase of GEO's Strategic Plan (2020-2025)? Please specify:

- Higher involvement and responsibility of developing countries in developing GEOSS and the Knowledge Hub
- Knowledge Hub as a positive development going forward

Funding/Administration

20) How would you rate the ability of the GEO Trust Fund funding model to ensure long-term sustainability of GEO's activities?



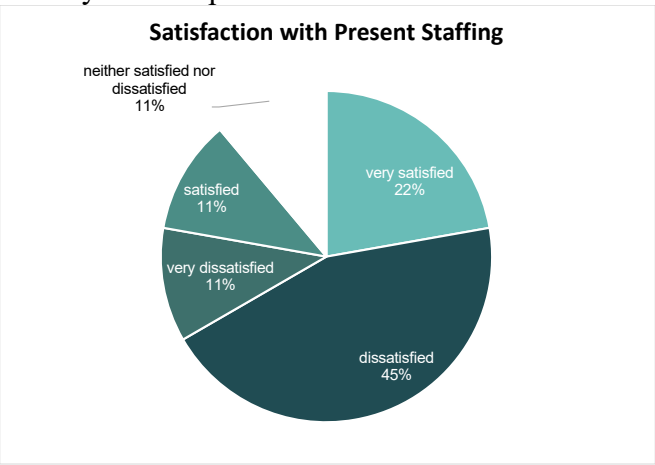
21) In your opinion, what steps could GEO take to maintain long-term sustainability of its key activities?
Please specify:

- Show real value to members and ask them to contribute
- Focus more on the policy side

22) What changes, if any, should GEO consider with respect to its present funding model? Please specify:

- Look at other potential sources of funds
- Ask that the Executive Committee members contribute to GEO
- Keep promoting contributions in line with the VISC, as there is still some work to do on this.

23) How satisfied are you with GEO Secretariat's present staffing capacity relative to its ability to carry out its operations?



24) What modifications could lead to positive impacts on the ability of the GEOSEC staff to carry out their mission with respect to GEO? Please specify:

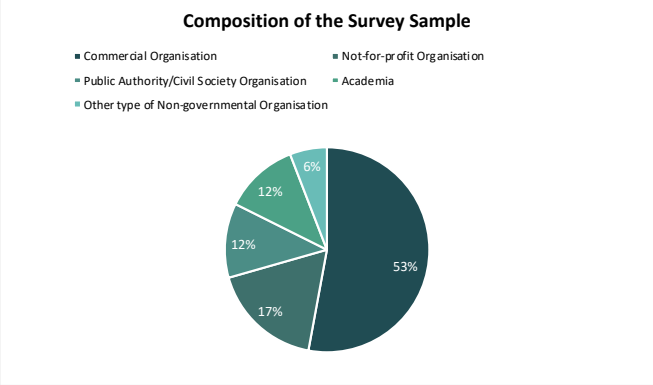
- Increase in the number of staff and secondments as it can be difficult to carry out all the tasks with limited resources
- Leadership to have a more holistic view of the organization

25) What recommendations would you make to GEO with respect to its current processes and infrastructure in how it implements the next phase of its Strategic Plan (2020-2025)?
Please explain:

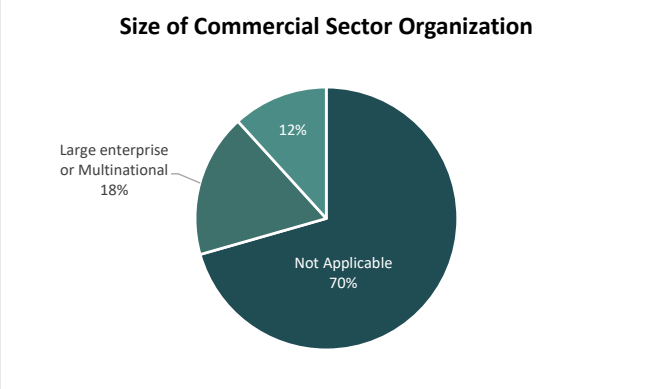
- Increase members participation and encourage contributions to the Trust Fund
- Make programmatic links across the Work Programme
- Improve overall direction given to the organization

7.5.1.3 Commercial Sector and Associates Survey

1. Which of these best describes your institution?



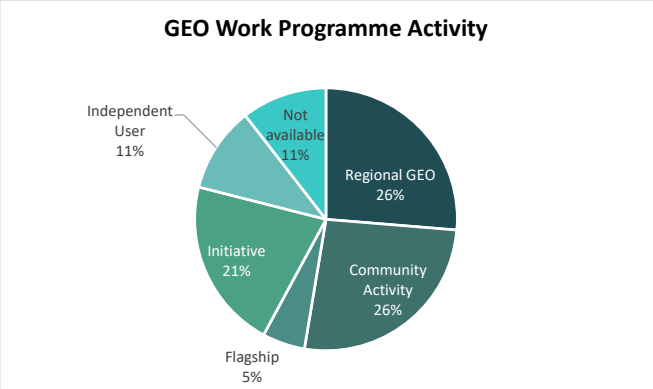
2. If you are a commercial sector organization, how would you describe your size?



3. For how long have you been involved / engaged with GEO?

- Average years of engagement: 5.6 years

4. Which GEO Work Programme activity have you been involved with?

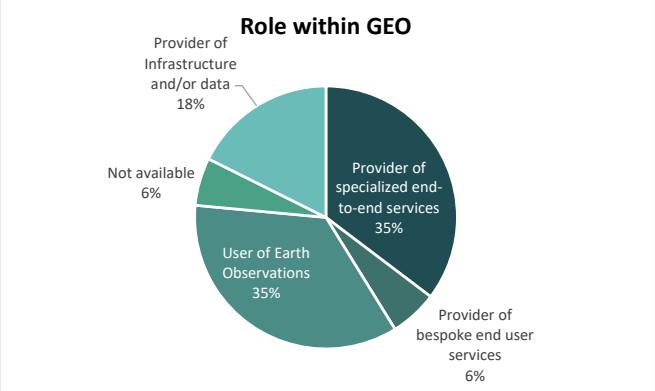


5. Please specify the names of the GEO Work Programme activities you have been involved with

- GEOGLAM, EO4Min, GEOGloWS, EO4EA, GEO-CRADLE, GEOBON, GEO-LDN, GEO Wetlands, Regional GEOs, among others

6. If you have been involved with one of the Regional GEOs, please elaborate further on the nature of the engagement
- Attend meetings, conference and workshops, provide inputs and work on joint programmes

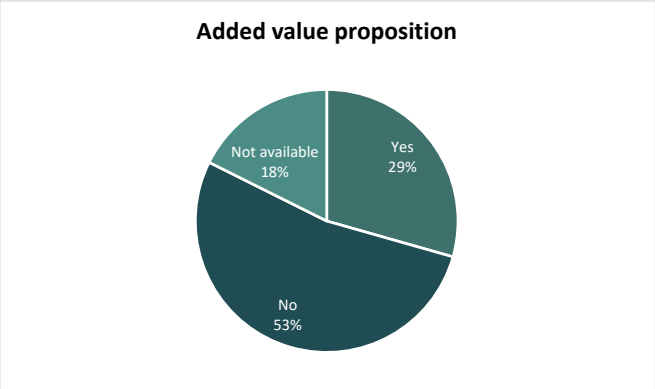
7. What has been your and your organization's role within GEO?



8. How has your organization benefited from the engagement with GEO and/or the GEO community? How can GEO benefit from the engagement with your organization?
- Networking opportunities with community members and exchange of data and best practices
- A few mentioned they have not benefitted or have not benefitted yet

9. How would you rate GEO's engagement with your organization?

10. Do you think that GEO has developed a clear added value proposition for the commercial sector to engage?



Please Explain:

- GEO is still very much focused on policy statements and engagement with bigger commercial partners, while it has not developed a clear value proposition for the commercial sector to engage, especially for SMMEs.

11. What are the obstacles, if any, that prevent your organization from increasing its engagement with GEO?

- Limited time and resources on the organizations' side and unclear value proposition/limited communication on GEO's side

12. How can your organization contribute to GEO's efforts to support capacity-development in the use of earth observations?

- Most of the respondents expressed the willingness to contribute to capacity development efforts of GEO going forward

13. What do you think GEO can do to help engage Small, Micro, and Medium Enterprises, as well as big tech companies across all of GEO's regions? In your experience, how can different types of commercial sector organizations participate with GEO?

- Provide more opportunities for the commercial sector, in particular SMMEs to engage with GEO and the GEO Work Programme through a clear value proposition
- Absence of a clear entry point to communicate with GEO so consider establishing a commercial division

14. How do you view the establishment of an Associates Category within GEO?

- Good idea providing companies with the opportunity to engage with GEO, an issue may be that SMMEs have limited time and resources to engage, need to focus more on the execution side

15. Do you have any additional comments?

- The establishment of such category gives the private sector the opportunity to positively contribute to GEO

16. (Optional) If you would like to provide the name of your organization, you can do so here.

- Names of the companies that took the survey

7.5.2 Interviews

7.5.2.1 Key Informant Interview

The GEO Mid-Term Evaluation (MTE) 2020 team has been given the mandate to review progress realized by GEO since 2016 and to assess the outcomes of implementing the changes introduced in *the GEO Strategic Plan 2016-2025*.

In addition to a survey, MTE is also conducting interviews with a selected number of candidates so as to gauge more information.

Below is a series of interview questions. We would like to remind you that you are not required to answer any questions that you cannot or choose not to address. Just let the interviewer know that you would like to skip the question and she/he will move onto the next one on the list.

Any information you provide will remain anonymous and none of your responses will be associated with you in our evaluation report.

In order to keep track of what has been said, the interviewer will record the meeting or take notes. If you do not wish for the interview to be recorded, please let the interviewer know. All interview notes/recordings will be destroyed at the end of the evaluation. If there is any information that you would prefer not to be documented in our notes, please let the interviewer know.

Personal information:
For how long have you been involved / engaged with GEO?
What has been your role within GEO?

Question 1:

- Do you think that the current GEO model is sustainable? Particularly, when it comes to maintaining and attracting voluntary participation of stakeholders in data/products sharing principles and in funding resources.
    - 23 think it is very, quite or overall sustainable, 1 thinks it is barely sustainable, 6 think it is not sustainable, 5 did not know and one did not answer
    - Major positive comments included: voluntary model, GEO as an alternative to Un organizations, increased focus towards products
    - Major issues included: unclear added value proposition, limited engagement, funding and resources
- How would you change the current GEO model? / What are the major changes which you would like to bring to the current model?
    - 33 agreed that some change is needed, 2 mentioned no change is needed and 1 was not sure
    - Major changes needed: improve users' engagement and engagement with other communities, deliver a clear value added and consider changes to the Trust Fund model

Question 2:

- In terms of GEO's engagement priorities within/between GEO, its communities and other organizations/stakeholders; how satisfied are you with the engagement and workflows?
    - 29 are very satisfied, satisfied or quite satisfied, 2 are not satisfied, 4 did not answer and 1 was not sure
    - Engagement Priorities have been positive in terms of providing the opportunity to engage with several stakeholders and there is a need to engage more local stakeholders and Regional GEOs
- According to you what can GEO do to improve upon this?
    - Make GEO more visible, formulate a clear value proposition and market it better,
    - Communicate more clearly GEO's added value and provide clarity on key issues,
    - Give more relevance to the GEO Work Programme and to the execution of the strategy,
    - Engage more at the local level, focusing on developing countries, better linking with users' communities,

- Do you think that GEO has been able to build a stronger relationship with UN agencies and other regional and global organizations particularly with regards to achieving the Engagement priority?
    - 27 think relations with the UN have grown stronger, 5 is not sure, 2 did not answer and 2 think these have not grown stronger
    - Relations have improved a lot since the introduction of the Engagement Priorities, but there is a need to deepen certain relations at a local level and there is space to, for example, improve the relation with the WMO
- Do think that GEO had maintained an adequate balance between focus on data infrastructure and access initiatives versus activities on developing societally relevant products and applications and the user interface?
    - 15 think there is no good balance, 11 think there is a good balance, 5 are not sure, 3 think there was a good balance in the past which has been lost and 2 did not answer
    - Some respondents noted how the balance with the launch of the Knowledge Hub has moved towards products, however, GEO should focus more on identifying and addressing users' needs. It has been noted that Regional GEOs could play a role in reporting on users' needs
- Based on your experience, is GEO recognized as a global leader in coordinating availability, access, and use of Earth observations (EO) for the benefit of the planet and humankind? Why or why not?
    - 15 think GEO is already a global leader, 8 think it is working towards becoming a global leader, 7 think it is a leader in certain areas and not others and 4 think it is a global player. 2 did not answer the question
    - GEO is mostly seen as a global leader with a unique capacity to convene, but some communities see other systems as systems of reference instead of GEO and recognize those as global leaders.

Question 3

- How would you define GEOSS?
    - GEOSS is defined as a system of systems, but the interview process has underlined how different actors have a different understanding of it
    - GEOSS is seen as very theoretical and not user-friendly. GEO has also made little progress in integrating the in situ component in GEOSS. However, overall, there is hope that it may become more practical with the Knowledge Hub
- Do you think GEO is on the right track as far as 'implementing GEOSS' is concerned? If not, what concrete steps can be taken to address this?
    - 25 think more has to be done to improve the implementation of GEOSS, 4 don't know, 3 did not answer and 4 think that only minor changes are needed
    - Better define what GEOSS and its value are to GEO and the community as a whole
    - Continue focusing on the Knowledge Hub, ensuring that this does not take over other GEO priorities
    - Continue work to integrate in situ data by promoting principles of open data and working with other organizations active in this field
    - Consider more modern technologies than the current ones

Question 4:

- According to you, what are the 2 main internal factors still limiting GEO's efficiency and/or effectiveness?

  - Top factors: limited resources (funding and staffing), limited communication and coordination across the Work Programme, need to improve engagement and to set an overarching mandate
- What are the root causes limiting efficiency and effectiveness on these two main factors?
  - Top factors: limited resources (funding and staffing), limited communication and coordination across the Work Programme, need to improve engagement and to set an overarching mandate
  - Many of these factors are seen as being connected to the voluntary model of GEO and the need to set a clearer overarching direction for the organization

- Can you think of any potential solutions which may be implemented?
  - Improve the GEO value proposition and strategy for engagement with the different communities including users, improve coordination and top-down direction given by the Executive Committee and consolidate the basis of funding and staffing resources
- We would like to hear your views on the existing GEO trust model. Do you think this model is sustainable? What changes, if any, would you like to see to improve the effectiveness of GEO?
  - 10 think the model needs to be changed, 5 think it works well, 10 think it works well but needs to be expanded, 7 did not know the model enough to answer and 4 did not answer
  - Expand the model through increased community engagement and delivery of a clear value proposition, engage with more potential donors and in general provide more clarity on the role of the Trust Fund and how it supports the Secretariat

Question 5:

- What emergent opportunities are on GEO's horizon?
  - GEO to become the reference organization in the EO field seizing the opportunity represented by the data revolution
  - GEO to increase efforts in capacity building and the developing world, increasing its linkages with the Regional GEOs
  - GEO to engage more with the private sector, users and other stakeholders providing the latter with added value products
- What emergent threats should GEO be aware of?
  - Presence of competitors in the same field, which may take over GEO's role in this area. Work to make sure that GEO collaborates with these other organizations such as the WMO
  - Need to market GEO's value to obtain funding and have members contribute to the organization
  - Risk that, if activities are not properly funded, they might not last in the long run
- Has involvement with the private sector increased over the years? Do you see this as beneficial, or does it detract from the core added value of GEO?
  - 18 think involvement with the private sector has been beneficial and it has to be regulated by a set of rules, 9 think engagement with the private sector is beneficial, 5 are not sure it has increased but think it would be beneficial, 3 think this engagement has increased but it would not necessarily be beneficial and 1 did not answer

- Need to further engage the private sector, in particular SMMEs but in general the engagement has been positive
- Improve the value proposition for this sector and address barriers to engagement for SMMEs
- Most of respondents were not aware of the GEO Rules of Procedure with the Commercial Sector

Question 6:
To sum up according to you:

- What should GEO keep on doing or do more of?
  - Engage stakeholders, increase regional and national engagement, communicate more, focus more on users' needs and integrating in situ data, continue working with developing countries
- What should GEO stop doing?
  - Most of respondents did not think GEO should stop doing anything and a minority mentioned it should stop building the GEOSS data infrastructure or the Knowledge Hub to just focus on its convening function

7.5.2.2 Targeted Interviews

This subsection will provide an overview of key points that emerged from the targeted interviews

GEO Secretariat

- Limited resources and funding and limited prioritization of activities with a lot of focus being recently put on the development of the Knowledge Hub
- GEO as a global leader in the EO field, but need to promote it and market it better
- Need to highlight role of the GEO Secretariat in supporting the execution of the Work Programme and functioning of GEO

GEO Work Programme

- With the Programme Board, the situation has improved, especially with the Engagement Teams, but the Work Programme still has a bottom-up structure
- Need to increase interconnectedness and coordination across the GEO Work Programme as this would also allow to establish synergies/complementarities

Capacity Development

- Efforts on capacity development should be carried out by the GEO Work Programme activities and not in a centralized manner
- Potential role to play here for Regional GEOs to connect with the users and support the implementation of the capacity development strategy

Budget

- Voluntary model is not unique, but typical of other international organizations
- Need to deliver a clear value added and engage members to increase funding
- It is also central to show the value added of the Secretariat and its work to attract funding

Private Sector

- Cloud Credits and License programmes have been viewed as very positive and with clear benefits on both sides and in general, there may just be a need to focus more on the capacity development element of some programmes
- GEO should improve its value added proposition for the private sector and particularly, for SMMEs
- Different companies have highlighted their preference for engaging with GEO in different ways and through different frameworks

Equality, Diversity and Inclusion

- Topic with need for increased attention within GEO and a primary role for Regional GEOs to work on promoting inclusivity and participation from different member states and other GEO members

GEOSS

- GEOSS can be a confusing concept and there is a need to better define and execute the system of systems improving integration of in situ data and connecting with regional and national data systems
- The Knowledge Hub is a positive step forward that needs to be harnessed to fill the knowledge gaps between Earth Observation and users

7.6 Evaluation Team Members

Mid-Term Evaluation Team Members				
Family Name	**First Name**	**Title**	**Organization**	**Representing**
Broad	Adrian	European Union Manager, International Relations Team	UK Met Office	United Kingdom
Dowell	Mark	Senior Research Officer	Joint Research Centre	European Commission
Hamer	Kate	Associate Director, European Partnerships	UK Research and Innovation	United Kingdom
Hui	Lim Ze	Director, Technical Training Division	Malaysian Meteorological Department	Malaysia

Nicinska	Justyna	Program Manager	National Oceanic and Atmospheric Administration	United States
Pauw	Johan	Managing Director	South African Environmental Observation Network	South Africa
Ramessur	Surekha	Divisional Meteorologist	Meteorological Service of Mauritius	Mauritius
Shirayama	Yoshihisa	Associate Executive Director	Japan Agency for Marine-Earth Science and Technology	Japan
Yang	Kun	Dean, School of Information Science and Technology	Yunnan Normal University	China
Caimi	Chiara	Monitoring and Evaluation Consultant	Group on Earth Observations	-