Importance of Earth Observation for effective SEEA implementation


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The monitoring of the MDGs taught us that **data are indispensable elements of the development agenda**.

Despite improvement, **critical data** for informed policy making on development are still lacking.

**New technology** is changing the **way data are collected** and disseminated.

Data should be **open, easily accessible** and **effective for decision-making**.

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**modernizing NSOs** is essential to achieving the 2030 SDGs.

**Integrating geospatial and statistical data** is a necessity.

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**First UN World Data Forum on Sustainable Development Data**

15-18 January 2017

Cape Town, South Africa.
The European Copernicus Programme

State-of-the-art observations with unprecedented coverage

Systematic data availability

Full, free and open data policy

Long-term availability

→ RADAR VISION
→ COLOUR VISION
→ A BIGGER PICTURE
→ EUROPEAN AIR MONITORING
→ GLOBAL AIR MONITORING
→ SURFING THE SEAS

Know more: https://copernicus.eu and https://sentinels.copernicus.eu

→ THE EUROPEAN SPACE AGENCY
Commonly stated obstacles to the scaling-up and operational use of EO in the global sustainable development agendas

- Restrictive data access policies (including cost)
- Not enough “fit for purpose” products
- Frequency of observations insufficient to track changes at appropriate scales
- Needs for continuity of observations and long-term EO programs
- Lack of analysis ready data
- Capacity building and training
- Difficulties to discover and access EO data
- Lack of clear and solid user-oriented methods and guidelines
- Insufficient solid track records of successful case studies
- Lack of standardisation of EO data processing methodologies
The emergence of EO exploitation platforms

"Bringing the users to the data"
Simplify the extraction of information
Enable large scale exploitation
Stimulate innovation

The power of the Cloud
The power of Partnerships

Platforms as enabling technology

Mobile data
Crowdsourcing
citizen science

Service providers
knowledge & algorithms
tools

Satellite data

Ancillary data
(land use, DEM, ...)

Toolboxes

Data Analytics

Processing & Storage Capacities

Remote access for users

User knowledge & algorithms
User data

User generated results

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International collaboration to scale up EO innovation for the full achievements of the 2030 Agenda on Sustainable Development
The UN System of Environmental-Economic Accounting (SEEA)

- SEEA Central Framework (SEEA-CF) adopted by UN Statistical Commission
- SEEA Experimental Ecosystem Accounting (SEEA-EEA)
- SEEA Ecosystem Accounting (SEEA-EA) adopted by the UNSC

European Natural Capital Accounting

- EU Regulation N 691/2011 on European environmental Economic Accounts
- EU Regulation N 691/2011 amendment on Ecosystem Accounting
Ecosystem Accounting underpins the Multilateral Environmental Agreements

**UN Convention to Combat Desertification (UNCCD)**
UNCCD 2018-2030 Strategic Framework
Strategic Objective 1: to improve the conditions of ecosystems

**Convention on Biological Diversity (CBD)**
Post 2020 Global Biodiversity Framework (GBF) and its monitoring framework

**UN Framework Convention on Climate Change (UNFCCC)**
UNFCCC Paris Agreement
Glasgow Climate Pact

**Ramsar Convention on Wetlands**
Ramsar Strategic Plan (2016 – 2024)
Conservation and wise use of all wetlands

**UN SEEA Ecosystem Accounting**
International standard on Ecosystem Accounting that regulates the production of statistical accounts on ecosystem extent, condition and services, underpinning the development of monitoring frameworks of other MEAs.

**Sustainable Development Goals (SDGs)**
- SDG Target 6.6: Protect and restore water-related ecosystems
- SDG Target 14.2: Sustainably manage and protect marine and coastal ecosystems
- SDG Target 15.1: Ensure conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems.
Bring together experts in Earth Observation and in Ecosystem Accounting to discuss the key challenges that need to be addressed in order to mainstream the use of EO in the production of national ecosystem accounts.

### 3 panels
- Importance of EO for SEEA Ecosystem Accounting
- MEA monitoring programmes that SEEA EA can support
- National implementation of SEEA EA and EO opportunities/challenges in national accounts

### 8 Sessions
- Ecosystem Extent, Condition and Services
- Thematic Accounts: Urban ecosystems, Forests, Marine/Coastal ecosystems, Agroecosystems
- Operationalisation of EO data flows in the compilation of national ecosystem accounts.

### Attendees
- 12 panellists
- 15 session chairs
- 7 guided discussions
- 50 oral presentations
- 800+ participants
Ecosystem Accounts are inherently spatial accounts that strongly depend on the availability of spatially explicit datasets, including Earth Observations.

The emergence of EO data streams at appropriate scales combined with advances in digital technologies offer unprecedented opportunities for countries to efficiently monitor the extent and conditions of their ecosystems, determine ecosystem services and implement their national ecosystem accounting.

**EO in Statistical Accounts**

- Requires a **change of mindset in NSOs** to use Earth Observation and Big Data more widely.
- Requires **integration of many strands of expertise** including statisticians, ecologists, national mapping agencies, geo-spatial and EO experts.
- Needs to have spatially explicit accounts **consistent in space and in time**.
- Importance to have a **precise estimation of the uncertainties** for officially statistics.
- Need to have **regularly updated accounts** that allows to track the “intrinsic” variations of the subject accounts.

**EO Enabling Elements**

- Need to adopt a **data flow strategy** similar to the SDGs.
- Request from the statistical community to have “Accounts Ready Data” which can simplify their integration into official statistics.
- Need for **practical methodological guidelines** (datasets, tools and models) with **operational examples** to help countries integrating EO within their national systems on ecosystem accounting.
- The importance to have **adequate infrastructures (data factory following FAIR principles)** to enable country appropriation of EO technology in ecosystem accounting.
EO opportunities & challenges in SEEA-compliant Ecosystem Accounting

<table>
<thead>
<tr>
<th>Ecosystem Extent Account</th>
<th>Ecosystem Condition Account</th>
<th>Ecosystem Services Account</th>
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<tbody>
<tr>
<td>• Classification is the <strong>backbone of ecosystem accounts</strong>.</td>
<td>• derivation of <strong>reliable EO-based metrics on ecosystem conditions</strong> and of their <strong>distance from a reference condition</strong>.</td>
<td>• Ecosystem Service is a <strong>priority for most countries</strong> (needed in multiple policy frameworks such as UNFCCC).</td>
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<tr>
<td>• Need <strong>reliable and comprehensive mapping of ecosystem types</strong> (EO need to go beyond LC/LCC and support IUCN GET/ EUNIS typology classification).</td>
<td>• Need for condition indicators in terms of <strong>biotic and abiotic characteristics</strong> and for <strong>ecosystem structure, function and composition</strong>.</td>
<td>• Conceptual Framework for Ecosystem services (provisioning, regulating and cultural services) well established but use of EO is still marginal.</td>
</tr>
<tr>
<td>• How to exploit the large quantity and variety of <strong>in-situ data collections available in MS</strong> on ecosystem types?</td>
<td>• Importance to monitor the conditions of ecosystems <strong>outside of protected areas</strong> (less reference information).</td>
<td>• Need to <strong>integrate EO data with other spatial datasets in spatial ES modelling</strong> to derive flows of ecosystem services.</td>
</tr>
<tr>
<td>• Monitoring <strong>changes in extent of ecosystem types</strong> bring another level of complexity.</td>
<td>• Needs to find a <strong>compromise between simple and rapid assessment</strong> based on remote sensing products wrt accuracy needed for statistical accounting.</td>
<td>• <strong>How to leverage the use of modelling tools and platforms</strong> (e.g. ARIES for SEEA) to estimate reliable ecosystem services accounts.</td>
</tr>
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<td>• Strong need to <strong>automate the production</strong> of ecosystem extents and their changes.</td>
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EO integration in SEEA EA workflows

**Stock Accounts and Changes in Stocks**
(in physical terms)

- Ecosystem Extent
- Ecosystem Condition

**Flow Accounts**
(flow and use)

- Ecosystem Services

**Natural Capital Valuation**
(in monetary terms)

- Ecosystem Asset Account
- Ecosystem Services Account

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**Wetland Ecosystem Extent**
e.g., Habitats Mapping

**Forest Ecosystem Condition**
e.g., Bark Beetle Infestation

- Bark beetle infestation progression (14-day) and infestation probability over the beetle season 2018

**Forest Ecosystem Services**
e.g., Carbon Stock Volume

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**Legend**
- 1 medium probability
- 2 medium - high probability
- 3 high probability
- 4 very high probability
Ecosystem Accounting in agroecosystems

Seasonal maize, 2021, Northern Italy

https://esa-worldcereal.org/en
Ecosystem Accounting in terrestrial ecosystems

Classification of in-situ vegetation relevés to EUNIS habitat types

- Training data European Vegetation Archive (EVA) & environmental data layers
- RS-enabled EBV’s, e.g. HR-VPP

Modelling with MAXENT

Habitat Suitability Maps (100m)

Actual Copernicus Land Cover

Habitat Probability Maps (20m or 100 m)

European Vegetation Archive (EVA)

https://eo4society.esa.int

Suitability map S41: wet heaths
Ecosystem Accounting in wetland ecosystems

http://globwetland-africa.org

Lake Burullus, Egypt
Ecosystem Accounting in mangrove ecosystems

https://www.globalmangrovewatch.org

There were 2000 mangrove disturbance alerts between January, 2020 and August, 2020.

Total organic carbon stored in Nigeria’s mangroves is estimated at 1,127.95 Mt CO₂e with 94.25 Mt CO₂e stored in above-ground biomass and 1,033.70 Mt CO₂e stored in the upper 1m of soil.
Ecosystem Accounting in urban ecosystems

Baseline Products: Urban and Peri-Urban LU/LC

World Settlement Footprint (WSF) and its dynamic evolution in time, with Landsat and Copernicus Sentinel-1 and Sentinel-2.

Understanding of urbanization at planetary scales.
Integrating EO workflows in SEEA-EA processes

- Review the opportunities and challenges of integrating EO data in ecosystem accounting for terrestrial and freshwater ecosystems.
- Co-develop high-quality EO-based ecosystem account models with countries.
- Showcase and validate pilot demonstrators to prove the value.
- Contribute to the international collaborative efforts to advance the use of EO in ecosystem accounting and support countries developing their national ecosystem accounts.
- Prepare a R&D roadmap to scale-up the use of EO in ecosystem accounting

https://esa-people-ea.org/
Take home messages

• The uptake of Earth Observation in SEEA (CF and EA) can benefit from the availability of a steadily increasing flow of satellite data of suitable characteristics from the emergence of affordable digital solutions to address the size and complexity of such large data sets of satellite observations.

• Within many national governments, there is a recognition of the need to link statistical information and geospatial information (including Earth Observation) to improve national data on SEEA, its disaggregation, and the evidence on which decisions are made.

• Despite the growing awareness among NSOs that traditional statistical techniques must be complemented with geospatial information to meet the ambition of the SEEA, the uptake of Earth Observation in SEEA has been slow and unevenly adopted by countries.

• A number of challenges still need to be adequately tackled by countries to fully embrace the EO potential in national statistics on SEEA (including Ecosystem Accounting). The challenge of synthesising multiple and heterogeneous data sources, and designing adequate methodologies that harmonise EO with statistical data according to the rigorous standards of official statistics, is key for the NSOs.

• There is a need for a stronger collaboration between NSOs and EO experts, to enable the potential of EO to be fully realised within the SEEA, in particular if EO data is to be merged with other statistical data and big data collections.
I wish all participants an inspiring and constructive seminar.