

Implementation Plan for the Earth Observation for Ecosystem Accounting (EO4EA) Initiative
2020 – 2022 GEO Work Program

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1. Executive Summary

Title: Earth Observation for Ecosystem Accounting

Short title: EO4EA

Status: GEO Initiative

Overview – The purpose of the initiative is to further the development and use of Earth Observations for natural capital accounting (NCA) consistent with the set of standards and guidelines put forth by the UN System of Environmental-Economic Accounting (SEEA) and specifically the Ecosystem Accounts (EA). Ecosystem Accounts rely on spatial data in order to systematically assess the health and status of ecosystems and the benefits of ecosystem flows to human well-being and the economy. Through partnership, research, and practical application we will advance the application of the science of earth observation to the practice of ecosystem accounting. We envision a future where earth observation systems enable environmental transparency and the value of ecosystems is incorporated into conventional economic accounts and decision making, leading to an important shift in the valuation of natural resources and the use of that information for policy and programmatic decision making. There is a significant global demand for ecosystem accounting with the UN Statistical Commission identifying over 70 countries that have indicated their desire to develop these accounts. However, data for many of these countries is unavailable or is not available in time series that allow analyses of not only status but also trends. Our mission is to document, pioneer, develop, and test the methods and tools that will allow earth observation technology to more effectively enable the widespread adoption of ecosystem accounting

Planned activities – Table C (Under Development).

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2. Purpose

Ecosystem Accounts rely on spatial data in order to systematically assess the health and status of ecosystem and the benefits of ecosystem flows to human well-being and the economy. The goal of these ecosystem accounts is to provide national government with the statistical information needed to make more effective decisions on the use of its' various ecosystems. By facilitating the development of the earth observation component of ecosystem accounts the initiative expects to provide governments with more effective tools to aid development planning and assessment and to inform management and policy options for any activity which will use or impact a country's natural capital or substantial flows of ecosystem services from those flows.

The purpose of the initiative is to further the development and use of earth observations for the natural capital accounting (NCA), based upon and consistent with the UN System of Environmental Economic Accounts (SEEA) – Ecosystem Accounts (EA). The initiative includes participants from both the Earth Observation and Ecosystem Accounting communities in order to facilitate the interdisciplinary approach needed to address key challenges. Ecosystem Accounts are designed to facilitate better understanding of the interaction of environment and natural resource with various economic sectors, the economy overall and the broader societal benefits generating results useful to land and resource managers, program and project designers and managers, and policy makers. Using these systematic and repeatable accounts-based approaches allow the state and trends of resource stocks and conditions to be tracked over time, which facilitate further post account assessments such as the efficacy of programs, projects and policies.

EO4EA will compile information on current Ecosystem Accounting efforts across varied themes and scales to synthesize our understanding of how earth observations (EOs) may be utilized in ecosystem accounts. It will further assess the gaps, in available earth observation systems, and issues associated with sampling, temporal and spatial resolution, classification, data interpretation and information processing, in order to identify further research needs. EO4EA will assess how EO can more effectively contribute to monitoring and assessing ecosystem extent and condition. It will also look at how EO can more systematically contribute to the measurement and monitoring of ecosystem services. These efforts will be shared with the UN Committee on Environmental and Ecosystem Accounts (UN-CEEA) as they revise the technical guidelines on the SEEA-EEA.

The upcoming revision of the SEEA EEA guidelines in 2020 is a key target for the initiative as it will provide an opportunity to directly integrate our findings into official United Nations Statistics Division (UNSD) recommendations. The revision of the guidelines also provides an opportunity to contribute to the scientific needs of the ecosystem accounting community and to ensure that both current and future EO platforms are incorporated.

There are multiple stakeholders and intended end-users for the methodologies and guidelines developed by the initiative. The primary end-user is regional and national government who are seeking to develop ecosystem accounts as a means of building considerations of nature directly into their statistical systems. Several member countries, including Mexico, Canada, United States, Netherlands, Australia, and Indonesia have already developed, or are in the process of developing, pilot accounts. Despite the focus on ownership and deployment by governments, there are also a number of additional end-users who could benefit from the outputs of the initiative, including academics institutions, NGOs, and private corporations.

The longer-term goal of the EO4EA initiative is the development of methodological guidance on using EO to measure and monitor ecosystem extent, ecosystem condition, and ecosystem services for the purpose of ecosystem accounting. To this end, the initiative will: synthesize exist examples of ecosystem accounting at the regional and national level; pilot ecosystem accounting efforts; advance the science of EO to support ecosystem accounting; publish guidance and methodological documents; and provide capacity building to support ecosystem accounts.

The expected outcome of the initiative is nothing short of changing the way that decision-makers and governments perceive and interact with the natural world. By incorporating the value of ecosystems into the accounts that are used to make decisions, the initiative seeks to enable better decision making which truly accounts for the value that natural ecosystem provide to people and the economy. In the era of the SDG's. governments have demanded this information and the impact of this change will lead to their ability to managed greater environmental stewardship, improved human-wellbeing, and more sustainable development.

3. Background and Previous Achievements

The EO4EA initiative is still very new within GEO and is continuing to develop, however, there have been numerous achievements over the past year. The EO4EA initiative hosted and participated in numerous key meetings this year including:

- The Forum of Experts in SEAA Experimental Ecosystem Accounts hosted by the UNSD
- Co-hosting The Natural Capital Assessment and Accounting side event at the 6th GEF General Assembly along with the most important agencies mandated to spearhead NCA.
- NASA funded workshop on EO for ecosystem service assessment at the University of Minnesota
- The UN Statistics Commission's London Group on Environmental Accounts in Dublin
- EO4EA side event at the GEO Plenary in Kyoto
- The Third Natural Capital Policy Forum in Paris
- Progress on various individual government projects conducting ecosystem accounting including Australia, US, Canada, Liberia, Mexico, Netherlands, Indonesia, and Rwanda.

Members also published three key synthesis reports over the course of the past year. UNEP-WCMC published a reported entitled "Technical proposal on opportunities for using earth observation data in KIP-INCA" which examined how ESA Copernicus product could be used to support ecosystem accounting in the European Union. To compliment the report, WCMC also published a database of the Copernicus products and provides an interactive tool to link data products to the extent, condition, and services accounts ([link](#)). The major synthesis entitled, "Earth observation for official statistics: Satellite imagery and geospatial data task team report", was authored by the United Nation, Australian Bureau of Statistics, Queensland University of Technology, the Queensland Government, Commonwealth Scientific and Industrial Research Organization, the National Institute of Statistics and Geography (INEGI) in Mexico and Statistics Canada. The report was produced as an input to the United Nation Working Group on Big Data for Official Statistics and outlines the current and potential future applications of earth observation to support national statistics, including SEEA. Finally, a third report was written by the government of Australia, entitled "Earth Observation for Environmental-Economic Accounting", which focuses specifically on how EO data could be used to inform the Australia ecosystem accounts. These

three reports highlight the increasing role of earth observation data in environmental accounting and represent significant progress toward the Case Study and Synthesis workstream in EO4EA. Additionally, EO4EA members contributed to peer reviewed publications on natural capital accounting in the United States ([link](#)) and the role of earth observation in ecosystem service assessment ([link](#)).

Finally, there has been much progress from the overall community throughout the year promoting ecosystem accounting with the United Nations and national governments. At present over 73 countries have expressed interest in undertaking some form of ecosystem accounting and many more are developing environmental-economic accounts under the Central Framework. This is a very positive trend and only provides further opportunities for EO4EA to simultaneously expand its activities and reach important user communities.

4. Relationship to GEO Engagement Priorities and to other Work Program Activities

The EO4EA initiative is fully grounded in the GEO Strategic Plan 2016-2025, seeking to “improve the effectiveness of GEO’s actions, to broaden engagement and collaboration of stakeholders,” as called for by the 2014 GEO Ministerial Summit. This initiative will include stakeholders and users as active partners across the public, private, academic and NGO sectors. These partners include environmental and ecosystem accountants, statisticians, environmental and ecological economists, geographers, geo-spatial data experts and ecologists.

The Initiative also responds to the Mandate of the GEO Mexico City Declaration of 2015. Specifically, the initiative - will be an active collaboration “with statistical agencies and others to integrate Earth observations with social and economic data to multiply their collective value and to contribute solutions that are linked from the global to local levels.” Both GEO and EA, share a systems level approach to help us achieve this mandate. GEO approaches the contribution of earth observations to SBA’s from a systems-level, while ecosystem accounting is globally regarded as the systems-level solution to assessing the contribution of ecosystems to human well-being and the economy. Ecosystem accounting was also identified by the 38th Executive Committee as one of the 5 GEO Engagement Priorities for 2017-2019. EO4EA will contribute to the implementation of the 2030 Global Goals for Sustainable Development (SDGs) and will also contribute to many of the “societal benefit areas” identified by GEO.

EO4EA will have significant overlap and synergies with several existing GEO initiatives and flagships, due to the interdisciplinary and wide-ranging scope of ecosystem accounting. The success of EO4EA will depend on collaboration with other GEO programs. At the GEO Plenary in Kyoto a meeting was set up with GEOBON to discuss synergies and opportunities to work together. Some of the key areas of overlap were around the Essential Biodiversity Variables (EBVs), specifically those related to ecosystem structure, condition, and ecosystem services. Another GEO initiative that EO4EA has started to work with is GEO-ECO, who are currently developing global consistent ecosystem extent products. A related EU funded project, Ecopotential, is using the work of GEO-ECO and applying it specifically to Europe. Much of the ecosystem accounting work to date has focused on terrestrial ecosystems, however, there is a desire to expand to coastal and marine ecosystems in the future. This will require close collaboration with other GEO groups, such as Blue Planet to better understand the contribution of EO in these biomes. Finally, there is significant overlap between the EO4EA initiative and the EO4SDG flagship, since in many cases achieving the SDGs will require greater environmental stewardship and robust monitoring. EO4EA

could do more to align our efforts with the SDGs by mapping indicators or sub-indicators that could be derived from ecosystem accounts.

5. Stakeholder Engagement and Capacity Building

Engaging with stakeholders across multiple disciplines and many institutions, including government, NGO and academic, will be critical to ensuring the success of the initiative. This engagement will happen across multiple platforms including GEO events, UN meetings, and direct engagements with our members. Additionally, EO4EA will seek to bring new countries into our membership to better deliver benefits to support national and subnational ecosystem accounting.

“Implementation and capacity building” is one of the 4 primary workstreams in the initiative (see Technical Synopsis below). Capacity building is a high priority for the ecosystem accounting community at the individual, organizational and institutional level, and will be carried out by our members and partners in the form of trainings and workshops to convey theory, practice, and methods for ecosystem accounting. Individual capacity building activities are typically built into the discrete projects that comprise EO4EA. The initiative will enhance those efforts by collating experiences and providing tool and best practice guidance. This approach will likely evolve over time towards a “library” tools and manuals specifically for incorporating EO data into ecosystem accounts. Finally, institutional capacity building is the end goal of the EO4EA initiative; enabling the collaboration between governments and institutions to implement, iterate and improve ecosystem accounting within the UNSD-SEEA. Organizations such as the United Nations and GEO will be key in providing the mandate and direction to achieve institutional-level capacity building.

6. Governance

The governance of EO4EA will be led by the Secretariat, Conservation International, and a steering committee comprised of experts in ecosystem and environmental accounting from Governments, International Organizations, NGOs, academia, and private sector. The initiative is still very new and currently the governance structure is evolving. The issue of governance will be revisited during the EO4EA general meeting in June 2019.

Until then, the steering committee is the primary governing force within the initiative and will provide direction and review progress on the workstreams on a biannual basis, identify opportunities for funding or capacity building, and report on key developments within the field. Steering committee membership is ad hoc and voluntary and will include representatives from several countries and institutions. Beyond the steering committee there is also a broader community of practice. The community of practice is invited to self-identify to be informed of progress of the initiative. There will be an annual meeting with the broader community of practice report on the progress of the initiative and to invite members to contribute to the workstreams.

7. Resources

Currently the initiative has funding from NASA to maintain the Secretariat for 3 years. During this time, Conservation International will seek to expand the membership of the initiative, develop opportunities for joint fundraising, and coordinate with the broader GEO community to identify synergies among the EO4EA workstreams and other GEO initiatives and workstreams. For the first year of this workplan there will be an initial focus to engage and invite developing countries to join the initiative.

There has also been in-kind support from several member countries and institutions. NASA has also funded CI to undertake work in Indonesia and funded the University of Colorado to do work in the U.S.

The steering committee has already identified that joint fundraising will need to be a major effort over the next year or two in order to promote the applied research elements of this workplan for the individual workstreams.

8. Technical Synopsis

The initiative will interact with all manner of EO data. Satellite data will be particularly important given the scale and temporal resolution of ecosystem accounting efforts. The initiative will not focus on specific platforms or agencies and will seek representation from multiple data providers. One area of focus for the initiative will be on making EO data more accessible for ecosystem accounts. This may involve creating new methods to apply to existing datasets or this may involve participating in planning processes to ensure that future sensors can adequately support the needs of the ecosystem accounting community.

EO4EA technical activities will be divided across 4 workstreams:

- 1) Case studies and synthesis,
- 2) Ecosystem extent and condition,
- 3) Identification, measurement, and monitoring of ecosystem services, and
- 4) Implementation and capacity building.

The objective of Workstream 1: Case Studies and Synthesis, is to highlight case studies and applications of ecosystem accounting. Information on the use of EO in Ecosystem Accounts will be available through the new EO4EA website. Additionally, a synthesis will focus on how earth observation data has been used in various case studies at national and subnational levels. The workstream will compile case studies and results to inform the development of new methods and applications.

The purpose of Workstream 2: Ecosystem Extent and Condition, is to develop and test methods for delineating ecosystem extent and assessing ecosystem condition. The ecosystem extent account provides the foundation for ecosystem accounting and is critical for the characterization of ecosystem services. Ecosystem condition reflects the vitality of ecosystems and their ability to provide ecosystem services. The workstream will focus on technical application of earth observation data to support the ecosystem extent and condition accounts.

Workstream 3: Identification, Measurement, and Monitoring of Ecosystem Services, will advance ecosystem service identification, measurement and monitoring through the application of earth

observation. The methods developed will seek to directly or indirectly assess the provision of ecosystem services and the value that they provide. The workstream will explore the wide range of approaches and tools that can be used to measure and model ecosystem services and identify how earth observation data can be used to inform such estimates.

Finally, Workstream 4: Implementation and Capacity Building, will lead the capacity building, pilot testing and implementation of ecosystem accounting at the subnational and national scale. Support will be given to governments and partners seeking to implement ecosystem accounting and integrate it within the system of national economic accounts. The workstream will focus on identifying barriers to implementation, developing materials for outreach and education, and advancing the application of ecosystem accounting with earth observation. Each workstream will have a workstream lead, who will also participate on the steering committee, responsible for organizing the research agenda within the workstream. The workstream leads will also be responsible for reporting on progress and documenting successes within their workstreams.

Indeed, the key challenge that the larger natural capital accounting community and thus, this initiative will face is *how to operationalize the use of EO data for ecosystem accounting*. There is a vast amount of EO data, but there is little guidance on how it can be effectively applied for ecosystem accounting. The identification of the most appropriate dataset and data sources and maintaining them over time will be one of the first major accomplishments for this initiative. A good example of this from our contributors at the European Environment Agency and WCMC is the report and interactive tool matching Copernicus resources with relevant applications in the ecosystem accounting framework, however, this only represents a small fraction of the EO data available. Another technical challenge will be bringing together data on a platform that is accessible to the ecosystem accounting community and ensuring that countries have access to resources needed to update those datasets, and therefore the account, over time. As is the case with most of the GEO world in a system of systems, ensuring repeatability is a paramount concern. Data cubes are one potential solution that will be explored along with cloud storage and processing. These technical issues will be addressed through the activities of the 4 workstreams to ensure that solutions are crosscutting and serve the broader ecosystem accounting community.

9. Data Policy

It is anticipated that many key data sets already exist but need to be integrated in a way that they can provide essential and relevant information needed for the development of ecosystem accounts. A key purpose of the initiative is to identify critical data gaps. The taskforces will proceed with their initial efforts to clarify what key datasets will be used or created, to measure and monitor ecosystem extent and condition and to track flows of ecosystem services. We will seek to adhere as fully as possible to the GEOSS Data Sharing and Data Management Principles, to contribute new data sets developed to the GEOSS Data CORE and to seek appropriate interoperability of the Earth Observation data used with the GCI (GEOSS Common Infrastructure). EU partners will also need to comply with recent EU data and privacy regulations.