**KIP-INCA Workshop on developing proposals on potential use of Copernicus for Ecosystem Accounting**

**EEA, 16 April 2018**

**Background paper, final draft**

**1. Background**

Measuring and accounting for natural capital is a key objective of the EU biodiversity strategy and its 7th Environmental Action Programme. To meet this objective, a natural capital accounting system is being developed by the Knowledge Innovation Project (KIP INCA). KIP-INCA aims to design and implement an integrated accounting system for ecosystems and their services in the EU by connecting relevant existing projects and data collection exercises to build up a shared platform of geo-referenced information on ecosystems and their services.

**2. The measurement framework**

The System of Environmental-Economic Accounting - Experimental Ecosystem Accounting (SEEA-EEA) provides the measurement framework for building ecosystem accounts under KIP-INCA. The SEEA-EEA has been produced jointly under the coordination of the United Nations Statistical Division with support from the European Commission, World Bank, FAO and OECD. This experimental framework characterises ecosystems on the basis of their extent and a set of condition characteristics (stock) and their ability to deliver ecosystem services (flow) at different points in time. The figure below sets out these core bio-physical ecosystem accounting modules (in green) and a set of associated accounting themes (in orange) of specific environmental management and policy interest.



The SEEA-EEA describes how to produce regular ecosystem accounts grounded in a spatially explicit and time series approach. As such ecosystem accounting depends on the availability of geospatial reference data that accurately describe the distribution and condition of ecosystems and the services they deliver with sufficient resolution to capture both large and small ecosystems. It also requires that this data is updated on a regular and reliable (assured) basis and that this data is consistent across both space and time.

**3. Criteria for ecosystem accounting reference data**

From EU level experience on ecosystem accounting over the last 10 years some key tenets in ecosystem accounting design can be learned that help steer the identification of the most promising data products and services for calculating the core bio-physical ecosystem accounts described in Section 1 (relating to ecosystem extent, condition and services). In particular, ecosystem accounting reference data should ideally meet the following criteria:

* Follow an analytical approach aligned with the characteristics of the data (i.e., avoid analytical over-reach).
* Be relevant to ecosystem typologies used in Europe (e.g., the MAES Typology and EUNIS system)
* Match key indicators on ecosystem condition identified in recent MAES work
* Be comparable across all MAES ecosystem types to which they are applicable
* Support an analysis of the link between ecosystem condition and service delivery
* Be able to organise information at the scale of functional ecological units (water basins, mountain ranges, ecosystem types, etc.), e.g. by linking to the 1km grid used by the EEA as core accounting grid
* Be well-suited to detecting signals of change
* Be harmonised, geo-referenced and quality assured
* Updated on a regular basis & fully documented

**4. How can Copernicus data help?**

What sets the Copernicus programme apart from other earth observation programmes is that it is service-oriented and not experimental or focused on research and development. A service implies a specific customer with needs to be met, dependent on delivery on time and on budget. Therefore Copernicus is founded on the core principle of continuity of observation and free and open access for a set of core users in key thematic domains. The services provided consist of spatially continuous data products and the spatial data infrastructure to access them, as well as supporting documentation to use them. Copernicus products are designed to be user-friendly and therefore do not require an ability to process primary satellite data sets. The spatial data products are routinely produced and come with well documented and, in some cases, peer-reviewed methodologies and validation protocols. Being an operational service, product validation is key to ensure product reliability and performance in real world applications.

The accessibility and ability of Copernicus products and services to monitor ecosystem characteristics over space and time make them well-suited for supporting ecosystem accounting. In particular, the land services theme of the Copernicus programme provides a strong data foundation for the terrestrial context. They provide robust, quality assured, regular and repeatable coverage of spatial data that is not only consistent over both space and time but also at the resolution required to support ecosystem accounting. Furthermore, the thematic breadth of the land service products is likely to yield spatial data that are applicable to a wide range of the parameters required to establish the ecosystem extent, condition and services accounts of the SEEA EEA handbook.

**5. Workshop objective**

This workshop will bring together a small group (around 10 participants) of practitioners in Earth Observation, Ecosystem Accounting and Assessment to establish how Copernicus data can best support KIP-INCA and ecosystem accounting generally. The objective is to identify all Copernicus activities and ecosystem accounting reference data that can inform the compilation of the different core bio-physical ecosystem accounting modules (i.e., ecosystem extent, condition and services) and how these can best be developed. To this end workshop participants will:

1. Review and develop a database linking current and future Copernicus Earth Observation and *in-situ* products and services to different ecosystem accounting modules (a first draft is appended); and,
2. Identify the key opportunities to develop Copernicus activities and datasets to support ecosystem accounting.

**6. Supporting information and material**

The workshop is being co-organised by the EEA, with support from UNEP-WCMC. For further information on the workshop and project please contact:

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A draft structure for the database linking Copernicus products and services to ecosystem accounting mentioned in Section 5 is provided and a description of the database is given in Annex 1 herein (also provided in the readme tab of the database).

Further information on the KIP INCA project and progress to date is available from the European Commission: <http://ec.europa.eu/environment/nature/capital_accounting/index_en.htm>

Detailed technical recommendations to support the SEEA-EEA are available from the UN SEEA website: <https://seea.un.org/sites/seea.un.org/files/technical_recommendations_in_support_of_the_seea_eea_final_white_cover.pdf>

**Annex 1: Database description**

Introduction

The accessibility and ability of Copernicus products and services to monitor ecosystem characteristics over space and time make them well-suited for supporting ecosystem accounting. In particular, the land services theme of the Copernicus programme provides a strong data foundation for the terrestrial context. Across the EU, there are both pan-European as well as local components. The following is a summary of the suite of Copernicus Land Services across the different components:

* **Global:** Biophysical variables which describe the state and the evolution of the continental vegetation and soils, the energy budget at the surface, the cryosphere and the water cycle.
* **Pan-European:** Land cover (CORINE Land Cover Map), biophysical variables (High Resolution Layers), reference data (digital elevation model, EU-DEM and river network, EU-Hydro
* **Local:** Land cover (Urban Atlas, Riparian Zones).
* **Reference Data:** In-situ data, e.g. Land Use and Coverage Area frame Survey (LUCAS).

These land monitoring products and services have considerable potential to support terrestrial ecosystem accounting at sub-national, Member State and EU scales. As outlined above, they provide robust, quality assured regular and repeatable coverage of spatial data that is not only consistent over both space and time but also at the resolution required to support ecosystem accounting. Furthermore, the thematic breadth of the land service products is likely to yield spatial data highly applicable to all the core ecosystem extent, condition and services accounts of the SEEA EEA handbook.

Database Structure

The database provided is designed to help users identify which Copernicus products have the best potential to inform on bio-physical ecosystem accounting for extent, condition and services. A separate spreadsheet is provided for each of these different ecosystem accounting modules. Using simple filter options, the user specifies the ecosystem account they are interested in and the degree of match of the desired data sets to these accounting themes, i.e., if they are ‘potential’ or ‘clear’ match. The data options spreadsheet provides a graphical interface for some filter options. The user can click on the level of match to the ecosystem accounting module of interest and also specific parameter categories relating to that ecosystem accounting theme (i.e., ecosystem extent, condition or services). These options are available in the smaller boxes, a list of highlighted data products and services will then populate in the large box that match these search options. This is intended to provide a broad overview of available Copernicus products and services for ecosystem accounting in the first instance.

The link between the Copernicus product or service to the different accounts is then categorised according to the parameter category as set out in the table below.

|  |  |  |
| --- | --- | --- |
| **Link to ecosystem extent** | **Link to ecosystem condition** | **Link to ecosystem services** |
| *Parameter Categories* | *Rationale* | *Parameter Categories* | *Rationale* | *Parameter Categories* | *Rationale* |
| Land cover | Common approaches for measuring ecosystem extent from the literature | Biodiversity | Table 3 of MAES 2nd Report combined with CICES Cascade | Provisioning | CICES Divisions  |
| Land use | Pressure | Regulating |
| Vegetation cover | State / Structure  | Cultural |
| Ecosystem / Habitat type | Biophysical process |  |

There will also be key data characteristics that Copernicus products and services will have to meet in order to support different analytical uses. As parameters chosen for inclusion in the accounts should be underpinned by datasets that allow a reliable quantitative analysis of trends at suitable spatial and temporal scale, the following characteristics will be a key concern for account producers:

* **Ecosystem specificity**: The degree to which the EO product can be used across all MAES ecosystem types, just a few, e.g. land, or specific to one ecosystem type e.g. grasslands.
* **Status**: If the Copernicus product is ‘operational’, ‘pre-operational’, ‘demonstration’ or ‘in development’
* **Temporal coverage:** Whether the product is for one time point or a time series
* **Spatial coverage and resolution:** How complete is the coverage of the European continent?Does the maximum spatial resolution provide data at a scale that matches the average size of the ecosystem features to be investigated, e.g. linear elements such as hedgerows or smaller-scale ecosystem patches?

Wider Objectives

The database is not only intended to identify where Copernicus land monitoring services can provide long-term support to ecosystem accounting but also to identify thematic and metadata limitations. For each accounting module spreadsheet an assessment is provided of limitations of the product or service for describing the ecosystem accounting theme of interest and possibilities for improvement. This, in turn, will help establish the key opportunities for the development of further Copernicus products to meet the needs of EU ecosystem accounting, and the wider ecosystem assessment community in Europe.