Earth observations for Nature-based Solutions:

the case of ecosystem extent

This document is submitted to the 18ᵗʰ Plenary for information

1　INTRODUCTION

Nature is the foundation of our health, livelihoods, and wellbeing. Our most important asset is deteriorating as never before in human history. Habitat destruction, soil erosion, pollution, climate change, and species extinction are just some of the most serious environmental problems facing our planet. We are facing imminent irreversible damage and loss environmentally, socially and economically. Three-quarters of the land-based environment and about 66% of the marine environment have been significantly altered by human actions. One million species on earth are at risk of extinction, some within decades source.

At the same time, positive actions to protect, manage and restore ecosystems are increasing. These include Nature-based Solutions (NbS) that impact hundreds of millions of hectares in diverse land and aquatic ecosystems around the world and generate an estimated US $170 billion of global benefits just for climate mitigation and adaptation, as indicated by the International Union for Conservation of Nature (IUCN). Well-conceived NbS are synergistically designed, with limited trade-offs and positive feedback loops integrated. They benefit from the richness and diversity of indigenous cultures that protect ecosystems and biodiversity in ways and dimensions not reached elsewhere.

In this context of increased momentum in supporting and financing NbS, Earth observations (EO) can ensure that their design and scale-up is evidence-based and impact-oriented. Through EO, the diverse ecosystem conditions in which NbS are implemented can be baselined and the numerous and diverse positive impacts they can bring, as well as any trade-offs, can be monitored.

We are currently unable to measure and compare changes to our ecosystems as the current methods are fractured, inconsistent and incomparable.

At GEO Week 2021 an anchor session on NbS showcased possible support from the GEO community to produce needed information to upscale NbS globally. Since then, the need for a coordinated global programme on ecosystem extent mapping and monitoring has been emphasized by the science and policy communities through relevant GEO Work Programme activities, Multilateral Environmental Agreements (MEAs), Committee on Earth Observation Satellites (CEOS) and GEO member countries.

This plenary session will explain why ecosystem extent mapping and monitoring is a priority, why the GEO community is extraordinary and uniquely placed to deliver this ambitious effort, and how such a programme can be designed, delivered and financed for impact.

2   THE POLICY CONTEXT

During the Fifth Session of the United Nations Environment Assembly (UNEA-5) this year, a resolution was adopted on a multilaterally agreed definition of NbS (on the basis of the definition proposed by IUCN members in 2016), recognizing the important role they play in the global response to climate change and its social, economic and environmental effects. Additional resolutions at this session prioritized ecosystem restoration and biodiversity protection as well as climate mitigation and adaptation actions.

Last year, during the United Nations Framework Convention on Climate Change (UNFCCC) COP26 in Glasgow, world leaders recognized the interlinked relationship between the global biodiversity and climate crises and the critical role that nature plays in both adaption and mitigation simultaneously. However, to keep global temperature rise within 1.5°C, there is a need to move from this recognition to establishing concrete pathways for delivery of actions. In this respect, while the COP decisions are an important step forward, the absence of a clear reference to NbS is a missed opportunity as there are still many contradictory actions around the globe such as investing in ecosystem conservation while encouraging intensive agricultural expansion.

At the end of this year, the Convention on Biological Diversity (CBD) COP15 in Montreal will deliberate the Post-2020 Global Biodiversity Framework (GBF). The Framework will define targets and pathways for the conservation and sustainable use of biodiversity for the next decade and beyond.

GEO has engaged with the CBD Secretariat to support the development of the Post-2020 GBF and methodological development of the suggested indicators. A key missing piece for the Post-2020 GBF is information on ecosystem extent, which is the first proposed indicator as well as foundational information for all the others, in addition to being one of the Essential Biodiversity Variables (EBVs). Ecosystem extent dynamics is key information also required by 2030 Agenda on Sustainable Development Goals (in particular target 6.6, 14.2 and 15.1), the Ramsar Convention on Wetlands (in particular wetlands inventories, monitoring and assessment), the System of Environmental-Economic Accounting (SEEA) and UN Convention to Combat Desertification (UNCCD).

GEO also engaged on the need for collaboration on ecosystem extent mapping and monitoring with IUCN. The latter has proposed a Global Ecosystem Typology that is standard for SEEA and likely to be confirmed as reference by the CBD during COP15. And finally, during the last CEOS Strategic Implementation Team Technical Workshop, CEOS with the support of GEO decided to create an Ecosystem Extent Task Team to be presented at the next CEOS Plenary in late November 2022 to support these efforts.

SOURCE: MARC PAGANINI, ESA

3   GLOBAL PROGRAMME ON ECOSYSTEM EXTENT MAPPING AND MONITORING

Recent developments in science and technology present the opportunity to revolutionize the way we measure and report on changes to our ecosystem. Leveraging the increased quality and quantity of satellite data from space agencies and the private sector, and information collected in nature, it is possible to apply new methodologies in Artificial Intelligence and decreased costs in processing to develop a global system that can provide up-to-date information on our natural ecosystems. Ther is now a unique opportunity to create one global tool to map and monitor forests, savannahs, grasslands, wetlands, mangroves, saltmarshes, coral reef, seagrass, macroalgae and intertidal habitats.

The ability to measure and track changes across the world produces significant incentives for further action and investment in protecting nature, fostering the highest level of transparency and accountability.

GEO proposes to co-create one a single, authoritative, and consensus defined global ecosystem monitoring platform for measuring and, reporting ecosystem condition, and to prompt urgent action to protect our biodiversity including ecosystems.

This will be an integrated effort to develop a standardized, robust, and practical classification and map of Earth's ecosystems for terrestrial, freshwater, and marine environments. The quantitative ecosystem extent for all ecosystems will be available for the individual occurrences of each ecosystem and for each ecosystem (summed) as a whole. The effort to produce this definitive classification and map will bring together

experts from all sectors (multinational, governmental, non-governmental, academic, industry) and will be built from consensus through integration of different approaches. The definitive global ecosystem map that will be produced will be wall-to-wall (all areas of the planet will be comprehensively mapped) and will include each of the three primary environmental domains (terrestrial, freshwater, and marine). As required by ecosystem accounting principles (e.g. UN SEEA) and intergovernmental protocol reporting procedures (e.g. SDGs), any portion of Earth's surface will be occupied by one and only one ecosystem type.

This ambitious programme will necessitate cross-sectoral partnerships between the GEO community and key entities from the public and private sector including local stakeholders that must be part of the co-design of such solutions to guarantee their long-term benefits and use. Implemented in a phased manner, the programme will require finance at scale from traditional and non-traditional donors in responding to global policy needs as well as to communities involved in NbS implementation.

GEO is extraordinarily well-placed to lead such an effort given its vast network of science, policy and finance communities and its existing Work Programme portfolio that supports the mapping and monitoring of many ecosystems. These GEO Work Programme activities include (but are not limited to):

- GEO Biodiversity Observation Network (GEOBON): GEOBON is currently developing a Global Biodiversity Observation System (GBiOS) that will fill large gaps in taxonomic, geographic, and temporal coverage of biodiversity monitoring. GEO BON will achieve this by creating a coordinated network of BONs and other monitoring schemes, thereby coordinating the flow of information that use essential variables to monitor trends and enrich the models used for proactive planning and the conservation of biodiversity worldwide. Since its start, GEOBON is one of the leading actors of the development of EBVs including the one on ecosystem extent.

- Earth Observations for Ecosystem Accounting (EO4EA): EO4EA supports the development of a System of Environmental-Economic Accounting (SEEA) that is a new international standard on Ecosystem Accounting which regulates the production on statistical accounts on ecosystem extent, condition and services. It is a measurement framework underpinning the development of monitoring frameworks of other international agreements, such as the CBD post-2020 GBF, the Ramsar Convention on Wetlands, and the 2030 Agenda on Sustainable Development. Ecosystem extent is a key information for such framework.

- GEO Wetlands (GEO-Wetlands): aims to build a global wetlands inventory of all existing monitoring programmes, which will help support countries to fill in the gaps in their national inventories and drive action around wetlands. Wetlands inventories are based on freshwater ecosystem extent mapping and monitoring.

- Global Forest Observations Initiative (GFOI): will continue to provide advisory and support services especially for developing countries to operationalize national forest monitoring systems and associated greenhouse gas accounting procedures. It responds to the global policy mandate REDD+ (Reducing Emissions from

Deforestation and Forest Degradation in Developing Countries) that is a key NbS for the forest sector.

- GEO Land Degradation Neutrality (GEO-LDN): is advocating within the EO community for the development of multi-decadal high-resolution interoperable data products for the land surfaces including ecosystem extent information. Through its open-source interoperable ecosystem of tools for geospatial analysis, GEO LDN is helping countries more effectively avoid, reduce and reverse land degradation while assessing it, evaluate trade-offs associated with potentially competing demands for land, optimize the spatial mix of land use in order to achieve multiple benefits, and plan interventions to conserve, sustainably manage and restore natural and modified ecosystems.

- Forest Biomass Reference System from Tree-by-Tree Inventory Data (GEO-TREES): supports the establishment and development of a global activity of in situ biomass reference measurement sites, the Forest Biomass Reference System (FBRS), to complement existing and planned space-based forest biomass observation instruments. These sites will provide integrated, multi-observational, multi-scale reference data to support global space-based forest biomass mapping and will include high-quality georeferenced data on tree biodiversity what will contribute greatly to forest's ecosystems identification and mapping.

4   DISCUSSION POINTS

The plenary session will discuss the urgent need for investment in a single, authoritative, and consensus-defined global ecosystem extent monitoring platform for measuring and reporting ecosystem condition, and to prompt urgent action to protect our biodiversity including ecosystems. The panel will focus on:

- What are the needed steps to develop and realize this ambitious global ecosystem extent platform. Are there any lessons learned and good practices that can guide the way?
- What partnerships will be necessary impact enablers, including as they relate to financing at scale and reaching the key users?
- Why is GEO uniquely placed to lead the design and implementation of this platform?
- What are the major risks and mitigation strategies to the development, dissemination and utilization of this tool?

5   KEY REFERENCES

- Visit Global Ecosystem Typology:
  https://iucnrle.org/global-eco-typo

- Promoting Nature-based Solutions in the Post-2020 Global Biodiversity Framework:
  https://www.iucn.org/sites/default/files/2022-07/promoting_nbs_in_the_post-2020_global_biodiversity_framework.pdf

- IUCN - Nature-based Solutions definition:
https://www.iucn.org/sites/dev/files/content/documents/wcc_2016_res_069_en.pdf

- IUCN Global Ecosystem Typology 2.0:
https://portals.iucn.org/library/sites/library/files/documents/2020-037-En.pdf

- Ecosystem Extent and related indicators: an overview:
https://geobon.org/wp-content/uploads/2021/10/Slides_27Sep_Part1.pdf