GROUP ON EARTH OBSERVATIONS

Draft Report of GEO-XIV

This Document is submitted to Plenary for decision.

Draft Report of GEO-XIV 25-26 October 2017 Washington D.C. United States of America

Wednesday, 25 October 2017

Meeting convened at 09:00 am at the Ronald Reagan Building and International Trade Center, Atrium Hall.

1 Session 1: Opening Session

Chair: Stephen Volz, Assistant Administrator for Satellite & Information Services, National Oceanic and Atmospheric Administration (NOAA), United States of America (USA).

1.1 Welcome from the United States of America

Mr Volz warmly welcomed all delegates to Washington DC and stated that the USA was honoured to be hosting the GEO week in support of all who are dedicated to using Earth observations for good decision-making globally. In his view, it is key that we learn to talk across communities and make sure all are included in the conversation, and the side-events of the previous two days had been tremendous in doing just that, highlighting the many successes of GEO and allowing people from all over the world to connect. He noted that more than 14 years ago, several nations got together and affirmed the need for "timely, quality, long-term, global information as a basis for sound decision making", and agreed to establish an ad hoc Group on Earth Observations. Over the years since that time, the GEO Plenaries have become recognized as premier gatherings of committed and dedicated experts and advocates sharing a common cause, which

is to apply Earth Observations and the information they provide to decisions for: societal well-being and security; scientific discovery and technological advancement; and economic and community development and healthy growth. Additionally, with passing year, new opportunities for engagement among champions from all sectors, all parts of the world are being created. Through its collaborative efforts, GEO is continuously improving the data and tools that enable benefits not only for individual nations but all around the globe.

Mr Volz noted that many remarkable weather and climate-related events had taken place during the year, including, severe droughts, flooding and landslides, and intense typhoons/hurricanes across all parts of the globe, challenging the resilience of local communities. Other phenomena are taking years to develop, such as desertification and sea level rise. Some nations are equipped to handle these while others do not have adequate capabilities. Getting much-needed Earth observations in real time to assist disaster and other extreme-event management has relied on international collaboration. GEO continues to be the convener that brings together the opportunities to apply Earth observations for world-wide use and benefit.

He continued by observing that the world is a different place now than it was 14 years ago. New satellite capabilities allow minute-by-minute pinpointing of the eye of a typhoon or hurricane, allowing emergency responders to react with ever greater efficiency. Similar examples exist for other Earth observation platforms around the world, which have incredible potential to aid understanding and be applied for societal benefit: GEO's job is to figure out how to make this happen. National Earth observation plans are being developed, pointing the way for others to follow since how to receive data is just as important as contributing. Referring to an old saying – best time to plant a tree is 20 years ago, and the next best is today – Mr Volz concluded by stating that the GEO tree planted 14 years ago is thriving, but we must not stop to simply admire it. Now is the time to plant new trees so that the GEO community can continue to flourish as it provides services and delivers information to society.

1.2 Opening Remarks

Co-Chair Philemon Mjwara, Republic of South Africa, expressed his thanks to the USA for hosting the GEO-XIV Plenary and GEO week. He looked forward to the panel discussions, in particular how GEO will be taking its Strategic Objectives – advocate, engage, and deliver – forward throughout the next decade. He also looked forward to learning about updates on the GEO Engagement strategy which he viewed as key for advancing GEO along with Plenary's endorsement of the updated 2017-2019 GEO Work Programme (GWP). He noted that the commercial sector will be participating in the Plenary for the first time. He thanked the GEO Secretariat Director, Barbara Ryan, for her steady nerves under duress, fellow Co-

Chair Robert-Jan Smits for his leadership during the past year as Lead Co-Chair, and all Members of the Executive Committee. He concluded by extending an open invitation to participate in the next AfriGEOSS Symposium, slated to take place on 25-27 April 2018, in Libreville, Gabon. .

Co-Chair Robert-Jan Smits, Director-General, Research and Innovation, European Commission (EC), welcomed all delegates to Washington DC for the 14th GEO Plenary session, and thanked the USA for hosting the GEO week, as well as the Secretariat for its preparations. He remarked that GEO and Washington DC have a special relationship since it was there in July 2003 that the first Earth Observation Summit was held. He announced that the EC will be increasing its contribution to the GEO Trust Fund, as well as to EuroGEOSS Initiative which features the Copernicus programme at its heart. He noted that Copernicus had provided satellite images and maps to the USA at time of recent hurricanes Harvey and Irma. In his view, the challenges currently facing GEO include optimally combining Earth observations with other sources of data, ensuring that Earth observations are taken up by society and the commercial sector, and improving communications concerning GEO and its activities. Finally, rendering Earth observations interoperable and accessible should continue to be a primary focus of GEO.

Co-Chair Wei Huang, Vice Minister, Ministry of Science and Technology of China, People's Republic of China, welcomed all delegates and expressed his gratitude to the USA for hosting the GEO-XIV Plenary. He also thanked Lead Co-Chair Robert-Jan Smits and Secretariat Director Barbara Ryan for their outstanding work and contributions over last year. He then highlighted several milestones that China had achieved over the past year, including the establishment of its own China GEOSS platform, will be utilized in social and economic planning for the country. He noted that full details on deliverables and achievements were available for review at the China exhibition area, and concluded by wishing the Plenary full success in its deliberations.

Secretariat Director Barbara Ryan, GEO Secretariat, thanked the USA for its warm hospitality in hosting the GEO-XIV Plenary and noted that, with over 700 delegates participating in activities of the GEO week, this was the largest attendance in the history of GEO during a Plenary not associated with a Ministerial Summit. In addition, the number of tweets about GEO was in the thousands, indicating that millions of individuals were being reached. Cambodia joined, sultanate of Oman. POs slide, recalls that Plenary gave ExCom the authority to approve POs. Download app for 2017, review schedule, exhibitor profies, etc. Explains slido, code needed, select session, vote on favourites. Statements – please submit to Rik, thanks US host and team for planning.

1.3 Approval of Agenda

Outcome: The agenda was approved, with no modifications.

1.4 Approval of Draft Report of GEO-XIII

Outcome: The draft report was approved, with no modifications.

1.5 Earth Observations: Insight for a Changing World

Barbara Ryan then introduced the Members, Participating Organizations, and Observers joining GEO over the course of 2017:

Members

- 104th Member: The Royal Government of Cambodia, effective 23 January 2017; and
- 105th Member: The Sultanate of Oman, effective 24 April 2017.

Participating Organizations

Approved at the 39th Session of the Executive Committee, 9-10 March 2017:

- (CI) Conservation International;
- Earthmind;
- (GODAN), Global Open Data for Agriculture and Nutrition; and
- (UNICEF), United Nations Children's Fund.

Approved at the 40th Session of the Executive Committee, 11-12 July 2017:

- AGRHYMET Regional Centre;
- (COMIFAC), Central African Forest Commission / Commission des Forêts d'Afrique Centrale;
- (CSDMS, Community Surface Dynamics Modeling System;
- (CRCSI), Cooperative Research Centre for Spatial Information;
- Eurogeographics;
- (ISESTEL), Institut Supérieur d'Etudes Spatiales et Télécommunications;
- (ECLAC), United Nations Economic Commission for Latin America and the Caribbean;
- The Paul G. Allen Philanthropies; and
- (WRI), World Resources Institute.

Total number of Participating Organizations in GEO: 118.

Observers

There were no new Observers this past year.

Total number of Observers in GEO: 12.

2 Session 2: Earth Observations in Public Policy

Session 2 featured a Panel discussion with city-and country-level policy makers to examine the current use of data in informing public policy. The discussion was designed to illustrate and promote the ways in which GEO Members can engage with the public sector to further support efforts promoting sustainable development and building resilient communities

The panellists included:

- Ann Bartuska, Vice President for Land, Water, and Nature, Resources for the Future, (RFF)
- Francis Blair, Senior Manager at Strategic Planning Environment, Jamaica
- Carlos Felipe Prada Lombo, Department of National Statistics (DANE) – Colombia
- Eli Yewdall, Senior Programme Officer, International Council for Local Environmental Initiatives, (ICLEI)

Moderator: John Firth, CEO, Acclimatise, UK

The Moderator set the context for the session by stating that what is exciting about Earth observations is that it is a largely untapped resource, and that the gap between end-users and providers needed to be closed in order to make better use of this important resource. His objective for this panel discussion was to provide insights, both obvious and less so, as to how the public sector both currently uses Earth observations, and could potentially increase its uptake of this resource.

To start the session the Moderator's requested real life stories as to how Earth observation data is being utilized to make an impact.

- Anne Bartuska noted that, prior to Landsat imagery, forest inventory analysis at the United States Geological Survey (USGS) had a very time-consuming, labor-intensive task. However, with the advent of remotely-sensed imagery, mappers can now easily keep track of forested regions, including composition, deforestation and reforestation zones, and urban expansion. The key point is that satellite imagery, especially when combined with data from other systems, provides a broader view at temporal, spatial scales, and this in turn allows public policy to determine where to focus resources;
- Eli Yewdall observed that in the USA, there is an emphasis on climate change mitigation adaptation, and preparedness for climate change impacts. Earth observation data can help local governments focus on

assessing vulnerabilities and building resilience, connecting data providers and users. The private sector can have in important role to play here, in helping make this connection happen. Additionally, climate projections, downscaled to regional and local scales, provide information necessary for cities to understand how they are vulnerable to various threats, from droughts to extreme precipitation events;

- Carlos Felipe Prada Lombo noted that DANE has established a smart-data strategy that includes Earth observations, in which the national statistical office connects with the Colombian government for SDG reporting. This is in contrast to the situation ten years ago, where all data produced by DANE was only for internal uses only. Now DANE's policy is that data belongs to everyone, especially users, and consequently all data products (including natural and cultural census data) are made available freely on web as part of the public domain. DANE strongly believes that this type of open data policy should be adopted by all national statistical offices;
- Francis Blair replied that as a Small Island Developing State (SIDS), the government of Jamaica is working to protect the environment by ensuring that development happens in an orderly, sustainable fashion. And, because it is a SIDS, Jamaica is vulnerable to climate change and impacts, all the more so since most of its infrastructure is located along the coasts. Other challenges include the concentration of populations in urban area while lacking the infrastructure to support growth, incompatible land use, land converted into housing developments, coastal erosion, and a lack of coordination between agencies. Jamaica is preparing a national policy to combat these challenges and Earth observation data and information is a critical component for assessment and planning. Indeed, open access to satellite information is important for Jamaica to improve its decision-making, protect its environment, and build its economy sustainably.

The Moderator noted a couple of issues were appearing in connection with Earth observation data: 1) a plea for all countries to adopt a broad, open data policy, and 2) a need for better data sharing and collaboration not only between the government and the private sector, but also between government departments themselves. He then asked the panel how they would be affected if Earth observations and information were not openly accessible.

- Carlos Felipe Prada Lombo responded that with open access to data, students and colleagues from all over world were able to use DANE's systems, which has led to many fruitful collaborations that otherwise

would not be happening. In DANE's view, data is a public good and all DANE needs to do is provide the data and let people use it;

- Francis Blair replied that it is possible for the Jamaican government to take better decisions and make faster progress in implementing its national policy, as open data overcomes scares resources and limited capacity. In this sense, an open data policy helps drive development;
- Ann Bartuska observed that this was an important conversation because open access to data and information allows all segments of society to be on same playing field, ultimately contributing to the public good. Open access to data allows fresh perspectives and contributes to innovation and new insights;
- Eli Yewdall added that having access to government data was critical for the work done by ICLEI. Inventories would be much harder without easy, full access. A variety of cities are making their air quality data available to public and providing reporting platforms to the citizens, which spreads awareness of air quality issues while getting the public involved.

The Moderator then asked the panel if the SDGs were important to their respective organizations in terms of setting policy and giving government direction, and if so, what activities being done in terms of supporting SDG monitoring might be of interest to other countries.

- Carlos Felipe Prada Lombo responded that, since the Colombian government made the decision to include SDG monitoring in its national development plan three years ago, DANE has been working with the Colombian Institute of Hydrology, Meteorology and Environmental Studies (IDEAM) to produce all data needed to produce reporting on SDGs. However, in his view, data for SDG monitoring can come from a variety of relevant agencies and other sources, including the private sector. He cited collaboration with NASA as being critical for reporting on SDGs. In terms of guidance to other countries, Colombia created national statistical plan for producing SDG information featuring a strong regulatory framework that includes both public and private sectors;
- Francis Blair remarked that GEO could have an instrumental role to play in providing the kinds of integrated data and methodologies needed for SDG monitoring. She noted that Jamaica had aligned itself with the targets of the SDGs, incorporating them in its national programs, projects and policies. Her advice would be for other countries to likewise and ensure their national policies are aligned with SDGs. The work being done in Jamaica can serve as a template as

to appropriate methods for collecting and using data. Also, methodologies for assessing indicators should be shared among the nations.

The Moderator queried the panel as to whether governments should invest in open Earth observation data systems as much as they do for other infrastructures.

- Carlos Felipe Prada Lombo replied that what was needed was not just investment in Earth observation data and information, but all kinds of data such as socio-economic;
- Ann Bartuska believed strongly that data and infrastructure, in both hard and soft formats, should be invested in, not just for informing decision-making, but also for stimulating the economy. As an example, experience in the USGS and the recent decline in stream-flow measurements proved just how valuable those observations were for decision-making, which has led to a turn-around in support for monitoring;
- Francis Blair felt that the government should invest in a public information system featuring interactive real-time data and information that would inform policy and allow decision-making to be made quickly and effectively (for example zoning assessment and planning).

The Moderator then commented on the over-abundance of data, that there is so much of it available it is sometimes difficult to know where to start. Thus he wanted to know if advocating open data comes with the responsibility to train people on how to use it?

- Eli Yewdall agreed, saying that often users may not know that they need certain types of data or are not aware that it exists, let alone how to use it. They simply don't know what questions to ask, thus there is an additional need to bring potential users early into the development process, to allow for iteration and training;
- Carlos Felipe Prada Lombo also agreed, noting that some institutions in Colombia had requested training after certain datasets had been released by DANE (e.g. cultural census);
- Francis Blair commented that, indeed, technical assistance was needed to develop capacity and strengthen institutions, especially in the areas of analysis and interpretation.

Other points made by panel members included:

- Finer spatial and temporal scales of Earth observation data helps with sectors such as precision farming and water management, allowing optimization of resources and efficient decision-making;
- Remote-sensing can help pinpoint where higher than expected GHG emissions rates are happening, which can then influence policy. There is value in linking data across different scales: downscaled climate projections can help anticipate severe rainfall events, which, combined with topography and socio-economic data, can help assess vulnerability down to individual buildings;
- Earth observations need to be delivered in real time as much as possible, to manage many sectors, especially disaster forecasting and mitigation;
- Tremendous opportunity to get citizens involved in data collecting is through citizen observatories which, if managed correctly, can influence policy. For example, there is the US National Phenology Network and the international Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) where citizens provide data into a structure with clearly defined methodology and protocols surrounding the information collected. The advantage of citizen observatories, besides cost, is that the sheer volume of data will drown out outliers.

In closing the session the Moderator asked the panellists what the highest priority challenge that each of them faced that Earth observations could unlock and help move towards a solution.

- Ann Bartuska responded that quantifying water reserves and being able to more fully understand how water networks function was a main challenge. The lack of water knowledge, especially with respect to underground reserves, made public policy that included water allocation difficult;
- Eli Yewdall said the greatest potential for Earth observations to improve responses to societal challenges would be in greater understanding of fine scale vulnerabilities, flooding and sea level rise;
- Carlos Felipe Prada Lombo replied that detailed, accurate portrayals of topography – which is very complicated in Colombia – was fundamental to generating many information products, essential to improving decision-making;
- Francis Blair answered that accurate and reliable data for monitoring land use and change, ecosystems, wetlands, coral reefs, sea grass,

flora and fauna were major challenges. Earth observations for tracking development, especially in areas of sensitive natural resources, and predicting impacts would be very beneficial.

3 Session 3: Earth Observations in the Commercial Sector

Session 3 featured a panel discussion with commercial sector decision makers to explore how they currently use Earth observations in order to assess and manage risks, thereby optimizing their investments. The discussion was designed to inform the GEO community how best to engage with the business sector to promote and advance utilization of Earth observation data.

The panellists included:

- Jack Dangermond, President of Esri (Environmental Systems Research Institute);
- Jon Davis, Chief Meteorologist, Riskpulse/Earthrisk;
- Franklin Nutter, Reinsurance Association of America;
- Kenji Wakamatsu, NTT Data, Japan;
- Brad Wooldridge, Farmer, Western Australia.

Moderator: John Firth, CEO, Acclimatise, UK.

The moderator kicked-off the discussion by asking the panellists to name some of the biggest challenges being faced at the present time, and how Earth observations can play a role.

- Franklin Nutter stated that natural disasters in the past few months alone have caused billions of dollars in losses. The insurance industry, as well as the government, is very dependent on publicly-available climate information alongside the development of catastrophe models which can take core databases of ensured properties, overlay climate model projections and related data, to assess to properly assess and price risk;
- Jack Dangermond observed that we are living in a challenging time, one in which we are transitioning to a digital planet, a twin to the real one. The digital planet must feature a geographic platform for moving from being at mercy of circumstances to creating a positive future. Earth observations are an integral part of that, but the challenge is

connecting science with end-users doing real work. Though important, it is not enough to just have open data: contents must to be made into decision-ready, analytic-ready, GIS-ready information to fill the gap between Earth observations and workflows of people;

- Jon Davis agreed, saying that getting the right information to the end user is the main challenge, all the more so with onset of big data and increasingly specific applications that end users want. An example of this is how the world of data analytics is being applied to supply chain logistics, an area where Earth observations are essential to forecast potential disruptions;
- Brad Wooldridge commented that, if the world's farmers are going to double food production, it is critical that they receive accurate assessments of certain parameters such as precipitation and the Normalized Difference Vegetation Index (NDVI). Using remote sensing technology can optimize crop production and help assess the health of the biomass, essential ingredients for predicting the amount of hay production for livestock.

The moderator queried the panel regarding the importance of open data for their projects.

- Jack Dangermond replied that, in his view, there is no such thing as bad data, even if poor quality. When the government produces data, if taxpayers paid for it, that data should be made available as long as it does not compromise security or invade the private sphere. The world is on a charter to make government data openly available, but open data is not enough - information services and products, based on integrated Earth observation data sources that can be readily used, are what is needed;
- Franklin Nutter noted that the insurance sector is entirely dependent on public sources of data since it does not operate any sensors. Thus, sustained funding of national agencies such as NASA and NOAA is critical. Insurance companies would have enormous difficulties pricing services, or even offering insurance in risk-prone areas (coasts, floods, fires) without open access to Earth observations and the histories they afford for calculating probabilities;
- Jon Davis commented that limiting access to data would negatively impact safety with respect to supply chains. Infrastructure operators need to focus on the logistics themselves, not be mired in tracking down forecast data;
- Brad Wooldridge cautioned that, as already mentioned, having access to open data was not sufficient. Farmers, for example, will not

participate in Earth observation pilot projects if it proves too hard to figure out how to use information and get a return on investment for time spent learning how to use the data. End users need to be brought into projects from the beginning; that way, market uptake will be more likely since products already have a proven track record.

The Moderator then asked the panel members whether they saw any issues with taking Earth observation data that was freely accessible, and using it to make a profit?

- Kenji Wakamatsu responded that, in some instances, the public might not understand why data paid for by their taxes would end up in a commercial usage. Thus, it was perhaps better for the commercial sector to use commercial data as much as possible, at least in an initial step;
- Franklin Nutter reiterated that government programs provide the core source of data for the reinsurance industry. However, as the raw data itself is often not suitable for use, the commercial sector was needed to transform the data into something usable;
- Jon Davis observed that there was no single answer to this question: the type of data used and approach taken depended on the needs of the client, on what temporal and spatial scales. In some instances providing solutions would involve paying for data, or some combination of open and proprietary data;
- Jack Dangermond replied that users are not interested in simply finding open data, but rather they wish to put it to use immediately, for specific purposes. His company has invested millions in developing data layers that are given away for free, to help users accomplish that. Once again, open data are simply not enough: Earth observations must be aggregated with multiple sources of data and “server-ized” to provide the services people need to just connect and put the data to use. This is the role the commercial sector has to play.

From the floor, the EC asked the panel, given that the audience was a broad representation of the GEO community, what message would the commercial sector wish to give to GEO? What should governments do to encourage your kinds of businesses?

- Franklin Nutter responded that, in a changing climate environment, data coming out of research programs and the insights their analyses bring are absolutely essential for supporting the commercial sector.

He mentioned the "The Collider" as an excellent forum for people seeking to provide data applications to business, a place where science meets business;

- Kenji Wakamatsu felt that government support for platforms allowing free access to open databases was key ingredient for promoting innovation from the commercial sector;
- Jack Dangermond replied that, although support for global initiatives with Earth observations and reinforcing open data policies were important, observations alone are not enough. What is needed is a single open platform that others can capitalize on and provide simple solutions that allow us to understand what we are doing to the Earth, and change our behaviour if necessary.
- Jon Davis agreed, saying that data by itself has value, but what really multiplies it its value is the development of applications for the betterment of society – this is what users want;
- Brad Wooldridge responded that greater engagement with end-users, in terms they can understand, would be a great step forward. In his view, GEO will be richly rewarded if it takes the time to invest in and engage users.

In another intervention from the floor, the World Health Organization (WHO) noted that, in many countries, ministries of health and space agencies do know how to work together. What would the panel recommend to remedy this situation; a common policy mandate, or perhaps a document they could both endorse that would allow health ministries and space agencies to work together, and include commercial enterprise?

- Franklin Nutter responded that the connection between climate change and health risk in the USA is not fully understood, so a good place to start would be funding from the government to promote a better understanding of this connection;
- Kenji Wakamatsu agreed, noting that there is a close relationship in Japan between the government, universities and the business sector that allows for this kind of mandate to work together and the production of innovative products.

Other points made by panel members included:

- The big innovation of web-services is that data can be stored anywhere, with software placed next to it to make integrated

dynamic viewing and analysis possible. The need now is for portals to discover and access distributed services;

- If the supply chain works well, it is not necessary to have all data in standardized formats. The added-value comes from providers who offer GIS-ready products for the end user who can go on to solve individual issues as needed;
- Organizational partnerships, those that collaborate well, are the key to success. Of less importance is the form that collaboration takes (e.g. public-private partnership [PPP]);
- In transitioning from a services- to a products-oriented business, Esri learned that it is essential to listen to what the end-users want or need. One must carefully determine who the clients are, how you can serve them, and be humble enough to evolve in order to remain relevant;
- A take-home message is that private sector competitive market place can spread ideas very quickly: understanding precedes action.

4 Session 4: Earth Observations in International Development

The panel discussion comprising Session 4 featured representatives from national and international funding and development agencies who discussed their roles and interests in increasing the world's Earth observation capacity, and how these were incorporated in their own policies and programmes.

The panellists included:

- Haishan Fu, Director of Development Data Group, World Bank;
- Ryosuke Nakata, Chief Representative of the JICA USA Office, Japanese International Cooperation Agency (JICA);
- Carrie Stokes, USAID – USA.

Moderator: Jennifer Morris, President, Conservation International, USA.

The Moderator opened the discussion by asking the panel how Earth observations were helping them make the smartest decisions possible, to decide where to invest their funds.

- Carries Stokes responded that, in a case of determining the origin of migrant children coming into the USA, and for what reasons (e.g. poverty versus violence), having this Earth observation- based

evidence helped decision-making at the highest levels of the US government. Having this type of information, conveyed in and easily understood fashion, can have a tremendous impact and help determine where investments should be made;

- Haishan Fu concurred, noting that the merging of remote sensing with local economic data was critical for helping save lives and doing rapid assessment of assessing economic loss in the case of earthquakes, for example, and helping determine where resources should be applied. In the case of sea level rise, Earth observations can help estimate the vulnerability of populations in low-lying coastal areas, which also influences how resources allocations are made in order to channel the right financing to right place to mitigate impact;
- Ryosuke Nakata commented that JICA works with helping local governments detect and deal with deforestation, and Earth observation data, especially from later-generation satellites and their ability to penetrate cloudy regions such as the Amazon basin, is an integral part of this. JICA also sends experts to help with training government users to access and utilize the data, blending advanced technologies with local capacity.

Building on the previous response, the Moderator then asked how capacity building was implemented in sponsored projects.

- Carries Stokes believed that the first step should always be to start with people and to dialogue with them in order to understand their concerns, and ultimately what the question is that we're trying to answer or the issue to be solved. Also, building trust is also very important. No amount of capacity building will work if the trust factor is not there; trust will make populations try something they may not have considered previously;
- Haishan Fu commented Earth observation applications are evolving so fast that the World Bank itself needs to build capacity. Realizing our full potential with is key to offering the correct tools. Second, we need to engage with clients and understand governmental arrangements, and then determine how data can translate to support for policy-relevant decisions.

The Moderator asked how panellists have implemented data sharing in politically sensitive contexts, making sure that Earth observation data get to people who need it.

- Ryosuke Nakata responded that it is important to agree on the conditions surrounding any activity, and to adhere to the agreement. It is indeed sometimes the case governments ask that data used be restricted, which in turn results in curtailment in investments. Governments cannot be forced to release data that may be sensitive, but the maps necessary for development purposes should be freely shared among relevant partners. JICA very much believes in transparency surrounding data used in development projects;
- Carries Stokes replied that data sharing can be a challenge, but when the need is evident, people will share. Sometimes it takes a disaster to catalyse things, and it is important not to lose the data once crisis is over, presents an opportunity to advocate for data sharing, use examples of data once the disaster has passed as it could be used for other purposes. The internal geospatial policy at USAID is that data be made available after use, to be curated by USAID.

The Moderator then asked the panel about the concept of data democratization and working with open source software, and whether there were any concerns with this approach.

- Carries Stokes responded that even though USAID was active the world over, it operated on the principle that data belongs to the originating country. USAID wants to work with integrity, which means that any data collected by USAID has to have direct relevance for projects and programs. For this reason, frameworks such as GEO are important as they provide a forum for sharing best practices so that all Members are informed and transparency surrounding data acquisition and usage is affirmed.
- Haishan Fu remarked that the World Bank was establishing a new data sharing platform in order to make data more open, accessible and used. At the same time, legal standards for the use and reuse of data exist, in order to protect confidentiality. A community of practice and geospatial support team have been created at the World Bank, to establish a common approach to data management and training. The World Bank wants to support data innovation, along with civil societies and private sector, to produce cost-effective solutions that can solve specific issues. International cooperation is very important to achieve this objective, and participation in GEO is a key component.

From the floor, China found the discussion excellent, appreciated the efforts made to alleviate poverty around the world, and noted that GEO was poised to

provide tailored information for any activities related to support of SDG monitoring frameworks.

Japan was pleased to see the close collaboration between the development agencies and space agencies, noting that it was also important for development agencies to work with research communities as well.

Australia commented that one of the big successes of GEO was its convening power, in which small activities can be incubated that end up having a large impact. The Global Forest Observation Initiative (GFOI) was cited as an example of a small activity that grew, by means of additional participants with time, into an effective tool, with a speed that could not have happened within the UN.

Other points made by panel members included:

- No decision is going to be fully driven by data. There are many factors that influence decision-making, but the idea of incorporating Earth observations is catching on;
- Capacity building is most successful when it involves multilateral cooperation among various agencies. A good example of is the services provided by SERVIR in West Africa, representing a collaboration between AGRHYMET technicians and NASA experts;
- There should be more participation from GEO in the development world; this panel was a first step. The development sector needs to understand Earth observation technologies, and GEO needs to understand development issues and demands. There should be a certain tolerance for failure, otherwise it will be difficult encourage innovation;
- GEO needs to engage with the younger generation. They are connected and they like to collect and share data and information. GEO should encourage innovation hubs to encourage those under 30 years of age to start using data in ways we have not yet imagined.

The Co-Chair then observed that the three panels presented viewpoints from a very broad cross section of users of Earth observation data, if not strictly the end users themselves. He synopsized the themes from the three panels as follows:

- **Diversity**: the first panel included experiences from small and large countries and organizations, working at different stages of development. No single solution or approach fits all, cross-collaboration is important;
- **Humility**: the GEO community has to listen to what users need, not tell them what we have to sell: GEO needs to change its offer;

- **Integration**: question users to discover what their concerns are. We need to solve a problem, not develop a platform, and data must be user friendly, transparent and useful for decision-making if it is to have real value.

Meeting adjourned at 5:30 pm.

Thursday, 26 October 2017

Meeting convened at 09:00 am.

5 Session 5: 2017-2019 GEO Work Programme

5.0 Keynote: Building Resilience Globally – Peter Head, Founder and Chief Executive Officer of the Ecological Sequestration Trust

Mr Peter Head was invited to deliver a keynote address describing the importance of integrated planning and implementation of Urban resilience efforts including development projects at the local scale. Included were his thoughts on building global resilience in a time when the Earth is "shrinking" e.g. in terms of usable hectares of land per capita. Additionally, citing a report from the Commission on Planetary Health (sponsored by the Rockefeller Foundation), he said:

"We conclude that the continuing degradation of systems threatens to reverse the health gains seen over the last century. In short, we have mortgaged the health of future generations to realise economic and development gains in the present." (2015)

He called for a new approach that focusses on sustainability, by decoupling natural resource use and environmental impacts, from growth and development. In his view, it is not enough currently investing in disaster risk reduction, but we also need to produce an integrated Earth-human systems modelling platform for city-regions that allows for forward-thinking and planning. Such a platform should accommodate:

- Multi-hazard, risk-informed planning and investment decision-making;
- Data for tracking progress against the SDGs, Paris Agreement targets and Sendai Framework indicators;
- Commonality to assess portfolios of investment in city-regions globally and maximise infrastructure diversification benefits; and
- Holistic, robust systems approach and data sharing technology, with the potential to reduce the cost of infrastructure and project design.

The Resilience Brokers Programme of which GEO is participating, features an open-source platform for smart city planning, developed by the Ecological Sequestration Trust. This effort has evolved over the past six years to meet city-region needs. It was tested by a regional pilot study in Accra, Ghana, and officially

launched in October 2017. GEO's emerging initiative on Urban Resilience will rely on, as well as benefit from this programme.

5.1 Spotlight on Emerging Successes

5.1.1 Earth Observations for Ecosystem Accounting

Mr Lars Hein (Wageningen University, The Netherlands) provided an update on the Earth Observations for Ecosystem Accounting (EO4EA) Initiative, which had grown out of a desire to explore how to use Earth observations to construct ecosystem accounting and develop new pathways for Earth observation products. He noted that the Initiative supported the System of Environmental Economic Accounting (SEEA), a system for national accounting endorsed by the UN Statistical Commission, the Food and Agriculture Organization (FAO), the World Bank and the Organisation for Economic Co-operation and Development (OECD). He explained the goal of the Initiative was to provide a template for modelling and mapping ecosystem services both in terms of physical and monetary supply and use. This approach requires the integration of data from various sources, including: statistical data (e.g. crop and timber production), spatial data (e.g. soils, water table, and air quality); and Earth observation derived data (e.g. land cover, net primary productivity [NPP], and flooding). He summarized by stating that Earth observations are crucial for ecosystem accounting, especially in developing countries, since:

- In many cases there are no alternative ways to obtain the datasets required for ecosystem accounting;
- It is cost-effective, and near-instant monitoring greatly enhances policy applicability; and
- Higher accuracy can be achieved by combining remote sensing information with survey data.

5.1.2 Earth Observations for Health

Ms Juli Trtanj (NOAA, USA) informed the Plenary about the various activities of the Earth Observations for Health (EO4Health) Community Activity, which seeks to integrate Earth observations for understanding, monitoring, predicting, and preventing health risks in the areas of heat, infectious disease, healthcare systems and facilities, the Arctic environment, and air quality. She highlighted that with the advent of seasonal predictions, it is now possible to forecast disease outbreaks several months in advance. Earth observations have the possibility to help change epidemic curves, and people should not be dying from heat waves, for example, since they are almost entirely predictable. It is also important to include citizen observatories and link this type of information with remote sensing and other in-situ measurements in global health information networks supported by the WHO and WMO. She challenged the Plenary by asking: "What kind of

world do you want to live in, one in which we are still surprised by disease outbreaks and extreme heat events, despite sitting on mountains of data, or one in which tools are developed to exploit this data and prevent human suffering? She called on Plenary to help make the latter choice a global reality.

5.1.3 Human Planet Initiative

Mr Lewis Dykstra (JRC/EC) presented recent work of the Human Planet Initiative, which is seeking to produce a global, people-based definition of cities and settlements based on common methodologies (such as creating population grids to help define city boundaries) and standards across the globe in order to aggregate and draw meaningful conclusions regarding human settlement. He noted that, with the UN Statistical Commission approval in March 2017 of the SDGs and associated targets and indicators, the Human Planet Initiative was working to supply relevant information based on Earth observation for national reporting by providing a mapping of all cities in the world (10,000) based on population grids, along with estimates of built-up areas and population growth for the next forty years.

5.2 GEO Programme Board Report

Programme Board co-chair Mr Ivan DeLoatch (USA) provided an update on activities of the Board during the past year. He noted that the three objectives of the Board had been to:

- Align activities to three GEO priorities;
- GWP refinement improvements; and
- Improve cross-cutting coordination.

To that end, the Board had developed an engagement strategy and work plan to align the 2017–2019 GWP to the three top Engagement Priorities of GEO. The principle actions undertaken to implement this strategy over the year included:

- initiating contact with Initiatives/Flagships to identify/refine contributions (mapping process) to engagement priority areas;
- organizing a virtual workshop with Initiatives/Flagships to discuss synergies and “cross-pollination”; and
- working through challenges where GEO activities may not bin neatly into three engagement priorities.

In preparing the update of the GWP, the Board developed a process to assess new and realigned proposals for Flagships and Initiatives while working with the Secretariat to improve the Monitoring and Evaluation processes. The Board also considered ways in which the GWP Symposium might be restructured to optimize community input to the GWP. Areas that the Board still needs to work on include promoting interactions among WP activities so that they work collaboratively to

achieve goal of the GEO Strategic Plan ("clustering"), and suggest reorientation to fill gaps and avoid overlaps; consider developing best practices to better promote regional coordination and improve collaboration; and find ways to encourage engagement with the commercial sector.

In closing, he noted that engagement with the Lead Co-Chair over the year had been very helpful, and caused the Board to be more results oriented. He also thanked all members of the Board and the Secretariat for their work and support.

5.3 GEO Highlights 2016-2017

Mr Craig Larlee (GEO Secretariat) introduced a new format for the annual report on GWP implementation. This new format was intended to communicate to audiences both within and outside of GEO the impacts that Earth observations, and GEO in particular, are having on decisions and improving people's lives. The report brings together a mix of specific examples, user testimonials, statistics, and illustrations in an easy-to-read format that does not assume deep prior knowledge of the GWP activities or the science that underlies them. The report is organized as a series of two-page sections, each of which is organized around a single theme. In future years, these sections may focus on a different set of themes, based on the priorities being addressed at the time.

Mr Larlee also spoke briefly regarding progress on implementing a set of key performance indicators (KPIs) for GEO. The KPIs are one product of a process that is being put in place to monitor implementation of the GWP. The information derived from this process will inform plans and decisions by the Programme Board, Executive Committee, Plenary and the Secretariat. Collection of baseline data from GWP activities began in June 2017 and is expected to be completed by the end of the year. The data will be updated on an annual basis thereafter, permitting the tracking of progress over time. Mr Larlee concluded with a request to the GEO community to assist these efforts by responding promptly to requests from the Secretariat for information, success stories, photographs and other materials that will be useful in demonstrating the impact of GEO and in providing visibility and recognition to the work being carried out across the GWP.

5.4 2017-2019 GEO Work Programme Update

Mr Douglas Cripe (GEO Secretariat) presented the update of the 2017-2019 GEO Work Programme (GWP). He started off by noting that the GWP was a remarkable document in that it provided tangible evidence of the convening power of GEO. The GWP frames the work of GEO and enables the broad, diverse GEO community to work together, to achieve the common goals and objectives of the GEO Strategic Plan. He observed that acceptance by Plenary of this document carried with it the implication that the resources mentioned as supporting each of the

activities of the GWP would, in fact, be committed. He also noted that the bulk of the GWP had not changed; the vast majority of the descriptive text of the activities of the GWP were identical to the initial 2017-2019 GWP. However, the overall structure of the document had been modified such that the Flagships appeared first, followed by the Initiatives, then the Foundational Tasks, and finally the Community Activities. There were a few items in the beginning pages of the GWP that were new, such as a Preamble that traced the political genesis and support for GEO and the activities of the GWP, based on past Earth Observation Summits and Ministerial Declarations since the World Summit on Sustainable Development (WSSD) in 2002. The Introduction had been expanded for readability. In addition to the alphabetical index of GWP, new GWP indices according to Societal Benefit Area (SBA) and support for SDGs were included. With respect to the SDG Index, he emphasized that the mapping of GWP activities to the SDGs had been produced in consultation with the Programme Board and Secretariat experts, as well as with leadership of the activities themselves. The intention with this index was not to "oversell" the contributions of GEO to the SDGs at this early stage, but rather provide an indication of which GWP activities had given thought to specific targets and indicators and were working towards, or have the potential to, supporting SDG monitoring frameworks. Similar indices for GWP support to the Paris Agreement on climate change and the Sendai Framework for Disaster Risk Reduction are anticipated for the 2018 GWP update.

With respect to new and revised activities, he noted that

- The GEO Biodiversity Observation Network (GEO BON) Flagship; the GEO Global Network for Observation And Information in Mountain Environments (GEO-GNOME); and GEOSS-EVOLVE Initiatives had all submitted revised implementation plans which had been reviewed by the Programme Board;
- New Initiatives included AquaWatch (formerly a Community Activity) and EuroGEOSS, whose implementation plans had been reviewed by the Programme Board;
- New Community activities included: Coordinating and Integrating State-of-the-art Earth Observation Activities in the Regions of North Africa, Middle East, and Balkans and Developing Links with GEO-related Initiatives towards GEOSS (GEO-CRADLE); the Global Ecosystems and Environment Observation Analysis Report Cooperation (GEOARC); and the Integrated City-Region Systems Modelling: resilience.io, all of which had been accepted by Secretariat.

He concluded by saying that GEO, and implementation of GEOSS, is an ambitious project, especially considering the best efforts nature of GEO. Constructing GEOSS takes time, energy, resources, cooperation, commitment, coordination and

dedication. By charting a clear course and providing transparency, the GWP helps build the trust necessary to achieve GEOSS and the Strategic Objectives of GEO, as alluded to during the final panel discussion of the previous day.

5.5 Presentation of the Proposed 2018 GEO Trust Fund Budget

Mr Stuart Minchin presented the document containing the 2018 Trust Fund Budget, Mr Minchin drew attention to the distinction between core budget activities, based on functions identified in the 2016-2025 Strategic Plan, and activities supported by earmarked funds, that is, funds contributed to support specific activities other than those identified as core.

On the core, the total expected resources for 2018 are made up from a starting balance of CHF2million, working capital of CHF0.2 million, CHF3.2 million expected contributions and in-kind contributions of CHF1.6 million. However it is important to note that CHF2,2 million should be left for 2019. Therefore the proposed total expenditure 4.8 million for core budget is expected CHF1.6 being In-Kind

As for the earmarked funds, which are over and above the core budget and add up to an extra 600,000, made up of funding for a GEOGLAM Coordinator, funded by Germany, a Junior Professional Officer from China and CHF100K for data sharing and AOGEOSS also from China.

The report of the budget working group with its recommendations are part of the document. They advised that as the budget is based is on expected expenditure of CHF 3.2 million, should more money arrive in the Trust Fund that the Executive committee be able to approve extra spending and as such, a change in the rules of procedure will be tabled at this Plenary to accommodate this.

Mr Minchin noted that the sustainable budget on which the indicative scale was based only accounted for core activities and thus contributions of earmarked funds should be considered as over-and-above the equitable share for each Member as calculated in the indicative scale. While contributions to the Trust Fund remain voluntary, the operations of the GEO Secretariat will only be sustainable if Members contribute their equitable share of the sustainable budget.

5.6 Strategy for a Sustained Resourcing of the GEO Trust Fund

Mr Minchin then continued with a second presentation regarding sustained resourcing for GEO. The presentation outlined several arguments that could be used by GEO Principals in seeking additional funding for the GEO Trust Fund. These included the value of broad, open data sharing, the efficiency of GEO's convening power, incubation of globally-relevant Flagships, and the role of GEO in stimulating economic activity. On the latter point, Mr Minchin drew attention to

several studies and examples of economic value generated or savings realized through the availability of earth observations and geospatial data. He then reiterated his earlier message that the sustainability of GEO depends not only on contributions to the GWP, but also on support to the Trust Fund. He drew attention to a recent decline in contributions over the past two years and how cash contributions did not come close to meeting the sustainable budget required by the Strategic Plan, even in the peak year of 2015. He then provided Members with several methods used successfully in the Australian context for increasing funding to the Trust Fund.

5.7 Discussion and Pledges

- GEO 2017-2019 GEO Work Programme;
- GEO Trust Fund

The Co-Chair opened the session up for pledges from members, and in the process the following members made individual national pledges of support, either in funding, as secondments:

Armenia informed Plenary it has received the agreement of their government to contribute to the Trust Fund to the level of the indicative scale.

China announced it will increase its contribution by USD 100,000.

UK pledged a virtual secondment to the Secretariat starting early 2018 for a period of two years to support Disaster Risk Reduction, for a value of GB£ 180,000.

Japan greatly appreciated the Secretariat's hard work and their efforts to save travel expenses, and will make continue their contribution to the GEO Trust Fund, and will make greater efforts to support AO-GEOSS.

US announced investment in new projects for 17 million USD, servicing nine GEO Flagships and initiatives. They also pledged USD 565,000 for 2018 and looking to increase will keep the Secretariat informed.

Sweden has contributed for many years to the GEO Trust Fund and supports the indicative scale, they may adjust their contribution according to percentage presented, but will stay with the 2017 level for 2018, which is double the indicative scale amount,

Canada recognized the importance ~~for need to support and will continue the support the~~of predictable and sustainable fudning for the Trust Fund ~~to extent possible within context while looking forward to continuing to support GEO~~and is committed to continuing to support the GEO Trust Fund to the extent possible within its financial context and contraints. .

South Africa appreciated the work being done by the Secretariat will continue support for work of GEO, which includes the investment in Trust Fund and especially work of AfriGEOSS. The pledge for 2018 will remain at the current level of ZAR 3 million.

Argentina will continue support to Trust Fund will try to make efforts to raise contributions to AmeriGEOSS.

Cambodia expressed gratitude to the Secretariat for supporting Cambodia as new Member. Their Pledge to the Trust Fund is to contribute € 1,000, They will also work to mobilize resources to support activities of GEO.

Germany thanked Mr Minchin for his report, and announced that Germany will remain a strong supporter of the Trust Fund. Their pledge of € 100,000 to the Trust Fund remains for 2018 in addition to financing the GEOGLAM position and a Junior Professional Officer.

Switzerland was glad to announce that they will continue to contribute in 2018 and that they are satisfied with the progress made on the priority areas. They are exploring additional financing for GEOGLOWS, particularly for the development of the essential variables.

The European Commission remains committed to GEO and GEOSS an announced an increase to their contribution in 2018 to reach €1 million. The Copernicus project also contributes to GEO and GEOSS.

5.8 Approval of 2017-2019 GEO Work Programme Update

The Co-Chair opened the floor for comments on the update of the 2017-2019 GEO Work Programme.

Germany thanked the Programme Board co-chairs for their excellent work and noted it would be supportive of removing the membership cap of 32 seats on the Board. Germany found that the GEO highlights report was a brilliant product, at the right level for ministers. However, Germany would also like to see more honest progress reports on the true state of activities, including those areas not so successful in the “dark side” of GEO.

Australia noted that a common theme among the talks was the need to merge Earth observations together with socio-economic data. However, since each domain tended to use different formats (different geographies, coordinate projections, raster versus vector formats) it was a challenge to carry out that integration. He noted that OGC, a Participating Organization in GEO, recently released a new geospatial standard called the “discreet global grid system”, which allows data integration to take place in projection-less space, a new key technology that will allow Australia to integrate Earth observations with economic

and statistical data. He urged Plenary to take note of this technology and consider how they might use it.

CEOS stated it was proud to be part of the Programme Board and will continue to contribute. CEOS noted that the Programme Board will need to take an increasingly proactive role in dealing with challenges and mobilizing resources to address them, including through reaching out to GEO Principals.

The USA applauded the Programme Board for its activity and progress, and the level of maturity that has been brought to GWP. The USA is looking forward to new visions for the GWP Symposium along with broader efforts to improve the coordination across all areas, in addition to the SDGs. The USA was also pleased with the restructuring of the GWP, finding the manner in which its activities are now indexed to be a great improvement.

Japan expressed its appreciation of the new GWP structure and the GEO highlights report.

ICIMOD informed Plenary that the Himalayan GEOSS had been officially launched during a symposium this past August.

ICOS informed Plenary that it is coordinating and supporting the GEO Carbon and Greenhouse Gas Initiative, which had been formally kicked-off at a meeting in Rome this past September.

As custodian for SDG indicator 15.3.1, the UNCCD announced that its Conference of Parties last month adopted a resolution which specifically invites GEO to support assessment efforts by providing space-based and in-situ measurements to support monitoring of 15.3.1. The UNCCD therefor wished to submit an Initiative to GEO on land degradation to the current GWP that will permit rapid deployment of Earth observations assistance and capacity building to support indicator reporting, starting in 2018. The UNCCD is already working with several GEO Participating Organizations and will seek to expand its collaboration with GEO to further develop implementation of the proposed Initiative. All interested contributors were warmly welcomed to assist preliminary efforts.

Noting that it is principally a dry continent, Australia strongly supported the UNCCD proposal for a new Initiative and its inclusion in the current update to the GWP. Australia planned to contribute through its CSIRO, noting that GEO is ideally placed to bring together Earth observation data providers and information development to bring the SDGs to a successful outcome.

ESA welcomed the proposal, noting that it has annual maps of global landcover that it will contribute to the UNCCD Initiative.

CEOS also welcomed the suggestion from UNCCD and will be pleased to contribute to developing the proposal for the initiative, in its role the space arm of GEO.

The OECD also strongly supported the UNCCD proposal.

UNEP expressed its strong support for the UNCCD proposal and looked forward to collaborating towards its success.

The IEEE noted that there has been a significant increase in interest for Earth observations to respond to societal challenges, which is very encouraging. As a member of the Programme Board, it suggested the Board would welcome an Initiative on the UNCCD proposal for fast-track review at its first meeting in 2018.

The WMO informed Plenary that, at its May meeting, the Executive Council approved closer collaboration with GEO on 11 specific points, seeking to leverage complementary efforts. The WMO is very committed to actively pursuing progress together, especially in regards to GEO-CRI (Cold Regions Initiative) and radio frequency protection, and thanked the GEO Co-Chairs and Secretariat Director for leadership in building synergies.

The Co-Chair concluded the discussion by noting the many positive statements that had been made with respect to the update to the GWP, and in particular the strong and remarkable response to the UNCCD Initiative proposal. He noted that the Initiative will need dedicated support to launch quickly and keep the momentum going, which may place an additional burden on the Secretariat. He proposed that a draft Initiative of the UNCCD proposal be provisionally accepted into the current update of the GWP, recognizing that a formal review by the Programme Board will need to happen in due course.

Outcome: The update to the GEO 2017-2019 Work Programme was approved.

5.9 Approval of 2018 GEO Trust Fund Budget

Outcome: The 2018 GEO Trust Fund Budget was approved.

5.10 Approval of Slate of 2018 GEO Programme Board

Outcome: The Slate as recommended by the Executive Committee, containing representatives from 16 Members and 16 Participating Organizations for a total membership of 32, was approved.

6 Session 6: National Earth Observations

Session 6 focused on a panel comprising representatives from both developed and developing GEO Member States who discussed the value and best practices in developing and assessing national Earth observation portfolios.

The Panellists included:

- Xingfa Gu, China;
- Iain Williams, United Kingdom;
- Tim Newman, USA;
- Pham Anh Tuân, Vietnam.

Moderator: Philip Thigo, Senior Advisor on Data and Innovation at the Office of the Deputy President, Kenya.

The Moderator initiated the discussion by asking the panel to comment on their experiences with setting up national Earth observation coordination offices.

- Tim Newman responded by stating that the establishment of a national GEO has proven to be very useful for the USA. USGEO has allowed a national strategy to be established that included a user needs working group and standardization of language when working with data providers, allowing US agencies to optimize their use of Earth observations;
- Xingfa Gu commented that the situation was similar in China. The establishment of China GEO has allowed a new level of coordination among its several ministries and agencies to be attained. China GEO recently released China's strategic plan for Earth observations in the coming decade, which puts the emphasis on international contributions through mechanism such as Asia-Oceania (AO) GEOSS as well as at the national level through China GEO;
- Pham Anh Tuân observed that, since Vietnam not a country with a space program, it is relying on international cooperation to help it take the necessary steps for consolidating its Earth observation plans and charting collaborating with space agencies. To that end, Vietnam has already partnered with international agencies across the regions, such as the Commonwealth Scientific and Industrial Research Organisation (CSIRO) of Australia, and hosted the GEOSS Asia-Pacific Symposium this past September;
- Iain Williams replied that the UK has an ambitious strategy for growing the space sector, from 6.5 to 10% by 2030, including products and services. In 2015, the Department of Environment, Food

and Rural Affairs (DEFRA) set up the Earth Observations Centre of Excellence, the aim of which is to stimulate innovation and develop tools that can be used multiple times. A few UK departments have already benefitted, reducing the number of field interventions and inspections in sectors such as water and air quality, and fisheries, or helping those interventions become more targeted when necessary. The intention is to now expand more broadly across other government sectors, and continue momentum gained in supporting scientific programmes and with international collaboration.

The Moderator then queried the panel as to what were the key steps needed to create and sustain a national GEO.

- Xingfa Gu answered that, in China, it is key to pay close attention to 5-year strategy plans as they are being developed. Demonstrating what Earth observations can do for the country must be a part of that planning. Also, there has to be a strong leadership mechanism. For China, which is huge country, that leadership comes from the Ministry of Science and Technology which hosts China GEO, which in turn supports coordination amongst 19 different ministries. Finally, the relationship between science and development very important. In China, infrastructure is critical and requires considerable investments, thus there is a need for clear objectives in that relationship;
- Tim Newman observed that, in the US, there tends to be pipelines between agencies, fencing them off from each other. A national GEO helps breaks down these barriers, and this often happens through sharing technology and data management principles. A good place to start is by inventorying which observing systems are used broadly across various agencies. Such an exercise showed the importance of Landsat, and became the impetus for speeding up the development of further Landsat missions. Collecting information across agencies can also feed into a requirements strategy and help inform system development;
- Iain Williams indicated that research and development were key ingredients. Real investments were required to industrialize technology and innovation, and render them usable by non-experts. Quantification is essential in order to attract investments and make the case for developing infrastructure, and the Centre of Excellence had kick-started research funding to help implement that process;
- Pham Anh Tuân commented that a first step was to change the mindset of the government by showing end user benefits of space applications. Have to find convincing stories to make the case to

officials in order to convince them of the need to invest in Earth observations.

The Moderator then asked the panel, given the number of voices competing for attention, what sorts of arguments are persuasive when advocating the importance and sustainment of Earth observations with a government?

- Iain Williams suggested that, when selling the importance of Earth observations internally, it is important to listen to government officials and determine how Earth observations can solve their problems. Coming to the government with ready-made solutions to questions no one is asking is ineffective. Success stories involving data sharing are also helpful to cause a shift in thinking;
- Xingfa Gu concurred, pointing out that, when approaching the government, the Earth observation community needed to be clear about whom they were proposing a given activity to, and for what reason. The right Earth observation applications in the hands of the right end users can be very persuasive. These applications should demonstrate integration of both space-based and in-situ data. Also, we have to be realistic about the fact that barriers that exist between different institutes and agencies, making it such that data cannot always be easily shared. If the high-level needs of a government are understood, and it can be shown that sharing data between agencies will help respond to these needs, the government will listen;
- Tim Newman observed that, when considering global problems, it is important to translate the importance of these problems down to the national government level, and show how the impact will be demonstrated. New vectors of remote diseases will eventually make their way to us locally as the world gets smaller and smaller. Also, to make an impact with the government at a federal level, agencies need to “take off their hats” and see how they can work together horizontally with each other, and demonstrate how they use each other’s systems. This was the case with the decline of stream gauge measurements alluded to earlier: an allied approach to communicating how important the stream gauges were had an impact on budget allocations from the government that reversed the decline;
- Pham Anh Tuân responded by noting that, developing countries such as Vietnam do not have the funds to implement a complex infrastructure, and needed to rely on international collaboration in order to start using Earth observations efficiently and routinely. The Vietnam Data Cube, in cooperation with Australia, is an example of

this collaboration. Taking things step-by-step, including pilot projects that demonstrate the benefits of Earth observations for end users, will be an effective way to convince the government to invest in observing systems.

From the floor, other points made by Plenary Members and Participating Organizations:

- Egypt remarked that demonstrating the full Earth observation value chain is key to changing the mind-set of reluctant governments and have them start looking at problems and solutions in a new way. The GEO-CRADLE project and the solar atlas it produced has been successful in this regard, building trust with the government, such that it backed the establishment of a new center of excellence and associated solar farm;
- The USA observed that we are no longer in era where there is the government and everyone else. It is time we realized we are all interconnected, including the commercial sector, and although GEO Members may have national agendas, there is a need to start to bring these communities more closely together in order to share reliance on critical systems. Also, although advocating for open data is important, it is necessary to go an additional step to turn it into something useful for the end user who needs an intuitive tool to solve an immediate problem. One such approach to taking this step is the data cube which has been showing very promising results;
- The WHO noted that it was difficult to find guidance or legal framework at the national level as to how governments and Earth observation agencies should work together. Perhaps this is an area that GEO could tackle and produce a policy document. Structures such as public-private partnerships (PPPs) might be a mechanism for this to happen under the umbrella of a policy mandate;
- Australia indicated Geosciences Australia had a strategy of embedding a staff member in various government agencies to gain a better understanding of how Earth observations could help them. Though labour-intensive, this has proven to be an effective means to gain government backing and investment for sustaining Earth observations systems and research.

The Moderator invited the panel to provide a few closing thoughts.

- Tim Newman said that, in his view, it's all about cooperation, beyond the narrow scope of agency perspectives, hence the importance of

setting up a national GEO. In his experience, working with agencies such as NOAA, NASA and the EPA, much has been learned with respect to items such as improving systems architecture, allowing everyone to achieve more than would have been the case individually;

- Iain Williams noted that a dominant theme of the discussions had been open data. There is a huge wealth of information to be harvested, yet current government structures sometimes keep agencies working in parallel stovepipes. Changing this structure to a culture of collaboration and sharing is very important, and the UK is working through its national GEO to improve collaboration among 12 of its agencies;
- Xingfa Gu stated that China has placed participation in GEO at the highest levels of its government. The national structure, China GEO, has been very effective at bringing together 19 of its ministries and improving cooperation. Also, data sharing is a very important issue for China. Realizing how much it has benefitted from open data, China is now working towards a broad open data sharing policy. Accordingly, in the past year, it has opened access to its 30m land use, as well as provided access to millions of images through GEO, including in response to earthquake disasters. Finally, China sees great value in regional initiatives and is fully committed to supporting AOGEOSS;
- Pham Anh Tuân reiterated his plea for international cooperation to help developing countries such as Vietnam set up a national GEO, and make quick progress in accessing and applying Earth observations to help find solutions to pressing societal challenges.

The Moderator summarized the Session by noting that, though demonstrably important, there was no magic formula as to how and where to establish a national GEO. Other issues touched on during the panel discussion, such as gaining an understanding of government needs, interfacing with academia, providing policy and guidance, and sharing of data, all indicated that GEO and GEOSS still have a lot of work to do.

The Co-Chair added that USGEO was happy to share lessons learned with any Members interested in setting up their own national GEO earth observations applications plans. However, he noted that lessons from older, established countries with significant observing infrastructure may not apply to smaller countries with limited capacity or resources. He encouraged members could benefit from its experiences, but could perhaps come to simpler solutions in the process, more efficiently.

7 Session 7: Other Business, Session Outcomes and Closing Remarks

7.1 Update on the Legal Status of GEO

The Secretariat Director informed Plenary of an update of the Legal Status of GEO. A process to increase the legal standing of the Secretariat had been agreed by the Executive Committee in 2016 and was completed in January 2017. This procedure had commenced by the signing of a renewed Standing Arrangement between WMO and the GEO Secretariat, which through an exchange of official letters between WMO and Switzerland had been formally noted by the Swiss authorities. The result is an enhanced legal standing for the GEO Secretariat under the WMO Host Arrangement.

WMO stated that the Standing Agreement between the GEO Secretariat and WMO ensured that the GEO Secretariat was covered under the WMO Staff, Financial and Administrative regulations and that the GEO Secretariat benefited from the privileges and immunities of the WMO conferred by Switzerland through the Host Agreement. The Service Level Agreement also provided that ten offices spaces were provided to the GEO Secretariat as an In-kind contribution.

Switzerland stated that they would continue to support the GEO Secretariat in its quest to become part of the Policy Advisory Committee (PAC) of the Global Framework for Climate Services (GFCS).

7.2 2016 Financial Statements and Audit Report

Mr Stuart Minchin presented the 2016 Financial Statements and Audit Report. The Secretariat had managed to keep expenditure within the received contributions and the Budget Working Group commended the Secretariat for its sound financial management. The Audit report was unqualified, or a clean report. He noted that the Auditors had introduced a process change which was not to include in the GEO Audit Report the Audit findings that were addressed to the WMO.

He further noted that the Interim Report of Income and Expenditure as of 30 September, presented to Plenary as an Information document, showed that in view of a very difficult year with fewer contributions to the Trust Fund, the Secretariat would need to dip into the Working Capital Fund to the order of around CHF300,000 at the end of 2017.

7.3 Update of the GEO Rules of Procedure

The Secretariat Director introduced the proposed changes to the Rules of Procedure. Section 5 dealing with the Programme Board is amended so that the term of members not participating in two consecutive meetings, rather than three, may be terminated (Article 5.4.6). Annex D is amended to allow the Executive Committee to authorize expenditure of any additional funds received over and above the approved budget. The Rules of Engagement with the Commercial Sector is presented in a revision of Annex C.

The WMO expressed concern that article 3.5 of Annex C (Rules of Engagement with the Commercial Sector), allowing commercial sector organizations to make contributions either financially to the GEO Trust Fund or in-kind to the Secretariat, could have the potential to radically change direction of GEO. The WMO was also concerned that the number of POs joining GEO as allowed under Annex A might be having a dilution effect. In particular, a number of POs appear to be joint initiatives with others that are already POs. The enormous range of POs makes it quite difficult to define an appropriate role for each of them in the GEO governance system.

China noted that, since GEO remains an intergovernmental organization by nature, any participation by the commercial sector will be under the guidance of the Member governments. China also suggested that the word “international” be added the beginning of article 3.3, between “not-for-profit” and “associations of commercial sector organizations.”

Australia pointed out that categorizing a not-for-profit entity as international would preclude most of them from joining GEO since the registration process for legal status requires a national identity by definition.

Canada recognized the value that could be realized by engaging in public-private partnerships (PPPs) and welcomed the clear governing rules of ANNEX C. However, Canada ~~felt that more thought needed to be given to the potential for conflicts of interest, especially with respect to ownership of intellectual property rights (IPR) in joint projects conducted under the GEO framework~~noted the importance of managing both real and perceived conflicts of interest, and recommended specific attention be paid to the treatment of intellectual property rights (IPR) in joint projects conducted under the GEO framework.

The WHO noted that its decision-making body, the World Health Assembly (WHA), had adopted a framework governing engagement with non-state actors. A key point of that engagement is that the WHO is not to enter any arrangements that might compromise its independence, credibility or reputation. Since several UN agencies are POs in GEO, engagement by GEO with the commercial sector may have repercussions on the continuity of those agencies.

Italy echoed the need for the GEO Secretariat to remain independent and unbiased in its operations.

The Secretariat Director responded to the points raised by noting that any UN organization can legally accept contributions from the private sector, so what was being proposed in Annex C is not unprecedented, and is consistent with existing practices in similar organizations. The Executive Committee has requested that the Secretariat develop a Memorandum of Understanding with the entity in question to outline the modalities of any programmatic work or contributions to the Trust Fund, which would subsequently be reviewed by the legal department of the WMO for compatibility with UN principles. The Executive Committee also requested that any funds contributed by the commercial sector be reported, while noting at the same time that, to date, there have been no contributions from the commercial sector. As for any concerns about potential appearances of impropriety or undue influence, in the Director's view, articles 2.1-2.10 clearly laid out the boundaries for preventing these concerns. She echoed the point made by Australia that most, if not all, not-for-profit entities must be based in a particular country to gain legal status, thus it would be difficult to accommodate the request by China. Regarding the USA's suggestion, the text of article 3.3 appeared in several places in the document on the advice of the Executive Committee since the text has relevance where it appears, and some may read only those portions of the document that pertain to their interests. With respect to Italy's concern, she was confident that, with provisions calling for scrutiny by both the Executive Committee and Plenary, adequate safeguards were in place to keep the Secretariat independent. Finally, regarding the numbers of POs and apparent duplication, she noted that in the case of GCOS and WMO, or GOOS and UNESCO, these are co-sponsored programs, and hence fall within several organizations which may or may not be members of GEO. Additionally, these joined early in the history of GEO and steps have since been taken to correct this concern. Those that had joined prior were "grandfathered in" and allowed to continue as POs in their own right, despite close reporting relationships with other POs.

Outcome: The Chair, noting no further interventions from the floor, announced that Plenary had approved of the proposed changes to the Rules of Procedure as submitted.

7.4 Announcement of 2018 Lead Co-Chair and Slate of 2018 Executive Committee Members

The 2018 Executive Committee will include the following Members:

- Africa: South Africa (Co-Chair), Morocco, Uganda;
- Americas: USA (Co-Chair and Lead Co-Chair for 2018), Argentina, Ecuador;

- Asia-Oceania: China (Co-Chair), Australia, Japan, Republic of Korea;
- Europe: European Commission (Co-Chair), Finland, Germany, United Kingdom.

7.5 GEO-XV Announcements

The Chair announced that Japan has offered to host the GEO-XV Plenary in Kyoto, in 2018. A video welcoming the GEO community was then showed by the delegation from Japan.

The Chair expressed appreciation for the offer and was pleased to accept on behalf of Plenary.

7.6 Any Other Business

None.

7.7 Session Outcomes

The Secretariat Director highlighted the outcomes in presentation.

7.8 Closing Remarks

China Co-Chair Wei Huang addressed his fellow Co-Chairs, the Secretariat Director, and the Plenary with congratulations for successfully concluding two days of hard work that completed the agenda, delivered a series of documents, and allowed constructive discussions to take place. He affirmed China's commitment to continue its duties as Co-Chair for 2018, fully supported the USA Co-Chair as he takes over the role as Lead Co-Chair, and affirmed China's confidence of a successful Plenary in Japan next year. China is especially looking forward to assisting with the supply of Earth observations for monitoring of the SDGs, Paris Agreement and Sendai Framework. On behalf of China-GEO, he wished to thank the government of the USA for hosting the GEO-XIV week, along with his fellow EC Co-Chair for the excellent Plenary preparation, the USA Co-Chair for skilful chairing of the Plenary, and the Secretariat Director and staff for their outstanding work. He also thanked the Co-Chair from South Africa, Mr Phil Mjwara for his hard work over the past 12 years, and looked forward to working with his successor, Mr Mmboneni Muofhe.

EC Co-Chair Robert-Jan Smits stated he had found this to be a very rich Plenary and expressed his thanks and congratulations to the USA for hosting the event. He also thanked the US Co-Chair, the Secretariat Director and staff for all the preparation, and the Plenary participants for their positive contributions. Referring to the present condition of the Trust Fund, he encouraged Plenary to not be shy in stepping up with their contributions. He thanked all the Co-Chair for

their collegiality, and was pleased to see that GEO is transitioning from a data- to a user-centred approach. He also applauded the new approach to communicating the many successes of GEO in a way that is understandable. Together with many successful side-events, in his opinion, the GEO-XIV Plenary was one of the best ever.

South Africa Co-Chair Phil Mjwara stated that a nice thing bears repeating, so he thanked his fellow Co-Chairs and the Executive Committee for driving the meeting, as well as the Secretariat Director and staff for their hard work and preparation. He found his engagement with the GEO community to be an enriching experience over the years, and hoped that the enrichment was mutual. His parting message would be that there are a number of critical issues to watch: we must remember that Earth observations and GEO exist to benefit society at large; GEO needs to carry on with the implementation of GEOSS and continue to mobilize our capacities where needed; GEO must keep the momentum going with gains that have been made through the regional approach to GEOSS such as AfriGEOSS, and South Africa would like to continue to coordinate and strengthen these efforts; and Plenary needs to keep supporting the Secretariat through pledges to the Trust Fund and ensuring the change of Directors happens as seamlessly as possible.

USA Co-Chair Stephen Volz thanked the Secretariat and the US team who worked hard to make the proceedings seamless and effective. The side-events were of excellent quality, and the discussion panels allowed for different levels of dialogue and interactions with Plenary. The Programme Board has also been effective and productive. Yet, GEO must remain conscious of the fact that there is still much to learn: this is where greatest chance for growth occurs. He noted that this will be the last Plenary for Secretariat Director Barbara Ryan. The Executive Committee has gone through the selection process for a new Director who will be starting in July 2018, and the announcement concerning the individual will be made public as soon as the offer has been accepted. He emphasized that a seamless transition between Directors is important, and all will be dedicated to making sure this happens. He then presented the Secretariat Director with a gift of a Landsat image of Geneva, who then received a standing ovation, and commented that no one had been more influential than she in the USA for promoting free and open access to Earth observations.

Secretariat Director Barbara Ryan thanked the Co-Chairs for their kind remarks, and noted that already in 1972 there were voices calling for a broad, open data policy in several agencies across the USA. Progress towards this policy, though very time consuming, has been made over the years, one step at a time. She thanked the Co-Chairs and in particular the EC Co-Chair for having been the Lead Co-Chair during 2017. She also thanked the Executive Committee and Plenary, the USA team and the Secretariat staff for their hard work and preparation. She

observed that movements which bring real lasting change are dependent on the relationships made. As an eternal optimist, she believed that GEO is, and will continue to be, in good hands over the next decade and challenged Plenary to not lose sight of the fact that GEO can change the world.

Meeting adjourned at 5:30 pm.

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- Armen Saghatelyan
- Shushanik Asmaryan

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- Alex Held
- Trevor Dhu
- Flora Kerblat
- Jonathon Ross
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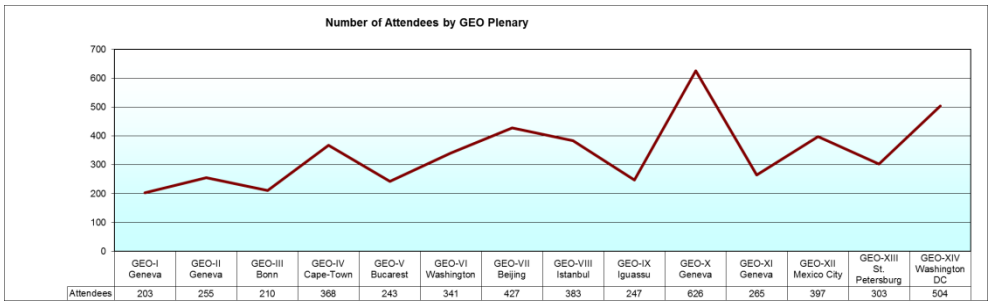
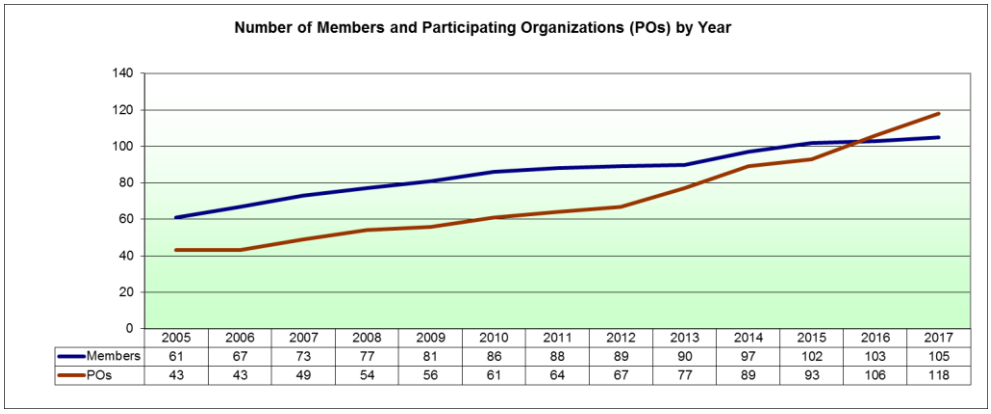


	GEO-I Geneva	GEO-II Geneva	GEO-III Bonn	GEO-IV Cape-Town	GEO-V Bucarest	GEO-VI Washington	GEO-VII Beijing	GEO-VIII Istanbul	GEO-IX Iguassu	GEO-X Geneva	GEO-XI Geneva	GEO-XII Mexico City	GEO-XIII St. Petersburg	GEO-XIV Washington DC
Attendees	203	255	210	368	243	341	427	383	247	626	265	397	303	504



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Members	61	67	73	77	81	86	88	89	90	97	102	103	105
POs	43	43	49	54	56	61	64	67	77	89	93	106	118