

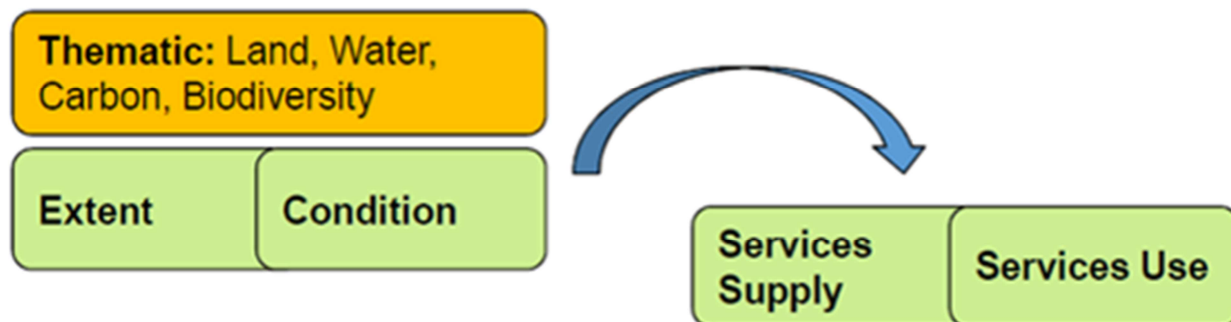
Hi = good afternoon – my name is Steve and I’m from the UN Environment World Conservation Monitoring Centre. My colleague

So many thanks for having me here and over the next few slides I would like to present some work we have been doing with Jan-Erik and Kremena, my colleague Katherine and SYKE in Finland looking at eh role Copernicus could play in supporting European efforts on ecosystem accounting.

Very much aware that this is EEA data and our work is a rapid assessment of how this can be used to support ecosystem accounting

We very much invite feedback from you guys, who are more familiar with the data, to help refine initial findings.

High level overview SEEA-EEA Bio-Physical Accounts



BACKGROUND REVIEW ON USE OF DATA FROM THE COPERNICUS LAND SERVICE AND IN-SITU PROGRAMME FOR ECOSYSTEM ACCOUNTING

16/04/2018

The System of Environmental-Economic Accounting - Experimental Ecosystem Accounting (SEEA-EEA) provides the measurement framework for building ecosystem accounts

It is grounded in a spatially explicit and time series based approach.

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.

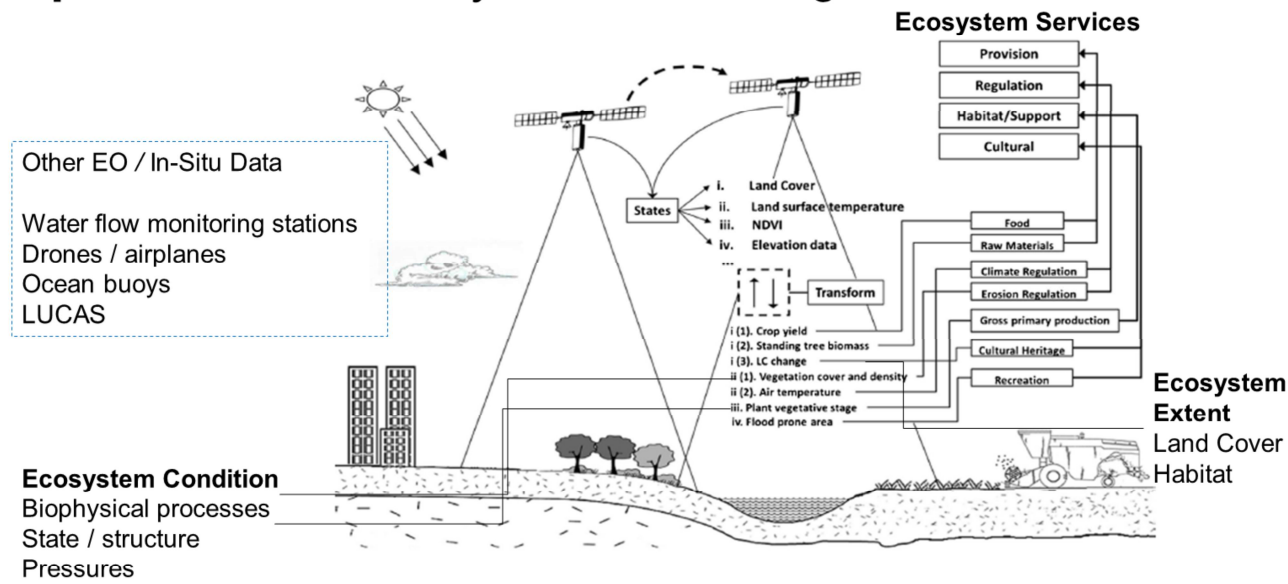
The figure below sets out these core bio-physical ecosystem accounting modules (in green) and a set of associated accounting themes (in orange) of specific environmental management and policy interest.

The testing of this framework is being implemented in Europe under the KIP INCA project, jointly between the EEA, JRC and DG Env.

What we are interested in discussing today is the role Copernicus products and services can play in providing regular, consistent information to allow calculation

of the core bio-physical ecosystem extent, condition and services supply and use

Copernicus EO for Ecosystem Accounting



BACKGROUND REVIEW ON USE OF DATA FROM THE COPERNICUS LAND SERVICE AND IN-SITU PROGRAMME FOR ECOSYSTEM ACCOUNTING

16/04/2018

The Copernicus programme provides a ready source of data to inform the compilation of the core bio-physical ecosystem accounts we are interested in under KIP-INCA.

We understand Copernicus to comprise of three programmes of activity - Space, Services and *In-situ*

And Earth Observation is specifically related to the use of satellite data to provide data products and services - this diagram tries to set out where such data can support ecosystem accounting for extent condition and services

In addition, to develop a more holistic appreciation of these ecosystem themes, a wider range of data sources and parameters need to be considered. These include other EO data, such as from water flow monitoring stations, drones and traditional *in-situ* measurement (e.g., LUCAS, biodiversity surveys, forest inventories, soil analyses). We are hoping, the Copernicus services and *in-situ* activities can also inform on these

Parameters to fill these accounts?

Ecosystem extent

- Land cover
- Land use
- Ecosystem / Habitat type

Ecosystem condition

- State / Structure
- Biophysical processes
- Pressures
- Biodiversity

Ecosystem services

- Provisioning
- Regulating
- Cultural
- Beneficiaries – demand!*

Over the past weeks we have completed a rapid assessment of the potential for Copernicus to inform ecosystem accounting.

In order to help organise this assessment we developed this preliminary list to help direct the selection and organisation of parameters for which Copernicus data is available under different accounting themes.

*The specific demand category is a development from the spreadsheet we shared with you guys

The ecosystem extent categories reflect common data identified in the literature

Condition reflects a combination of the CICES Cascade diagram and MAES recommendations

Services is based on broad CICES divisions and also the notion of demand (this was added over the last couple of days)

Characteristics of the data we want for Europe

Spatial

- Comprehensive coverage
- At the resolution that captures the finer grain mosaics patterns of Europe.

Temporal

- Need to have a time series to integrate with other key data (e.g., CLC)

Consistent

- Across time and space - but also surety of production into the future

Thematically accurate

- Needs to meaningfully represent key ecosystem accounting parameters
- Needs to represent key ecosystem types (e.g., MAES / EUNIS)

The challenge is for Copernicus to support all this!

BACKGROUND REVIEW ON USE OF DATA FROM THE COPERNICUS LAND SERVICE AND IN-SITU PROGRAMME FOR ECOSYSTEM ACCOUNTING

16/04/2018

As the Copernicus products and services are user orientated their metadata is readily accessible – this allowed us to quickly compile information on the characteristics of the data provided that we felt was of most relevance for ecosystem accounting –

This includes – (Describe)

Our *a priori* assumption is that Copernicus can meet these challenges!

Land Services Database

Structure

- Captured all 68 datasets and their description on <https://land.copernicus.eu/> ~ Easter*
- Captured selected metadata relevant to important characteristics
- Subjective judgement on the thematic links to extent, condition and services**

Clear match – data is directly representative of the accounting parameter of interest. For example, using land cover data to represent ecosystem extent.

Potential match – implies a proxy or causal (i.e., modelled) association. For example Fraction of Vegetation cover (Fcover) may be used to model carbon sequestration.

No match

- Preliminary judgement on possibilities to improve thematic accuracy***

- Changing all ready – for instance a new set of data on HRLs on water and wetness and small woody features

** This was based on a rapid assessment of the data between Brian and I – would benefit from review in the future from those more familiar with the data

*** This was based on our superficial understanding of th data -> data providers will have a far greater appreciation of these potentials.

Database overview

FAPAR refers only to the green and alive elements of the canopy and provides a diagnostic measure of carbon assimilation and, by extension, plant health. It can be used as a useful indicator for crop health and as an input parameter for forecasting yield. It will only be useful for ecosystems with a green (i.e., chlorophyll) cover - such as Forest, Crops, Grasslands. The Collection 300m Version 1 products are not accurate over the wetlands and can provide unrealistic values over water areas.

Dataset #	Component	Sub-component / Domain	Condition	Dataset description	Condition account	Link to condition parameters	Limitations of data for describing condition (thematic accuracy - approx. 50 words)	Targets / possibilities for improving thematic accuracy of data for describing condition (approx. 50 words)	Ecosystem specificity	Access	Product Version	Status
1	Global	Vegetation	FAPAR	Quantifies the fraction of the solar radiation absorbed by live leaves for the photosynthesis activity.	Clear match	Biophysical process	FAPAR refers only to the green and alive elements of the canopy and provides a diagnostic measure of carbon assimilation and, by extension, plant health. It can be used as a useful indicator for crop health and as an input parameter for forecasting yield. It will only be useful for ecosystems with a green (i.e., chlorophyll) cover - such as Forest, Crops, Grasslands. The Collection 300m Version 1 products are not accurate over the wetlands and can provide unrealistic values over water areas.	For the FAPAR, accuracy was generally good over agricultural areas but shows a positive bias for bare or harvested areas. Further research is needed to better assess the accuracy of the Collection 300m products over different biomes under-sampled in the available ground data set such as needle-leaf forests, deciduous forests, grasslands or shrublands and limitations also exist with respect to wetlands.	Terrestrial (excl. freshwater)	https://land.copernicus.eu/xcoba/products/faparc3	1	Dis
2	Global	Vegetation	Burnt Area	Maps the burnt scars, and gives temporal information on the fire season.	Clear match	State / Structure	This product provides very narrow evaluation of condition -> patches where vegetation is damaged or destroyed by fire. The product may overestimate the extent of burnt areas at marginal wetland water bodies and coastline.	This can be tackled using a suitable land-sea-water mask is available that will reduce the level of commission observed around coastal areas.	All ecosystems	https://land.copernicus.eu/xcoba/products/ba	1	Phi
3	Pan-European	High Resolution Layers	Natural Grasslands	Grassland/non-grassland binary	No match				Grassland	discontinued		dis
4	Local	Riparian zones	Delimitation of Riparian Zones	Represent transitional areas occurring between land and freshwater ecosystems	Potential match	Biophysical process	Riparian zones represent transitional areas occurring between land and freshwater ecosystems, characterized by distinctive hydrology, soil and biotic conditions and strongly influenced by the stream water. They provide a wide range of riparian functions (e.g. bank stabilization, aquatic life and riparian wildlife support, etc.). However, the data only provides information on where the potential for such functionality to exist.	Further in-situ data is likely to be required in order to identify ecosystem functionality in these areas	Terrestrial (incl. freshwater)	https://land.copernicus.eu/xcoba/products/delimitation-riparian-zones		
5	Reference data (in situ)	LUCAS	LUCAS 2000	Land Use and Coverage Area Frame Survey					Terrestrial (excl. freshwater)	https://land.copernicus.eu/xcoba/products/stubdata/lucas-2000/2000taburmetdata		
6	Reference data (in situ)	LUCAS	LUCAS 2012	Land Use and Coverage Area Frame Survey					Terrestrial (excl. freshwater)	http://land.copernicus.eu/xcoba/products/stubdata/lucas-2012/2012taburmetdata		

This is the broad layout – see there are separate tabs for extent, condition and services – each provides an assessment of links of data to these accounts, thematic limitations and targets and possibilities for improvement for ecosystem accounting purposes.

Lets take condition as an example and look in more detail

Database – Datasets and their links to accounts

The screenshot shows an Excel spreadsheet titled 'Copernicus database draft structure v3.2_status of 12-04-18 - Excel'. The spreadsheet contains a table with the following columns: Dataset #, Component, Sub-component / Condition Domain, Dataset description, Condition account, Link to condition parameters, Limitations of data for describing condition (thematic accuracy - approx. 50 words), Targets / possibilities for improving thematic accuracy of data for describing condition (approx. 50 words), Ecosystem specificity, Access, and Product Version. A red box highlights the first row of data, which is: Dataset # 1, Component Global, Sub-component / Condition Domain Vegetation, Dataset description FAPAR, Condition account Clear match, Link to condition parameters Biophysical process. Below the spreadsheet, there is a summary table with the same columns as the spreadsheet, but with a black background and white text. The first row of this summary table is: Dataset # 1, Component Global, Sub-component / Condition Domain Vegetation, Dataset description FAPAR, Condition account Clear match, Link to condition parameters Biophysical process. At the bottom of the spreadsheet, there is a row for 'Reference data (LUCAS 2009)' with columns for 'LUCAS 2009', 'Land Use and Coverage Area (Landsat Survey)', 'Terrestrial (eco: freshwater)', and 'http://land.copernicus.eu/land'. The date '5/04/2018' is visible in the bottom right corner.

Dataset #	Component	Sub-component / Condition Domain	Dataset description	Condition account	Link to condition parameters	Limitations of data for describing condition (thematic accuracy - approx. 50 words)	Targets / possibilities for improving thematic accuracy of data for describing condition (approx. 50 words)	Ecosystem specificity	Access	Product Version
1	Global	Vegetation	FAPAR Quantifies the fraction of the solar radiation absorbed by live leaves for the photosynthesis activity.	Clear match	Biophysical process	FAPAR refers only to the green and alive elements of the canopy and provides a diagnostic measure of carbon assimilation and, by extension, plant health. It can be used as a useful indicator for crop health and as an input parameter for forecasting yield. It will only be useful for ecosystems with a green (i.e., chlorophyll) cover - such as Forest, Crops, Grasslands. The Collection 300m Version 1 products are not accurate over the wetlands and can provide unrealistic values over water areas.	For the FAPAR, accuracy was generally good over agricultural areas but shows a positive bias for bare or harvested areas. Further research is needed to better assess the accuracy of the Collection 300m products over different biomes under sampled in the available ground data set such as needle-leaf forest, deciduous forest, grasslands or shrublands and limitations also exist with respect to wetlands.	Terrestrial (eco: freshwater)	https://land.copernicus.eu/land/fapar	1
2	Global	Vegetation	Burnt Area Tracks the burnt areas, and gives temporal information on the fire season.	Clear match	State Transition	This product provides a very narrow evaluation of condition - surfaces where vegetation is damaged or destroyed by fire. The product may overestimate the extent of burnt areas at margins with	This can be tackled using a suitable land-sea-water mask to available the will reduce the level of commission observed around coastal areas.	All ecosystems	https://land.copernicus.eu/land/burnt-area	1

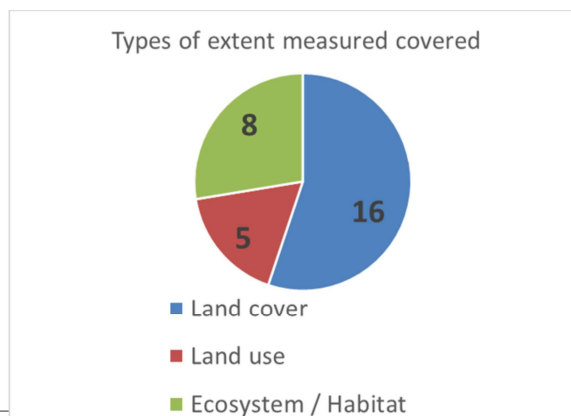
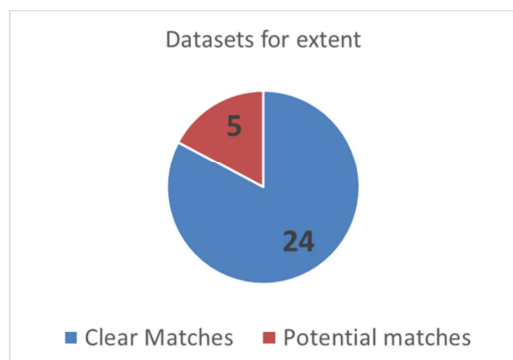
Dataset #	Component	Sub-component / Condition Domain	Dataset description	Condition account	Link to condition parameters
1	Global	Vegetation	FAPAR Quantifies the fraction of the solar radiation absorbed by live leaves for the photosynthesis activity.	Clear match	Biophysical process

Describe what we see is info on the dataset, a high level description and the match level and relevant parameter category for the account – this coarse assessment yields some preliminary findings with respect to the potential for the Copernicus products and services to inform ecosystem accoutig

Some preliminary results

Ecosystem extent – 29 out of 68 products and services

- Note: Products are nested – 12 out of 29 relate to CLC



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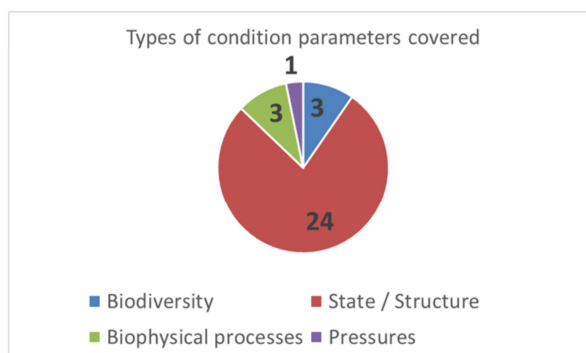
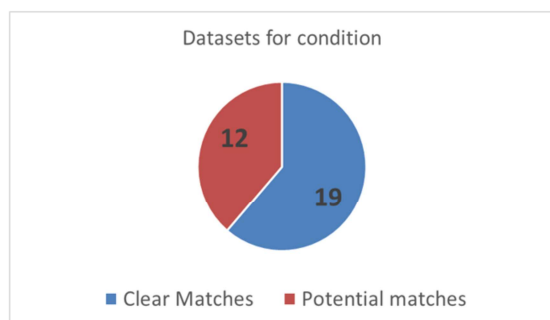
16/04/2018

Describe breakdown

Important to note that a number of these products and services are nested – for example 12 out of the 29 datasets represent Corrine Land Cover time series and change observations, plus their underlying image mosaics

Some preliminary results

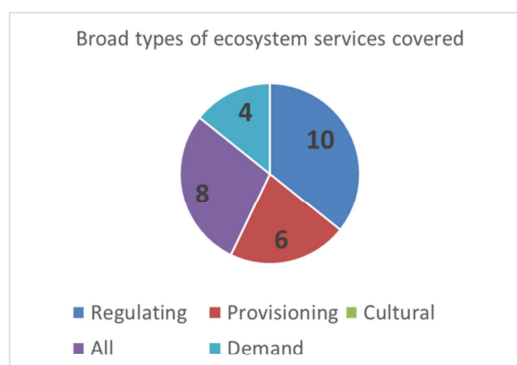
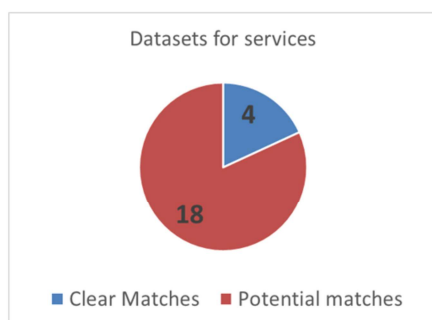
Ecosystem condition – 31 out of 68 products and services



Dominated by structural indicators – very little data on pressures (these are population based) and limited data on biodiversity (these are actually Natural 2000 and Riparian cover too)

Some preliminary results

Ecosystem services– 22 out of 68 products and services



No data on cultural services Supply....

Database – Metadata

Dataset #	Limitations of data for describing condition (thematic accuracy - approx. 50 words)	Targets / possibilities for improving thematic accuracy of data for describing condition (approx. 50 words)	Ecosystem specificity	Access	Product Version	Status	Sensor	Data type	Spatial coverage	Maximum spatial resolution (m)	Temporal coverage	Timeliness	Product provider
1	FAPAR refers only to the green and alive elements of the canopy and provides a diagnostic measure of carbon assimilation and by extension, plant health. It can be used as a useful indicator for crop health and as an input parameter for forest carbon yield. It will only be useful for ecosystems with a green (i.e., chlorophyll) cover - such as Forest, Crops, Grasslands. The Copernicus 30m Version 1 products are not accurate over the wetlands and can provide	For the FAPAR, accuracy was generally good over agricultural lands but shows a positive bias for bare or harvested areas. Further research is needed to better assess the accuracy of the Copernicus 30m products over different biomes under sampled in the available ground data set such as needle-leaf forest, deciduous forest, grasslands or Shrublands and limitations also exist with respect to wetlands.	Terrestrial (excl. freshwater)	https://land.copernicus.eu/global/products/fapar	1	Demonstration	PROBA-V	Raster	Global	300	Jan 2014 - present	NRT within 3 days after compositing period	VITO
2	This product provides very narrow evaluation of condition - just land where vegetation is damaged or destroyed by fire. The product may overestimate the extent of burnt areas at margins with	This can be tackled using a suitable land-sea-water mask is available that will reduce the level of commission observed around coastal areas.	All ecosystems	https://land.copernicus.eu/global/	1	Pre-operational	PROBA-V	Raster	Global	300	April 2014 - present	Within 3 days after compositing period	VITO

Access	Product Version	Status	Sensor	Data type	Spatial coverage	Maximum spatial resolution (m)	Temporal coverage	Timeliness	Product provider
https://land.copernicus.eu/global/products/fapar	1	Demonstration	PROBA-V	Raster	Global	300	Jan 2014 - present	NRT within 3 days after compositing period	VITO

Describe what we see is info metadata taken directly from the Copernicus services website that is relevant to understanding the needs for ecosystem accounting in Europe

Database – Thematic accuracy and possibilities

Dataset #	Component	Sub-component / Domain	Condition Product	Dataset description	Condition account	Link to condition parameters	Limitations of data for describing condition (thematic accuracy - approx. 50 words)	Targets / possibilities for improving thematic accuracy of data for describing condition (approx. 50 words)	Ecosystem specificity	Access	Product Version	Status
1	Global	Vegetation	FAPAR	Quantifies the fraction of the solar radiation absorbed by the leaves for the photosynthesis activity.	Clear match	Biophysical process	FAPAR refers only to the green and alive elements of the canopy and provides a diagnostic measure of carbon assimilation and, by extension, plant health. It can be used as a useful indicator for crop health and as an input parameter for forecasting yield. It will only be useful for ecosystems with a green (i.e., chlorophyll) cover - such as Forest, Crops, Grasslands. The Collection 300m Version 1 products are not accurate over the wetlands and can provide unrealistic values over water areas.	For the FAPAR, accuracy was generally good over agricultural sites but shows a positive bias for bare or harvested areas. Further research is needed to better assess the accuracy of the Collection 300m products over different biomes under-sampled in the available ground data set such as needle-leaf forest, deciduous forest, grasslands or Shrublands and limitations also exist with respect to wetlands.	Terrestrial (exc. freshwater)	https://land.copernicus.eu/odata/v1	1	DM
2	Global	Vegetation	Burnt Area	Maps the burnt areas, and gives temporal information on the fire season.	Clear match	State / Structure	This product provides a very coarse evaluation of conditions on surfaces where vegetation is damaged or destroyed by fire. The product may overestimate the extent of burnt areas at margins with land/water.	This can be tackled using a higher resolution water mask available that will reduce the level of commission observed around coastal areas.	Terrestrial (exc. freshwater)	https://land.copernicus.eu/odata/v1	1	PH

Limitations of data for describing condition (thematic accuracy - approx. 50 words)	Targets / possibilities for improving thematic accuracy of data for describing condition (approx. 50 words)	Ecosystem specificity
FAPAR refers only to the green and alive elements of the canopy and provides a diagnostic measure of carbon assimilation and, by extension, plant health. It can be used as a useful indicator for crop health and as an input parameter for forecasting yield. It will only be useful for ecosystems with a green (i.e., chlorophyll) cover - such as Forest, Crops, Grasslands. The Collection 300m Version 1 products are not accurate over the wetlands and can provide unrealistic values	For the FAPAR, accuracy was generally good over agricultural sites but shows a positive bias for bare or harvested areas. Further research is needed to better assess the accuracy of the Collection 300m products over different biomes under-sampled in the available ground data set such as needle-leaf forest, deciduous forest, grasslands or Shrublands and limitations also exist with respect to wetlands.	Terrestrial (exc. freshwater)

Describe what we see is info on the dataset, a high level description and the match level and relevant parameter category for the account

We also identify if the product pertains to a certain type of MAES ecosystem or is cross-cutting – this is example is cross cutting with some obvious restrictions.

Copernicus *In-Situ* for Ecosystem Accounting (SYKE)

Overview

- Observation data from ground-, sea- or air-borne sensors, as well as reference and ancillary data
- Used by service providers to calibrate and supplement satellite data
- Provided by Member States, European Bodies, Global initiatives

Strengths

- Terrestrial domain for ecosystem accounting
- Captures data on many environmental measurements collected by providers external to Copernicus

Weaknesses

- *In-situ* observation data often dependent on time-limited funding
- Potential commercial restrictions
- Limited systematic collection and validation

In situ data is an observation data, which currently is not centralised available for service providers. Each service provide need make contracts with service providers .

Slide 14

SK1 Do we delete this? It may overlap quite a lot with the other presentation.
Steven King, 13/04/2018

Copernicus Reference Data Access (CORDA) (SYKE)

Overview

- Provides access to Spatial Reference Data from European data providers
- A precursor to the Copernicus In Situ Component Information System (CIS2)

Strengths

- Significant resource of spatial data (5,813 datasets)
- Includes relevant datasets for INSPIRE Themes: land use (141), Land cover and cadastral information

Weaknesses

- Limited additional data for ecosystem accounting (Data also on Pan-European services)
- Omits a number of relevant INSPIRE themes: Habitats & biotopes, Soil, Species distribution
- Metadata is inconsistent

Opportunities for Copernicus *In-Situ*, CORDA & Ecosystem Accounting (SYKE)

Increase awareness

- Many key stakeholders unaware of the in-situ data potentially available
- Provide free access (currently under way)
- Demonstrate use – show how contributing data will support Ecosystem Accounting and other applications

Data systems

- Include observation data on INSPIRE Themes for ecosystem accounting
- Improve metadata to stimulate use

Integration

- Consider integration of EU GeoPortal

Slide 16

SK2 **Just focus on Cords?**
Steven King, 13/04/2018

Key questions.

- **How to improve our understanding of the thematic accuracy of Copernicus EO data?**
 - What are the strengths and weaknesses for describing ecosystem extent, condition and services account?
- **What are the best possibilities for improving Copernicus EO data?**
 - What are the key data gaps? (thematic, spatial, temporal)?
 - Where can Copernicus EO data best be developed to addresses these?
- **Where can *In-situ* data best contribute?**
 - Where can *in-situ* data plug gaps? (in conjunction with EO or on its own)