SEEA_EnvAcc_M3_EN

1. Module 1 - Introduction

1.1 Welcome

Notes:

1.2 Welcome…

Welcome…

…. to the **third module on Experimental Ecosystem Accounting!**

This module is designed to give you an overview of the ecosystem extent account. The following topics will be covered:

- Basic information
- Mapping of information
- Combining information
- Basic spatial units (BSU)
- Developing a spatial data infrastructure
- Grids and vectors
- Delineating spatial units
- Developing a national spatial data infrastructure (NSDI)
- Key research issues

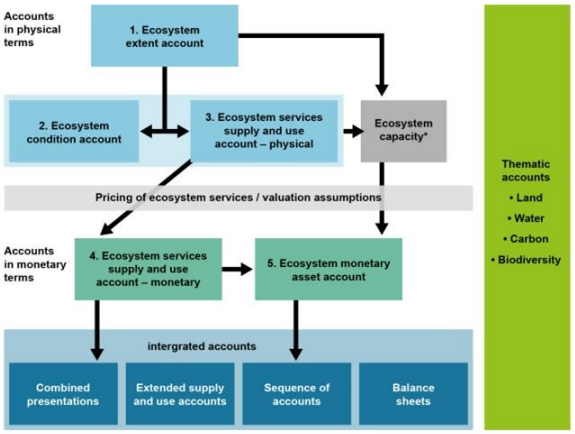
We appreciate your interest in accounting for the environment!

1.3 Ecosystem extent accounts

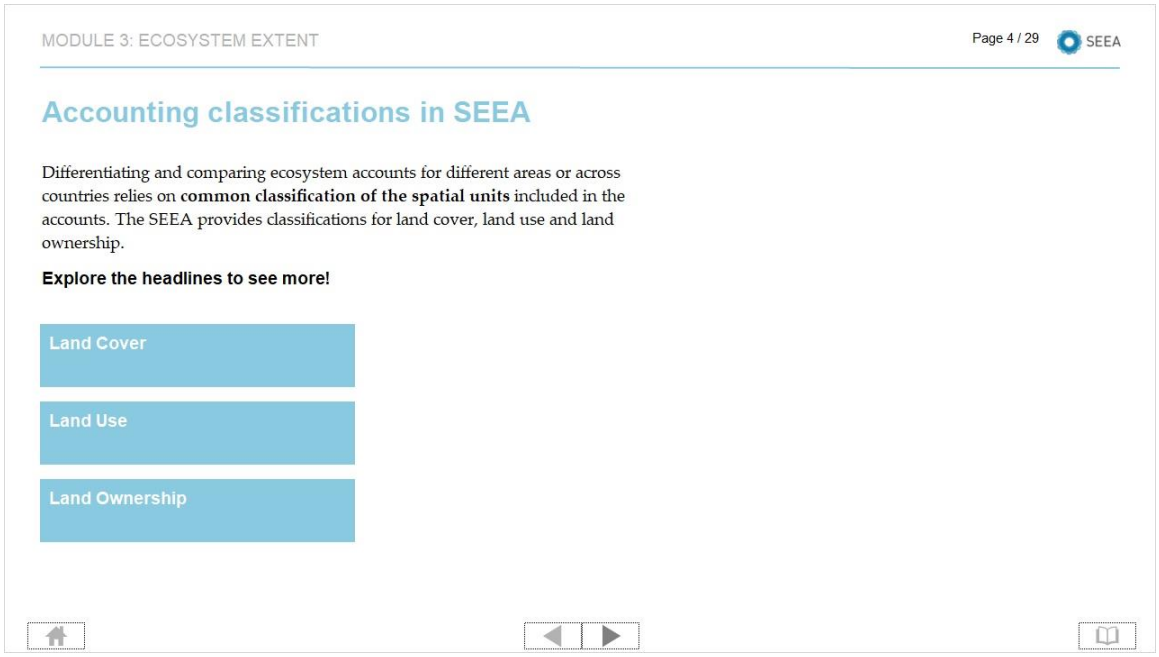
Ecosystem extent accounts

The ecosystem extent account will usually be the first ecosystem account to be developed. It is organizing information on the **extent of different ecosystem types within a country** in terms of area:

- It **measures the area of coverage of a given ecosystem type (ETs)**, e.g. hectares of area covered by a specific forest and **serves as a link** between the other accounts within the framework by establishing a common spatial infrastructure.
- When compiling the ecosystem extent account the main challenges are to make informed choices on the **ETs to be distinguished** and the **resolution (and minimum mapping unit) of the maps**.

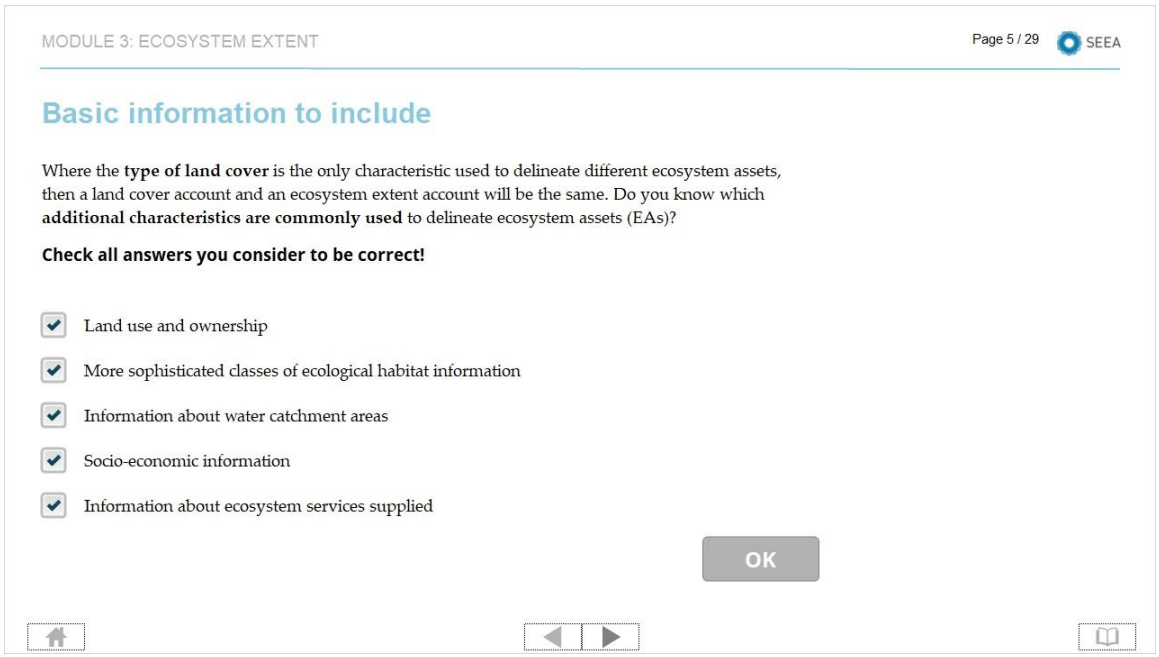


1.4 Accounting classifications in SEEA



1.5 Basic information to include

(Multiple Response, 10 points, 1 attempt permitted)



Correct	Choice
X	Land use and ownership
X	More sophisticated classes of ecological habitat information
X	Information about water catchment areas
X	Socio-economic information
X	Information about ecosystem services supplied

Feedback when correct:

Land cover approximates the major ecosystems on land while use and ownership enrich the picture. This is why these are recommended for national level coverage.

Including more information, such as the extent of more ecologically defined habitat types, is recommendable if resources allow it. Such detail can consequently be aggregated to land cover types for reporting and international comparison.

In particular, when accounts are produced for smaller areas, it may be decided to fill the accounts with more detailed information for individual EAs. This increases the resolution at which data on ecosystem services flows and assets needs to be compiled.

Feedback when incorrect:

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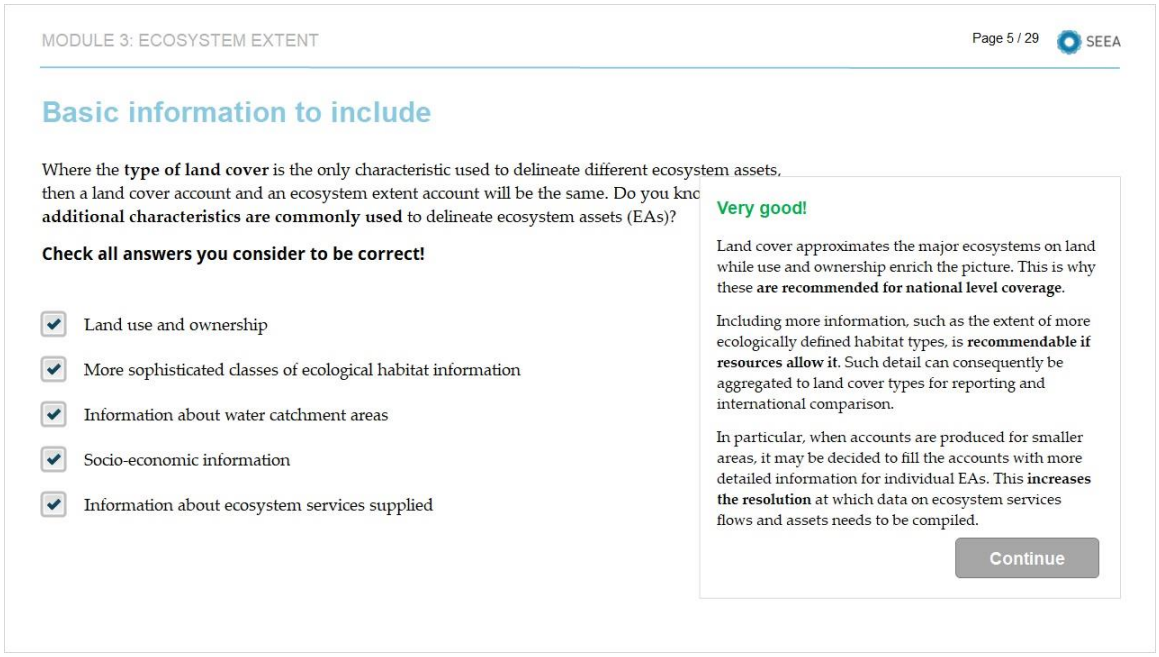
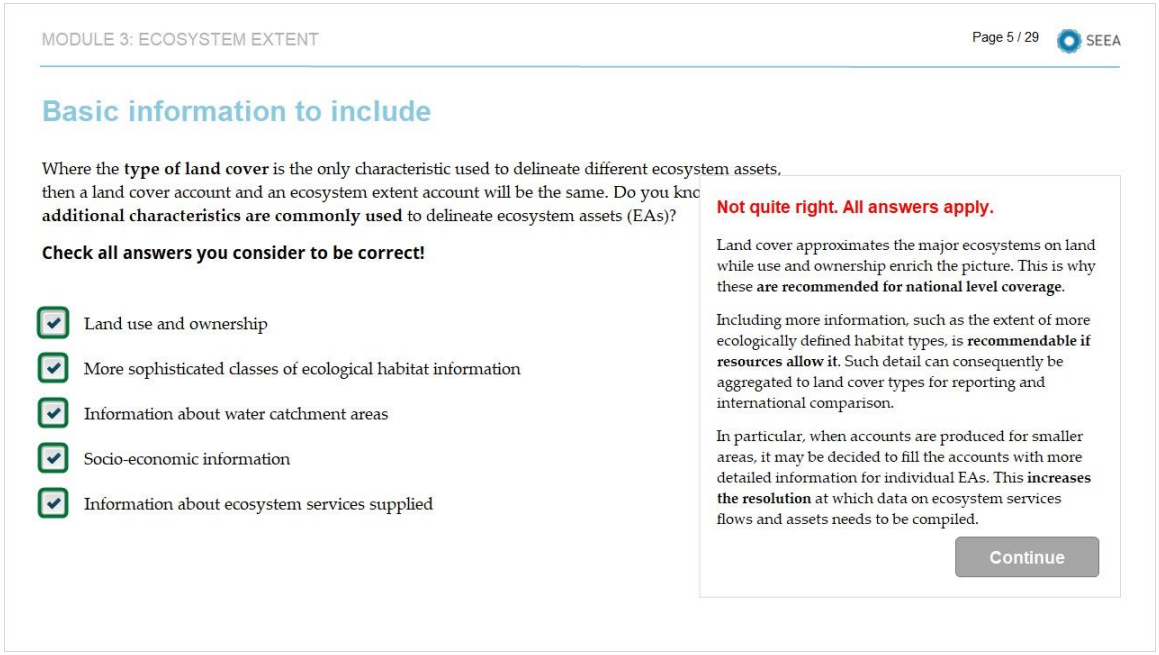
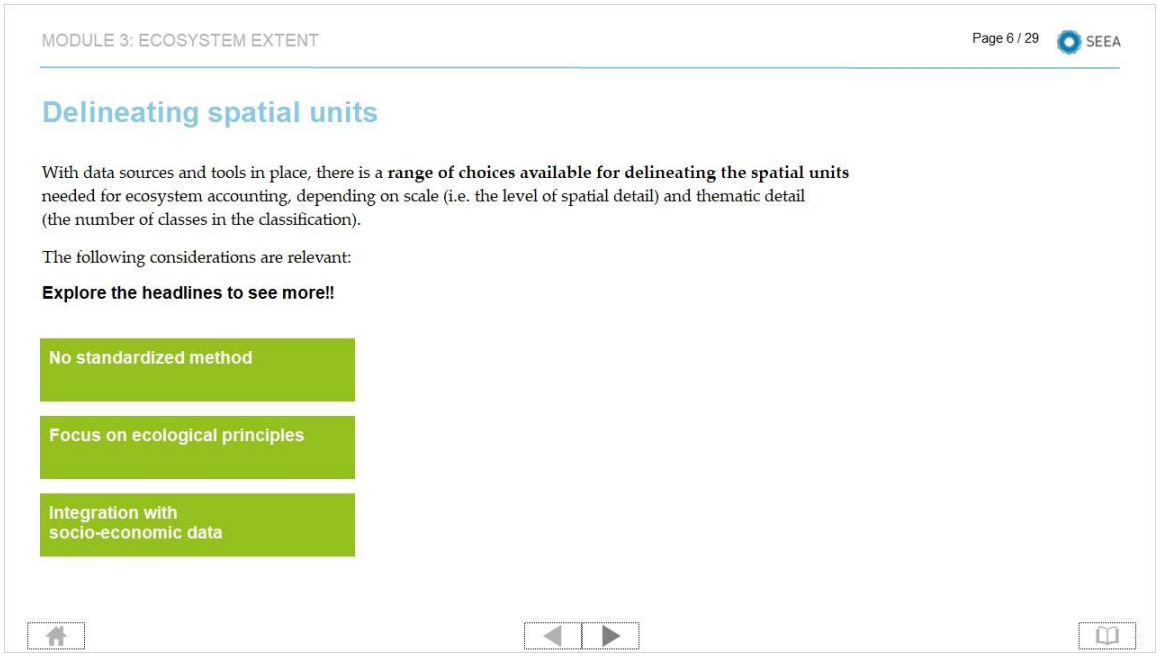
Correct (Slide Layer)



Incorrect (Slide Layer)



1.6 Delineating spatial units



1.7 Ecosystem extent accounts

Ecosystem extent accounts

This table shows a basic condition extent account using **high level ecosystem types based on the land cover classification in the SEEA Central Framework**. Additional sub-classes may be added depending on the ecosystem types of most relevance within a country.

Explore the highlighted areas to get more information!

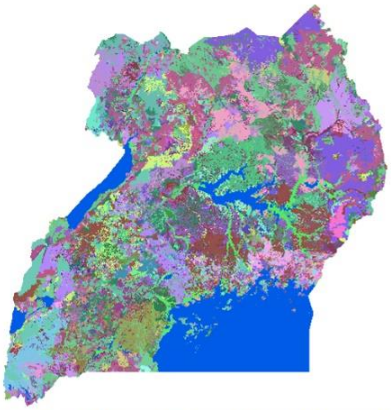
	Proxy ecosystem type (based on land cover)															
	Artificial surfaces	Herbaceous crops	Woody crops	Multiple or layered crops	Grassland	Tree-covered areas	Mangroves	Shrub-covered areas	Regularly flooded areas	Sparse natural vegetated areas	Terrestrial barren land	Permanent snow and glaciers	Inland water bodies	Coastal water and inter-tidal areas	Sea and marine areas	TOTAL
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Opening extent																
Additions to extent																
Managed expansion																
Natural expansion																
Upward reappraisals																
Reductions in extent																
Managed regression																
Natural regression																
Downward reappraisals																
Net change in extent																
Closing extent																

1.8 Mapping of information

Mapping of information

In the ecosystem extent there is **no requirement** that the areas of each type of ecosystem be contiguous:

- That is, the total area of, for example, grassland, will occur **in various ecosystem assets (EAs) across a country** and the data in the accounts represents an aggregation of all of the different EAs.
- Disaggregated information from an ecosystem extent account would be usefully **presented in maps using different colours** for different ETs.
- Mapping the information can more readily highlight issues of **fragmentation of ecosystem types and possible connections** between ecosystem types that are not apparent when the information is presented in a traditional table format.

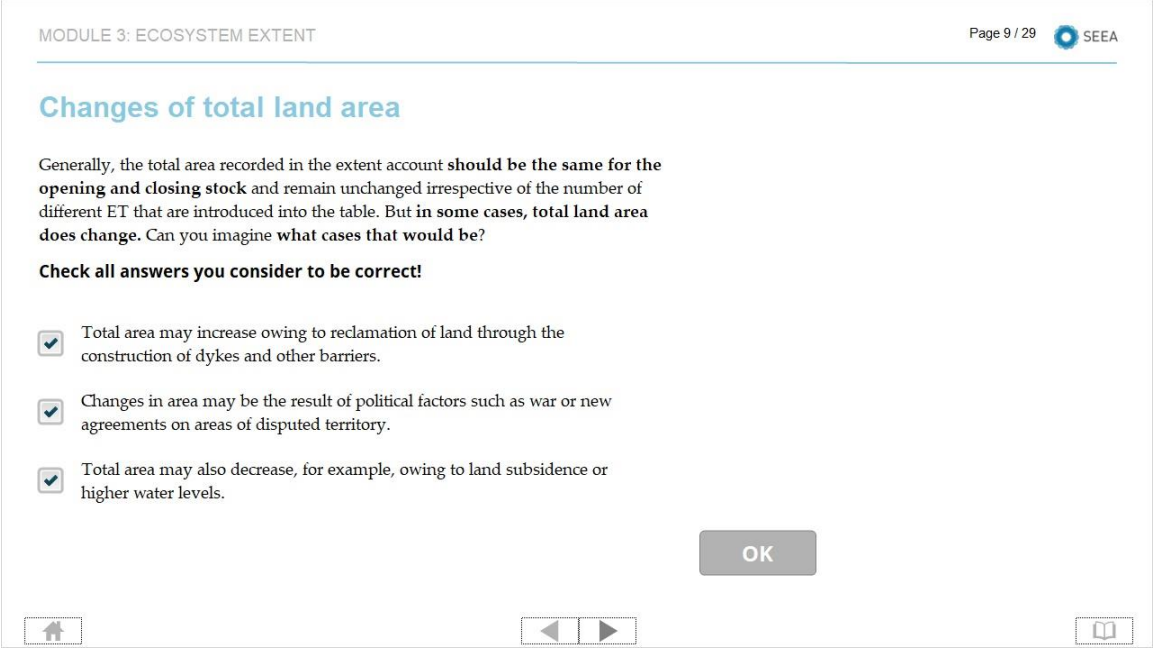


Land cover of Uganda, Multipurpose Landcover Database of Uganda - AFRICOVER, FAO, 2003
(http://www.fao.org/geonetwork/srv/en/metadata.show?id=38103&currTab=simple)

Image was produced from visual interpretation of digitally enhanced high-resolution LANDSAT TM images.

1.9 Changes of total land area

(Multiple Response, 10 points, 1 attempt permitted)



Correct	Choice
X	Total area may increase owing to reclamation of land through the construction of dykes and other barriers.
X	Changes in area may be the result of political factors such as war or new agreements on areas of disputed territory.
X	Total area may also decrease, for example, owing to land subsidence or higher water levels.

Feedback when correct:

All changes due to land reclamation should be recorded against the relevant addition or reduction following the advice in the SEEA Central Framework.

Changes in total area due to natural, economic or political factors are recorded as upward or downward reappraisals.

Such use of updated information may require the revision of previous estimates to ensure a continuity of time series. Thus the area that is within scope of ecosystem accounts should be clearly defined to prevent confusion.

Feedback when incorrect:

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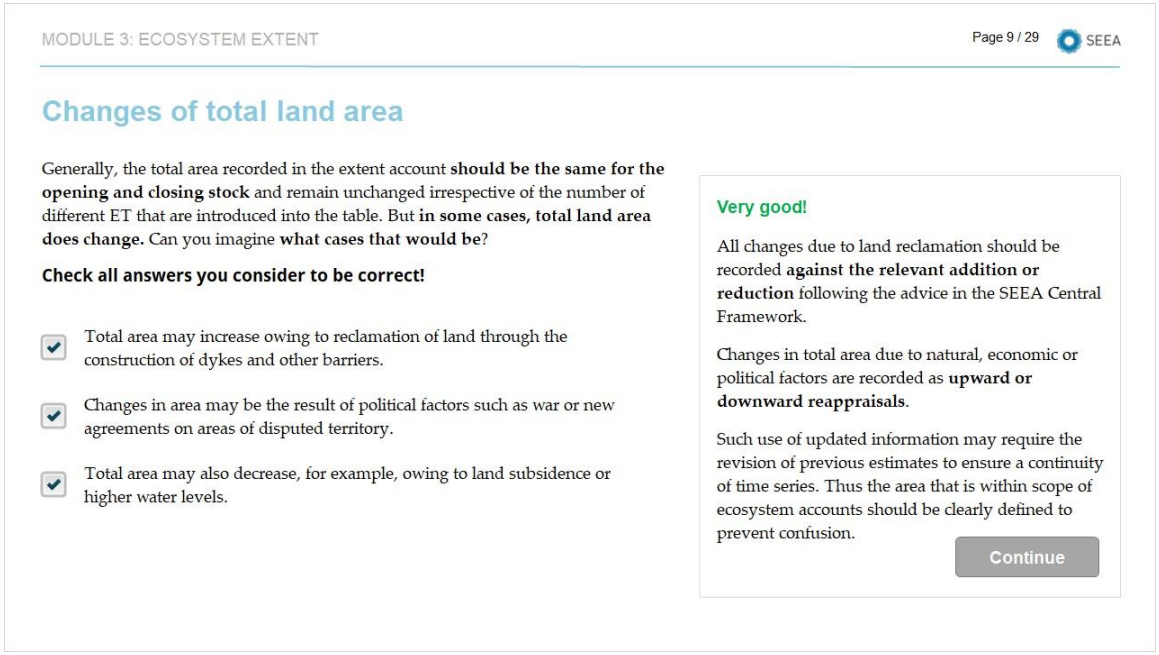
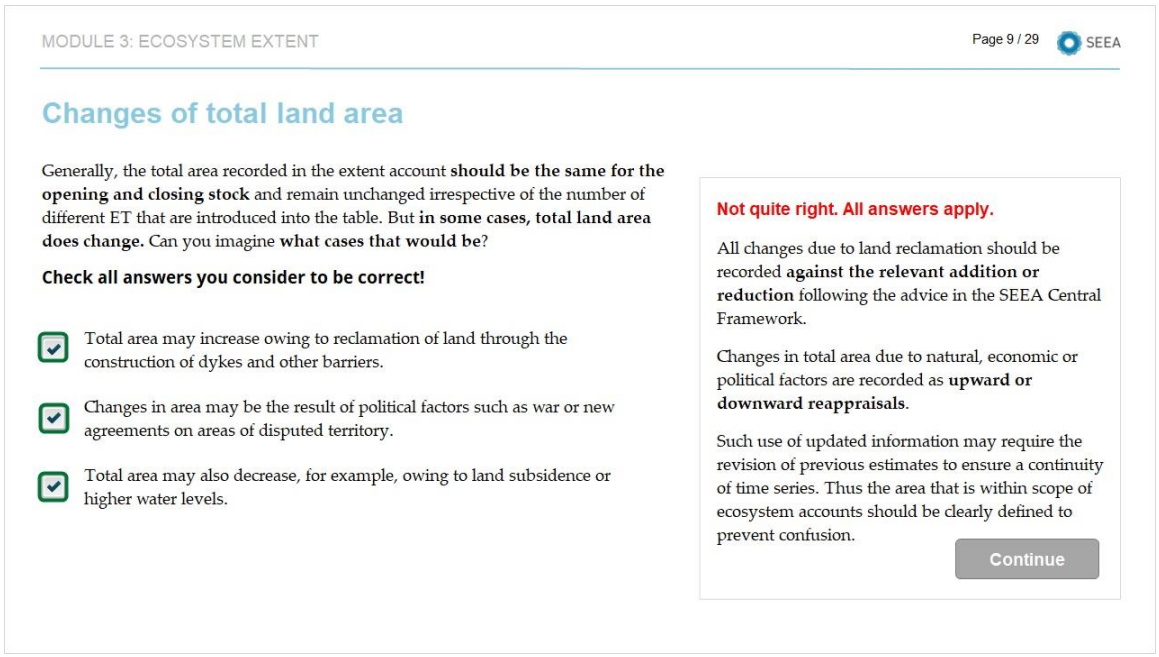
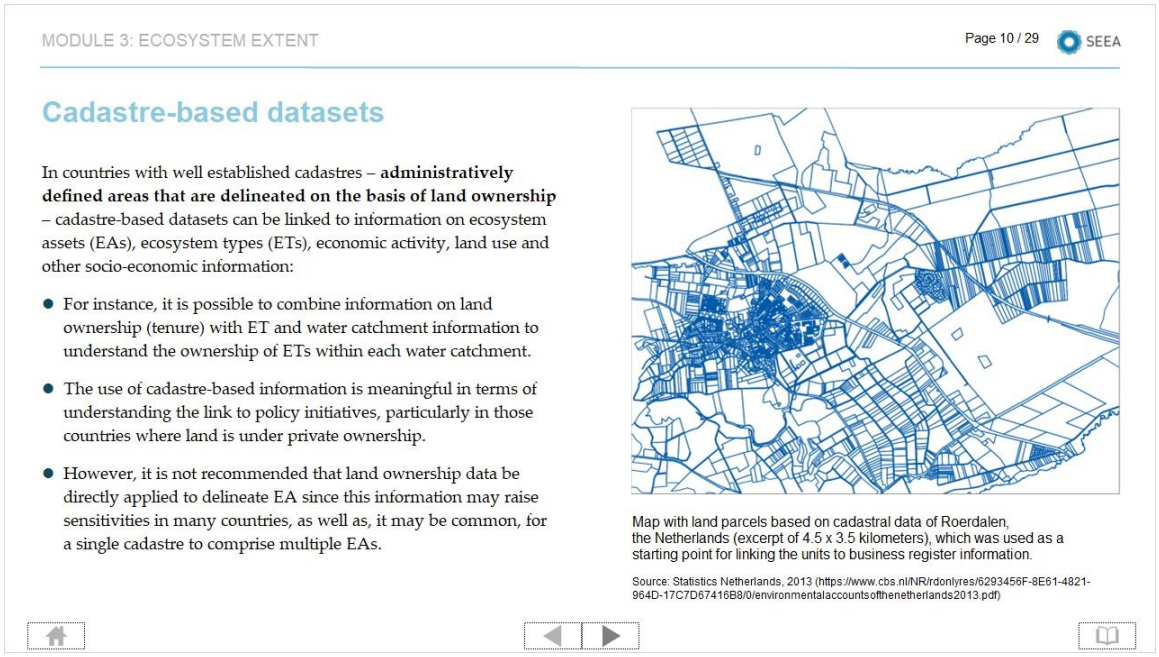
Correct (Slide Layer)



Incorrect (Slide Layer)

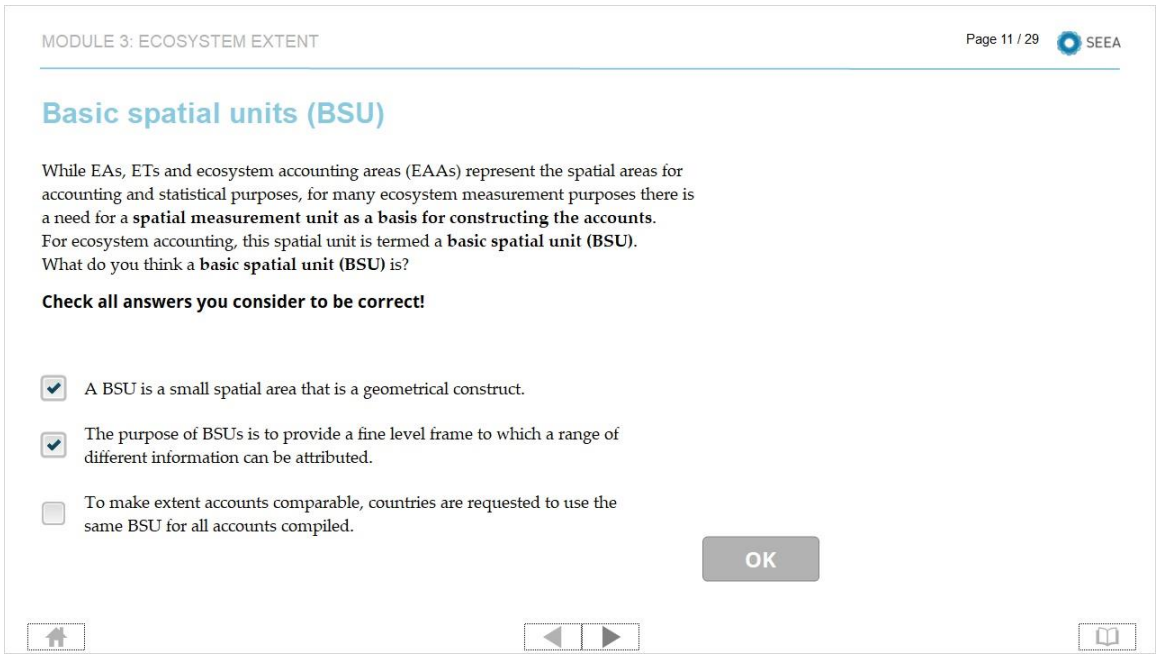


1.10 Cadastre-based datasets



1.11 Basic spatial units (BSU)

(Multiple Response, 10 points, 1 attempt permitted)



Correct	Choice
X	A BSU is a small spatial area that is a geometrical construct.
X	The purpose of BSUs is to provide a fine level frame to which a range of different information can be attributed.
	To make extent accounts comparable, countries are requested to use the same BSU for all accounts compiled.

Feedback when correct:

The precise definition of BSUs will depend on the context and the nature of the approach taken to managing spatial data for accounting.

A flexible approach is proposed in recognition of the large differences across countries in terms of spatial area, ecological heterogeneity and data availability.

A fundamental choice in setting up the spatial data infrastructure is whether to use a reference grid and use this reference grid to integrate all data layers,

or to allow different datasets to have different formats (grid or vector) and/or different

grid sizes.

Feedback when incorrect:

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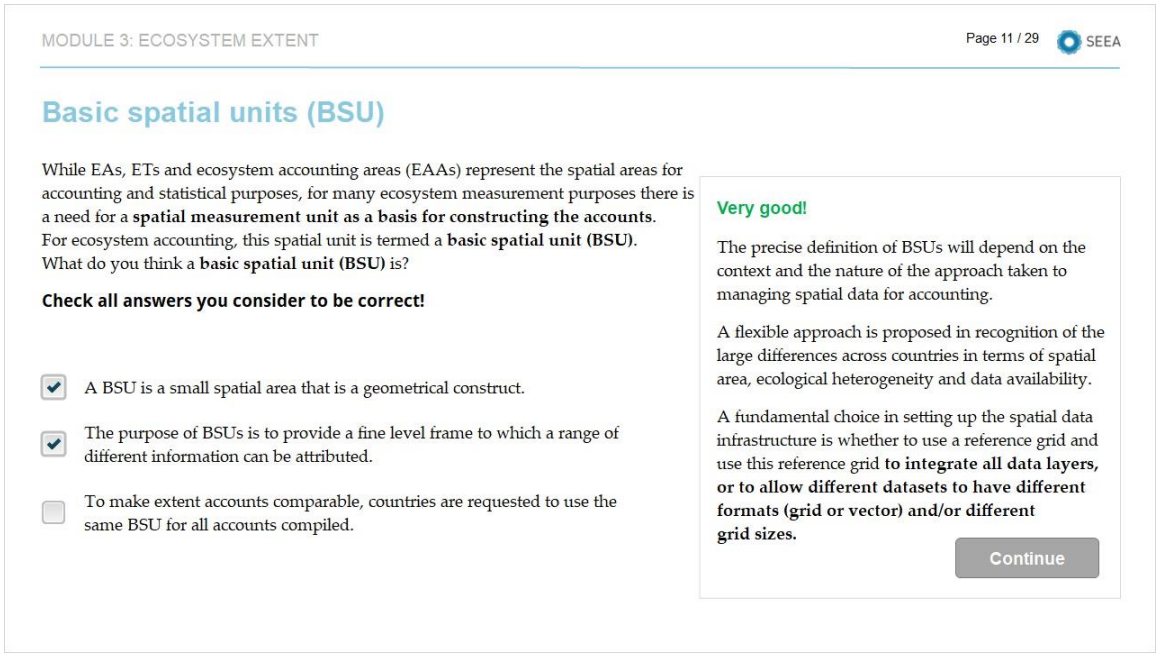
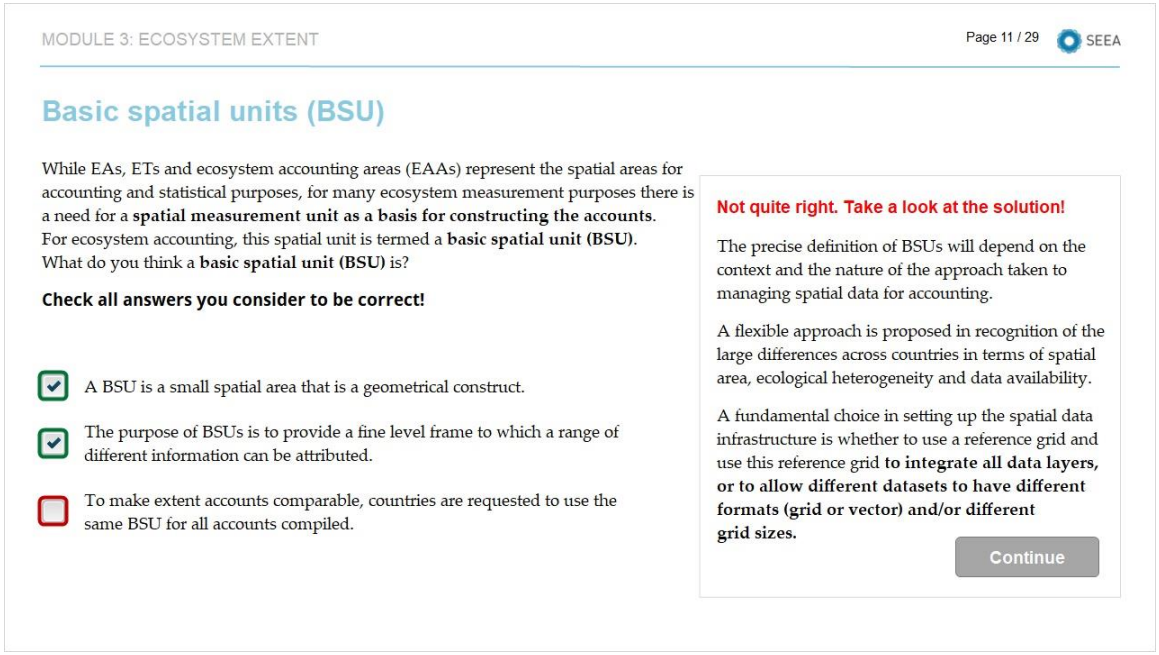
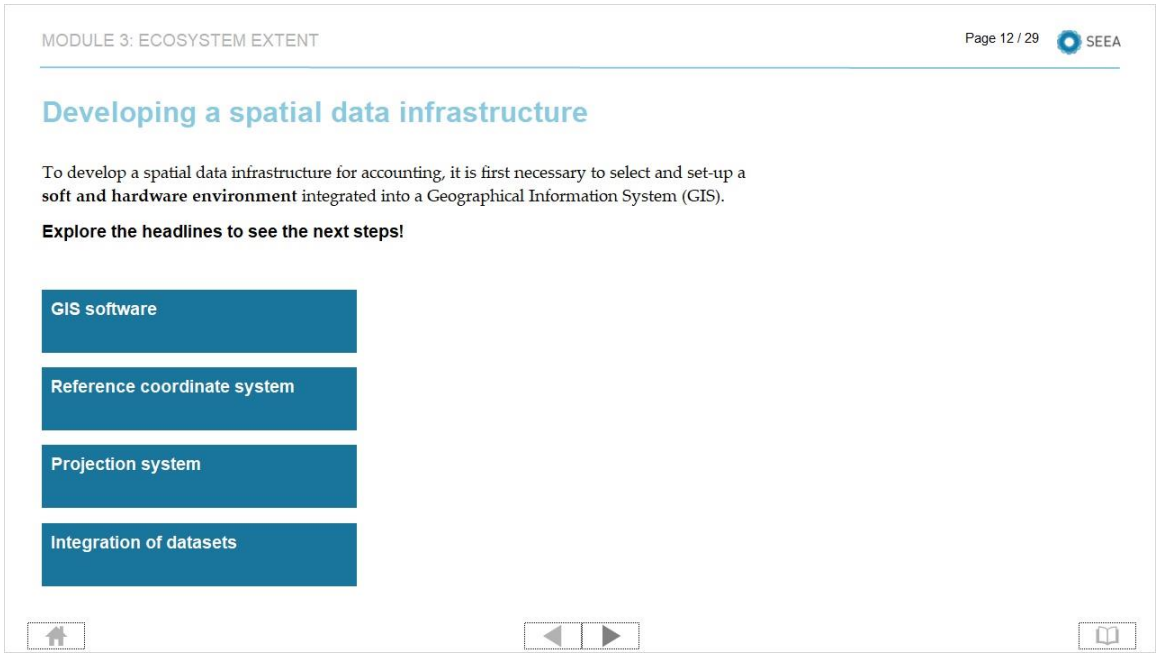
Correct (Slide Layer)



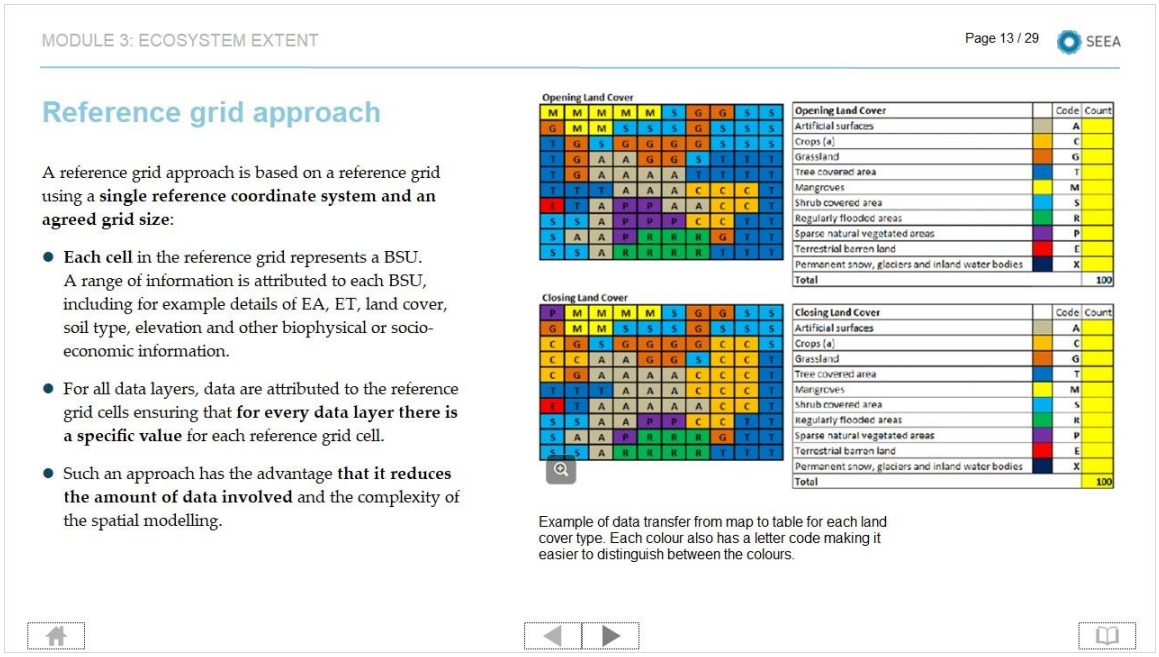
Incorrect (Slide Layer)



1.12 Developing a spatial data infrastructure

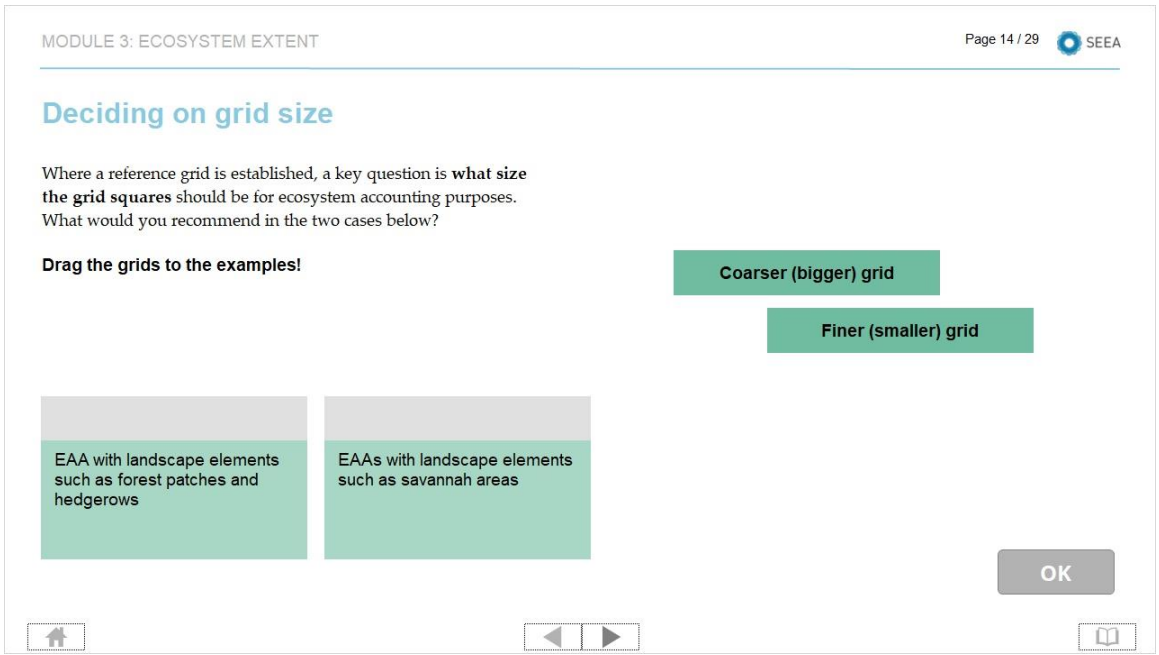


1.13 Reference grid approach



1.14 Types of spatial units

(Drag and Drop, 10 points, 1 attempt permitted)



Drag Item	Drop Target
Finer (smaller) grid	Rechteck 4
Coarser (bigger) grid	Rechteck 5

Drag and drop properties
Return item to start point if dropped outside the correct drop target
Snap dropped items to drop target (Tile)
Allow only one item in each drop target
Delay item drop states until interaction is submitted

Feedback when correct:

There are three main considerations in the selection of the grid size:

First, the resolution at which data are available.

Second, the spatial variability of the ecosystems within the EAA.

Third, the potential limitations on computational capabilities and data storage.

Feedback when incorrect:

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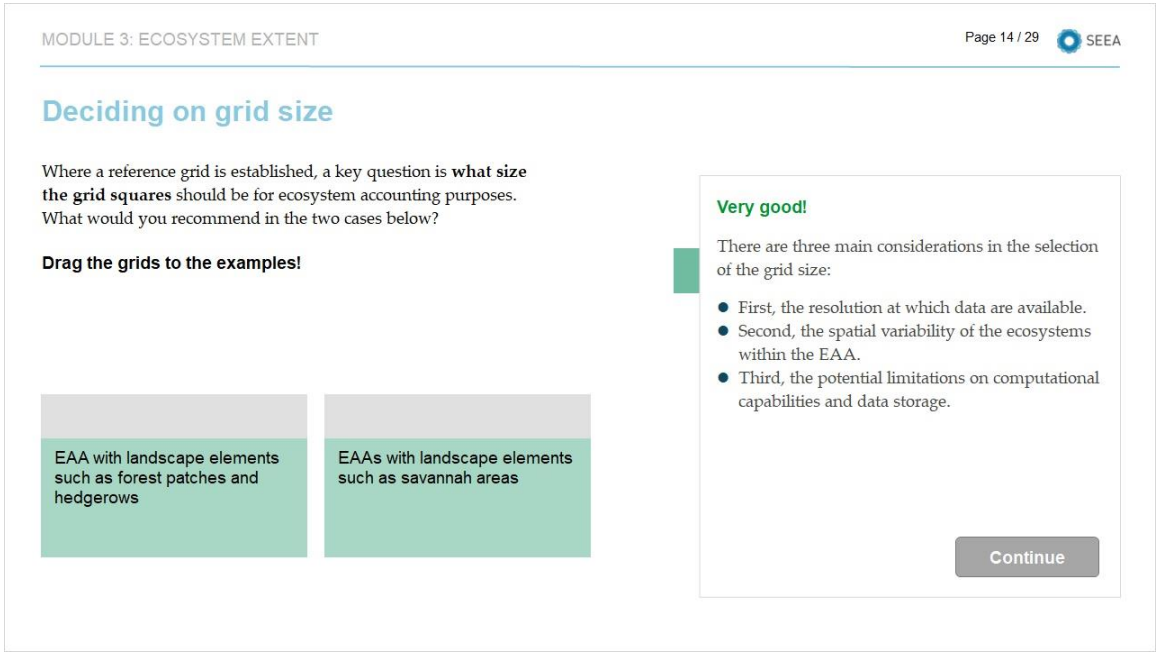
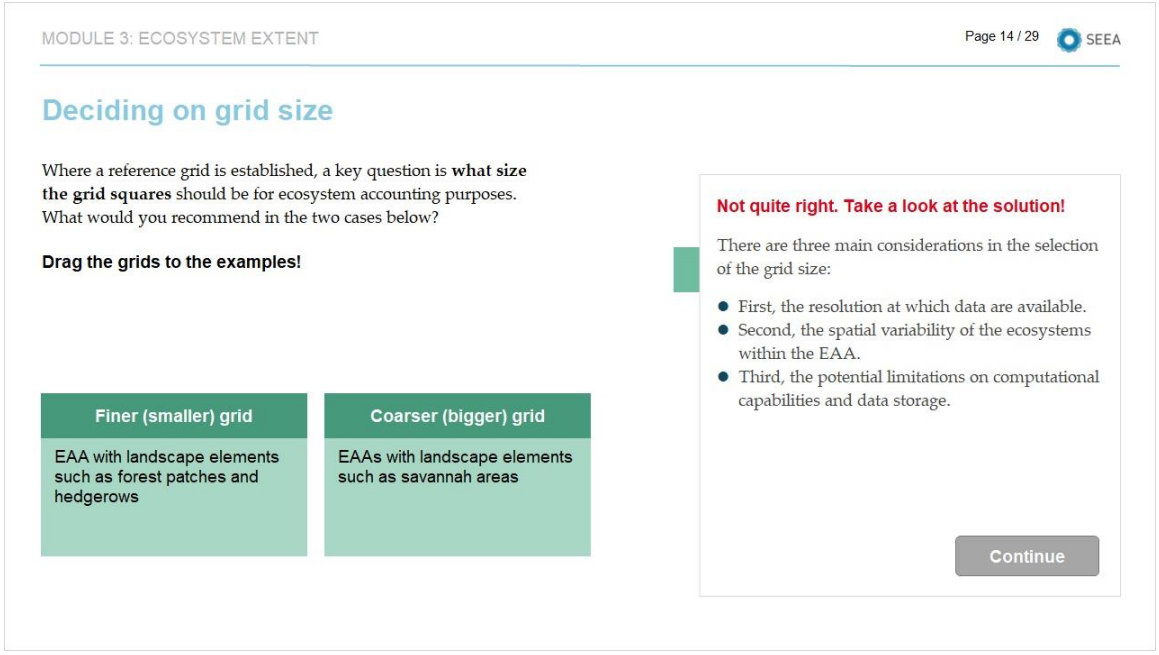
Third, the potential limitations on computational capabilities and data storage.

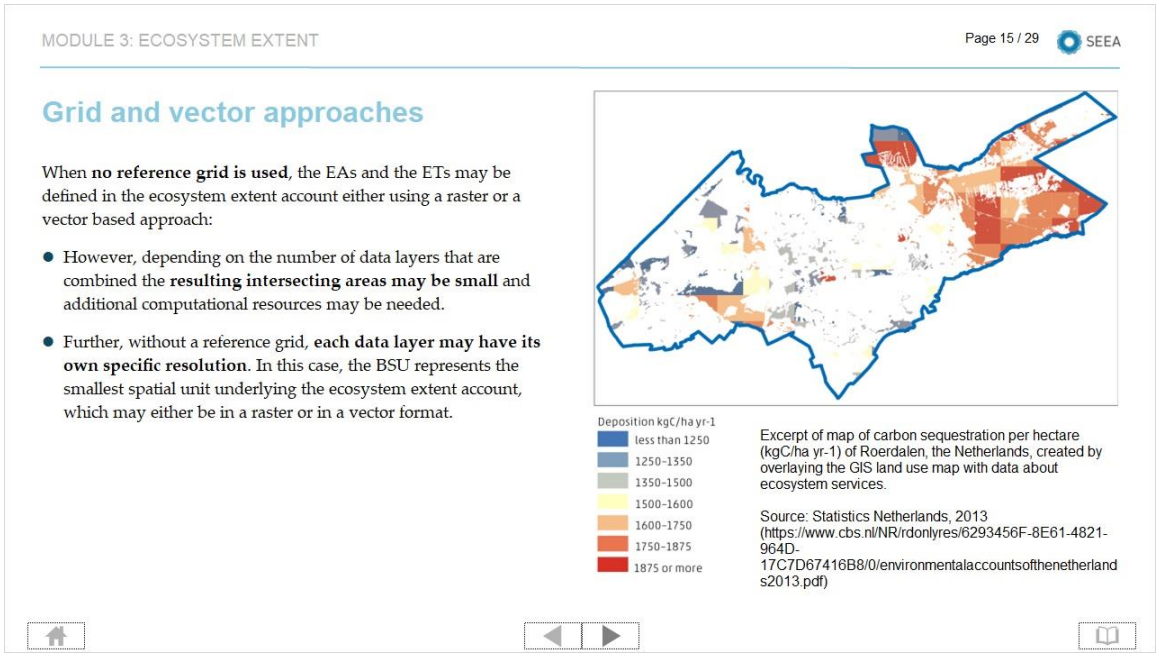
Correct (Slide Layer)



Incorrect (Slide Layer)

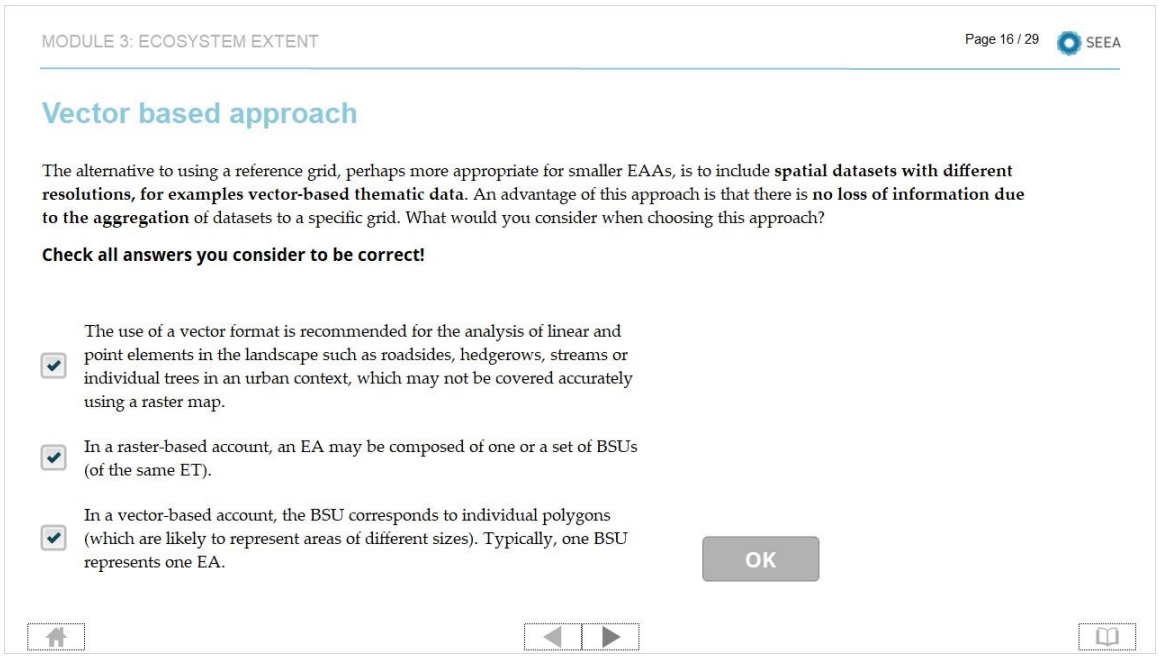


1.15 Grid and vector approaches



1.16 Vector based approach

(Multiple Response, 10 points, 1 attempt permitted)



Correct	Choice
X	The use of a vector format is recommended for the analysis of linear and point elements in the landscape such as roadsides, hedgerows, streams or individual trees in an urban context, which may not be covered accurately using a raster map.
X	In a raster-based account, an EA may be composed of one or a set of BSUs (of the same ET).
X	In a vector-based account, the BSU corresponds to individual polygons (which are likely to represent areas of different sizes). Typically, one BSU represents one EA.

Feedback when correct:

Provided a consistent reference coordinate system is used for all data layers, different datasets can be used and integrated in the accounting structure, such as:

Coarse vector-based thematic data

Detailed vector-based topographic datasets

Ecosystem condition indicators sampled with remote sensing imagery of 30m resolution

Other ecosystem condition indicators sampled at 10m resolution

Feedback when incorrect:

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Detailed vector-based topographic datasets

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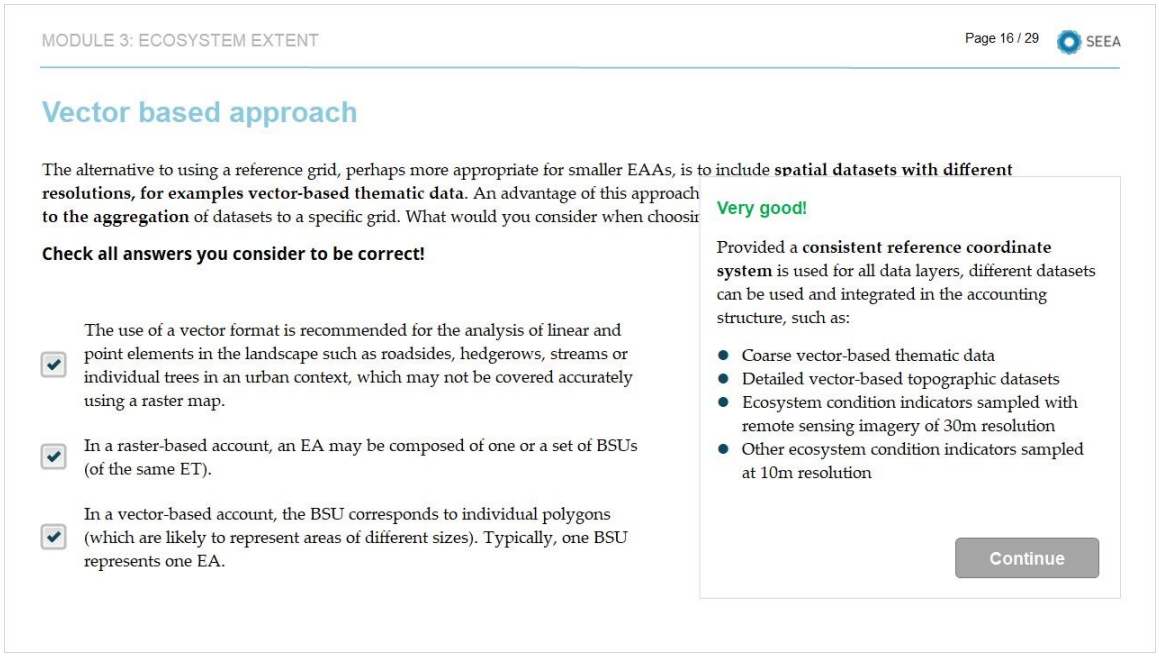
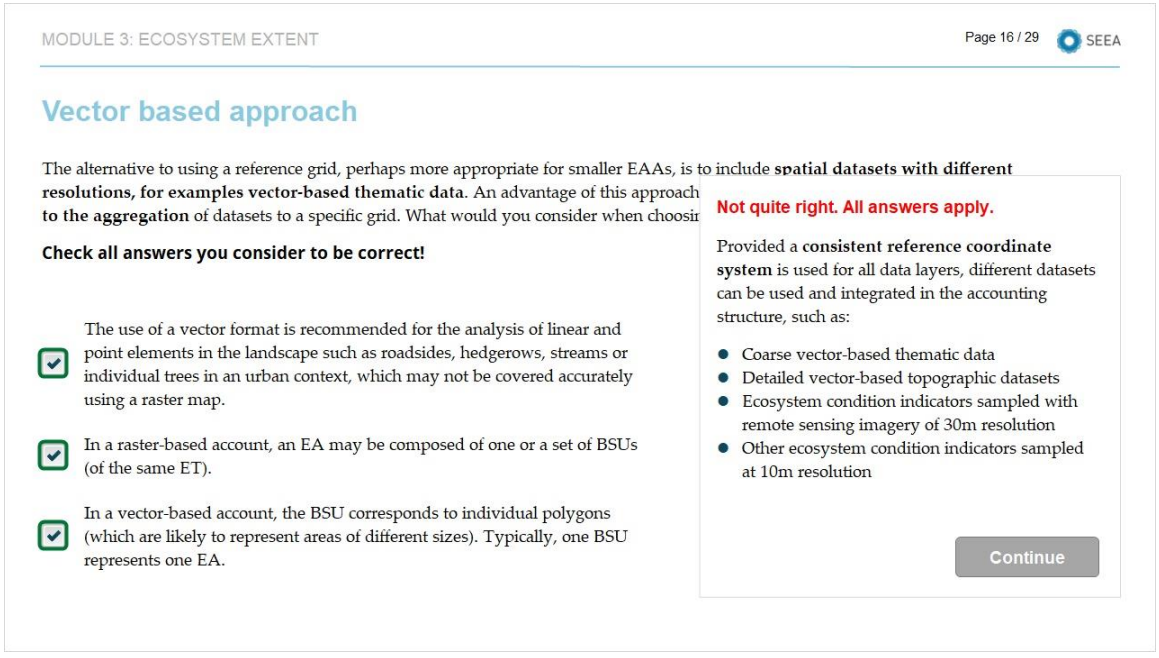
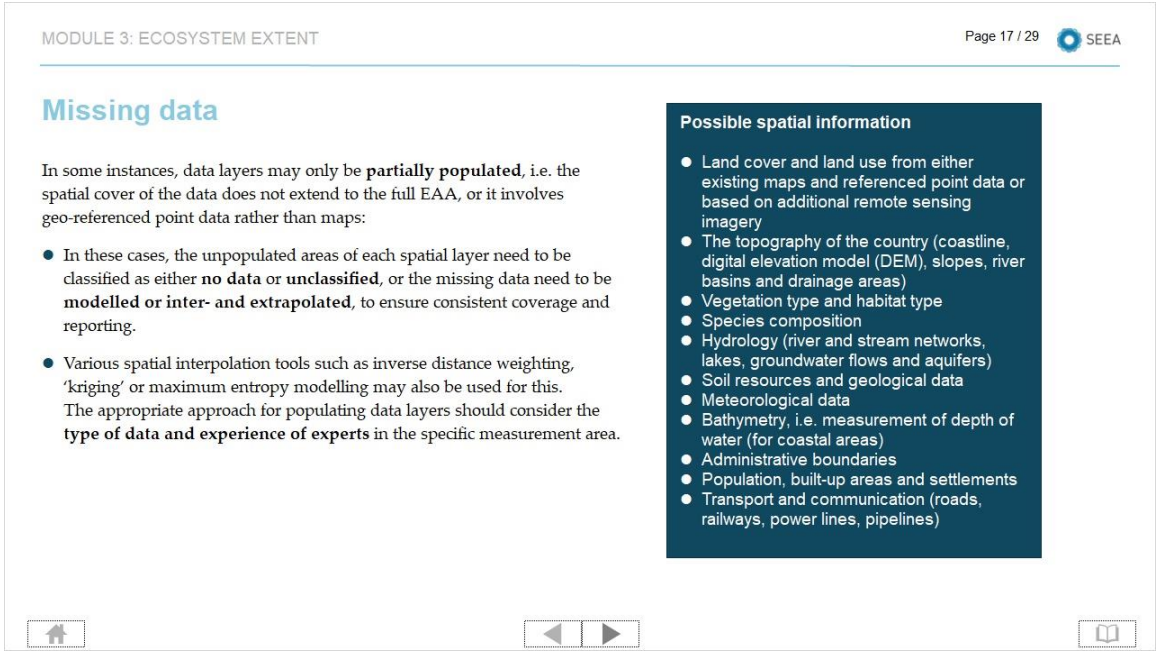
Correct (Slide Layer)



Incorrect (Slide Layer)

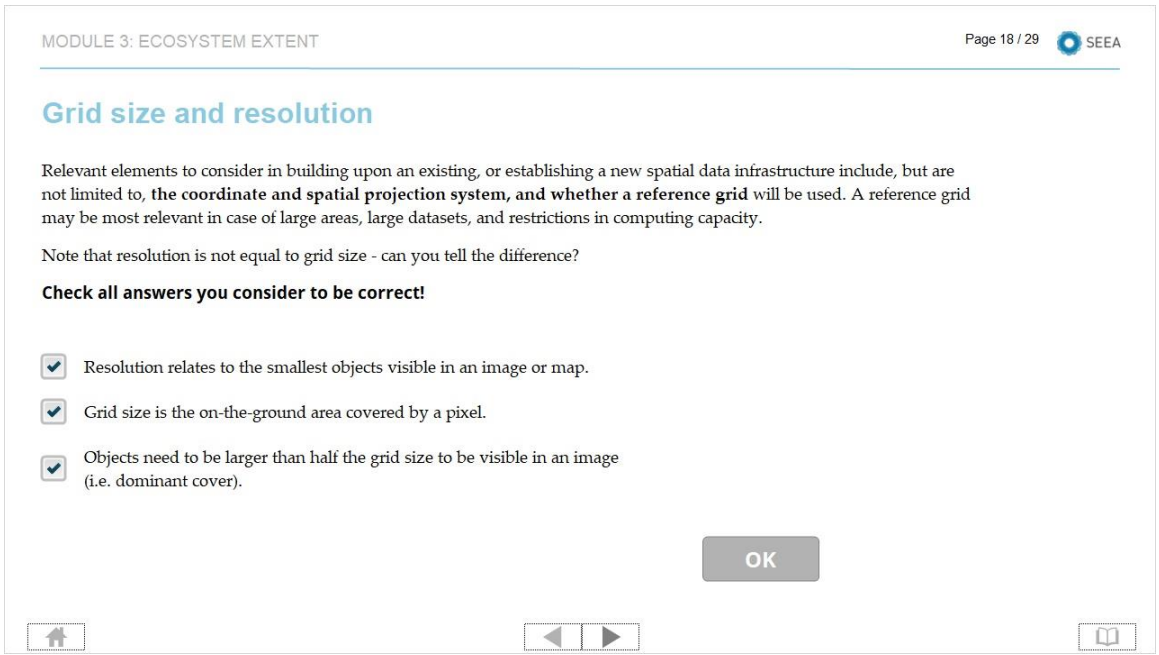


1.17 Missing data



1.18 Grid size and resolution

(Multiple Response, 10 points, 1 attempt permitted)



Correct	Choice
X	Resolution relates to the smallest objects visible in an image or map.
X	Grid size is the on-the-ground area covered by a pixel.
X	Objects need to be larger than half the grid size to be visible in an image (i.e. dominant cover).

Feedback when correct:

Another consideration in setting up the spatial data infrastructure is the minimum mapping unit (MMU), i.e. the minimum size a contiguous area needs to have to be distinguished in the map.

Usually, an MMU substantially exceeding the grid size is chosen to facilitate interpretation of the map.

Feedback when incorrect:

Another consideration in setting up the spatial data infrastructure is the minimum mapping unit (MMU), i.e. the minimum size a contiguous area needs to have to be distinguished in the map.

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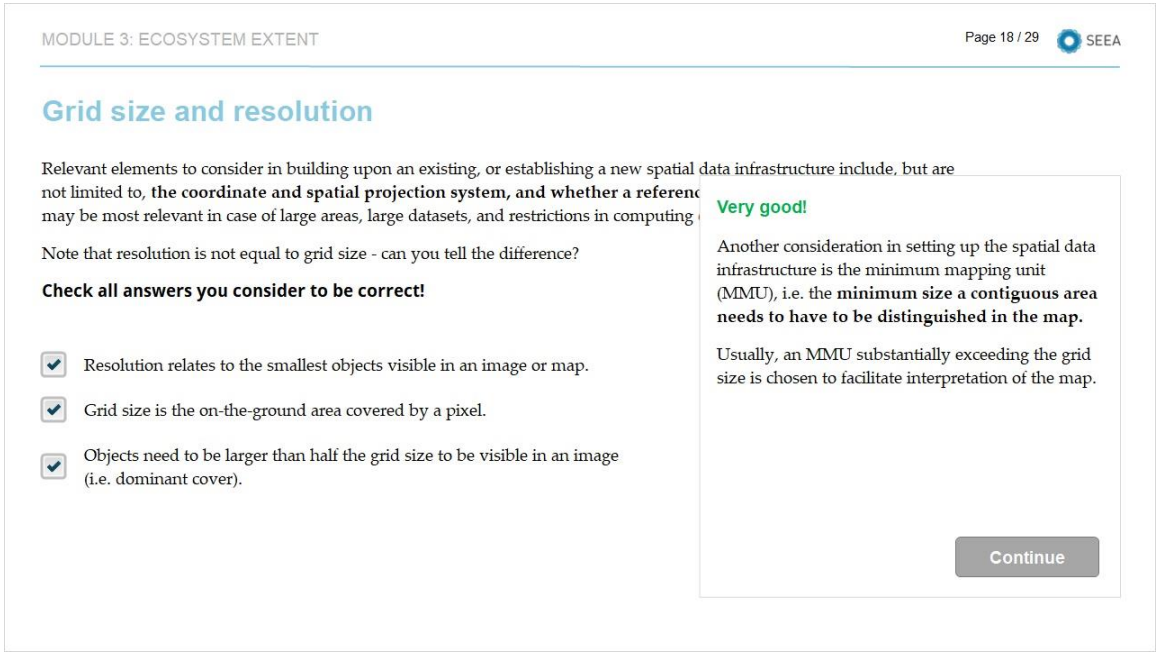
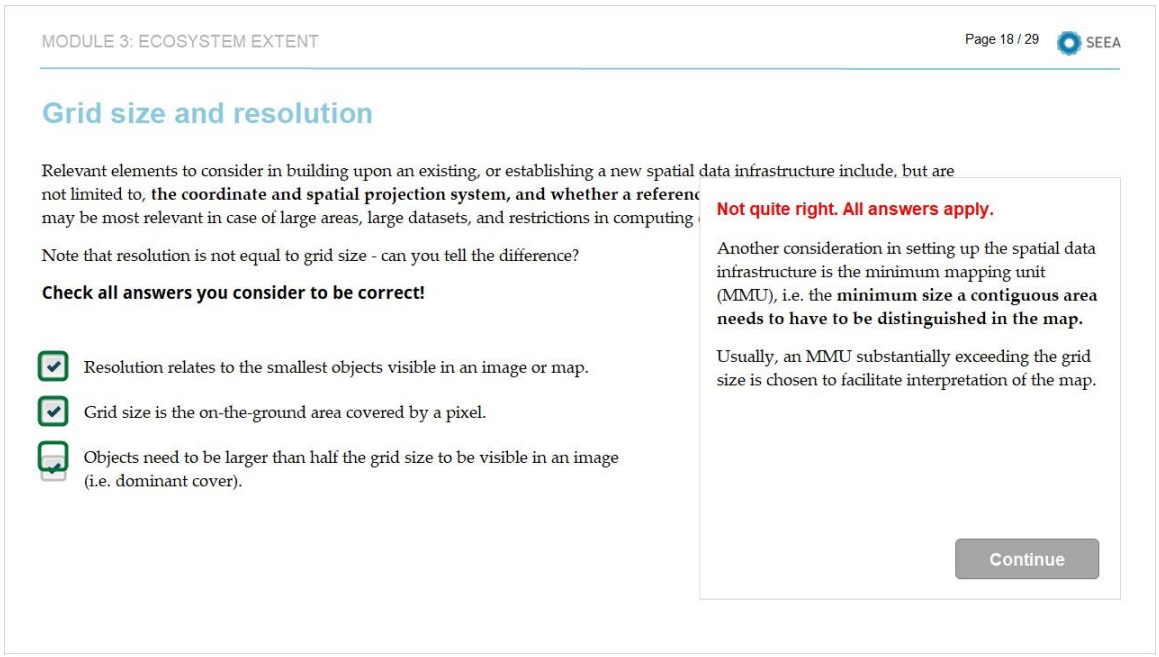
Correct (Slide Layer)



Incorrect (Slide Layer)



1.19 Developing a NSDI

Developing a NSDI

Establishing the spatial areas required for ecosystem accounting is **best undertaken within a broader context of work**. While not being essential to commence work, a national spatial data infrastructure (NSDI) would **support integration of environmental and socio-economic data:**

- The starting point in utilizing an NSDI is an inventory of **what spatial data infrastructure already exists in a country**, in particular within government agencies such as spatial planning or environmental agencies.
- This assessment should include documenting the most commonly used **GIS software packages and the available datasets**. Where feasible, the development of a spatial data infrastructure for accounting should build upon existing infrastructure.
- The development of spatial data infrastructure also requires selecting **hardware with sufficient processing, storage and back-up capacity, and GIS software**.

- Official boundaries (country, administrative, statistical, river basins, biogeographic areas, shorelines, etc.) as polygon vector data
- Elevation and topography data, based on a digital elevation model (DEM) to distinguish elevation and slope of BSU
- Land cover data
- Land management/use
- Vegetation type
- Soil and geology data
- Hydrological data related to rivers, lakes, streams, coastal and marine areas
- Data on urban infrastructure, including cities, villages, industrial zones, and transport (rail, road), needed for assessing ecosystem condition and understanding ecosystem use (e.g. relevant for mapping fragmentation and other impacts)
- Socio-economic data including population data, employment, economic activity, etc.

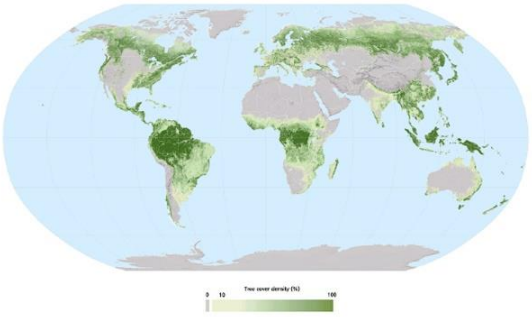
List of data layers recommended for integration in a spatial data infrastructure

1.20 Data sharing and capacity

Data sharing and capacity

Data sharing and capacity are the **key bottlenecks**, even more than the availability of data:

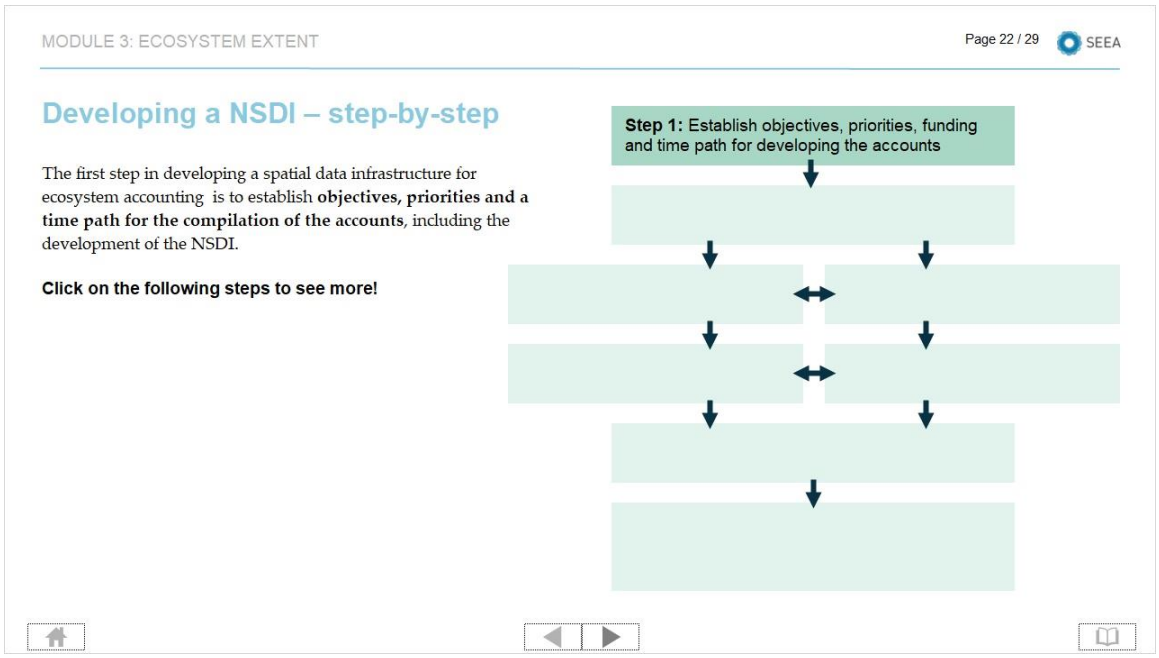
- It is recommended that, given the amount of **time it may take to establish data sharing arrangements**, this is one of the first priorities in the development of an NSDI.
- It is recommended to consider the data formats including the reference coordinate systems used by the various agencies and to assess **if similar formats and coordinate systems can be aligned within an NSDI**.
- Typically, an initial pilot ecosystem accounting project may be run on an up-to-date, powerful, stand-alone computer. However, if ecosystem accounting is applied for large countries or at a continental scale, **additional computing power, either deploying a server or computing and data storage in the cloud may be required**.



The 2015 Global Forest Resources Assessment (FRA2015) is a raster product with a pixel size of 250 meters by 250 meters and includes forest cover, water data, elevation, country boundaries and global ecological zones. Accessible via FAO GeoNetwork.

1.21 Building on work that has already been done

1.22 Developing a NSDI – step by step



1.23 Compiling an ecosystem extent account

Compiling an ecosystem extent account

NSDI is not essential, but very useful in the compilation of an extent account. After an NSDI has been populated with data, the **first ecosystem extent account is compiled** as a priority output. This requires the following considerations:

Explore the headlines to see the next steps!

- Use of existing land cover data
- Level of detail
- Data for testing

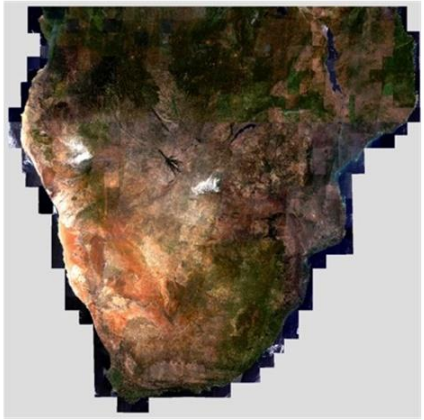
1.24 Freely available data

Freely available data

The delineation of spatial areas may involve the use of remote sensing data including satellite earth observation data. Where there is an agreed national land cover map this should be utilized.

Otherwise, there is an increasing availability of such data freely available:

- Data from **MODIS** with medium spatial resolution since 2000, high temporal frequency and including derived products such as land cover, vegetation dynamics and NPP.
- **Landsat** (several bands (wavelengths) available at 30m grid since 1984 but with lower temporal frequency)
- **Sentinel** including the Sentinel I radar sensor and the Sentinel II optical sensor, with grid sizes of 10m for some bands of the optical sensor.



The European Space Agency (ESA) provides access via GlobCover to newest data obtained from Sentinel-2 satellites, that map global land cover at 10m resolution. Processing and interpretation of images is required if the available products are not sufficient, as well as dealing with issues such as cloud cover (for optical sensors).

1.25 Key research issues

MODULE 3: ECOSYSTEM EXTENT

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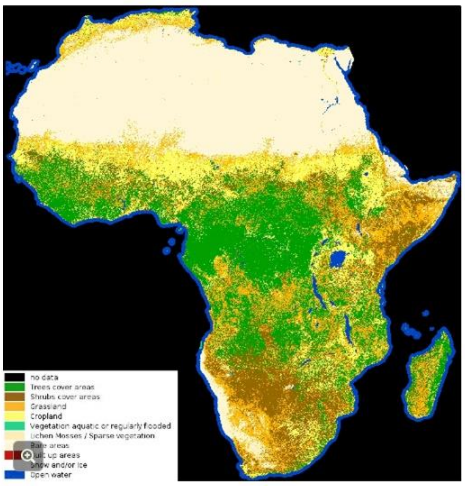
Key research issues

Approaches to delineate spatial areas for ecosystem accounting are still under development. Key research issues include:

- Detailed standard classifications are still under development and in testing. In the first instance, countries should **seek to use relevant country specific classifications** as these will reflect the local situation.
- The framework of spatial units has been developed for terrestrial areas. The importance of **accounting for marine areas** is well recognized and further research is required to fully consider the spatial framework in this context. Some work has already been achieved by the Australian Bureau of Statistics (ABS) with the Experimental Environment-Economic Accounts for the Great Barrier Reef in 2017.
- Incorporating some specific ecological aspects such as information on **soil resources and properties, linear features** such as hedgerows and roads and **subterranean ecosystems** like caves and groundwater systems needs further research.



CCI LAND COVER – S2 prototype Land Cover 20m map of Africa 2016 provided by ESA.

1.26 Example: Netherlands

MODULE 3: ECOSYSTEM EXTENT

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Example: the Netherlands

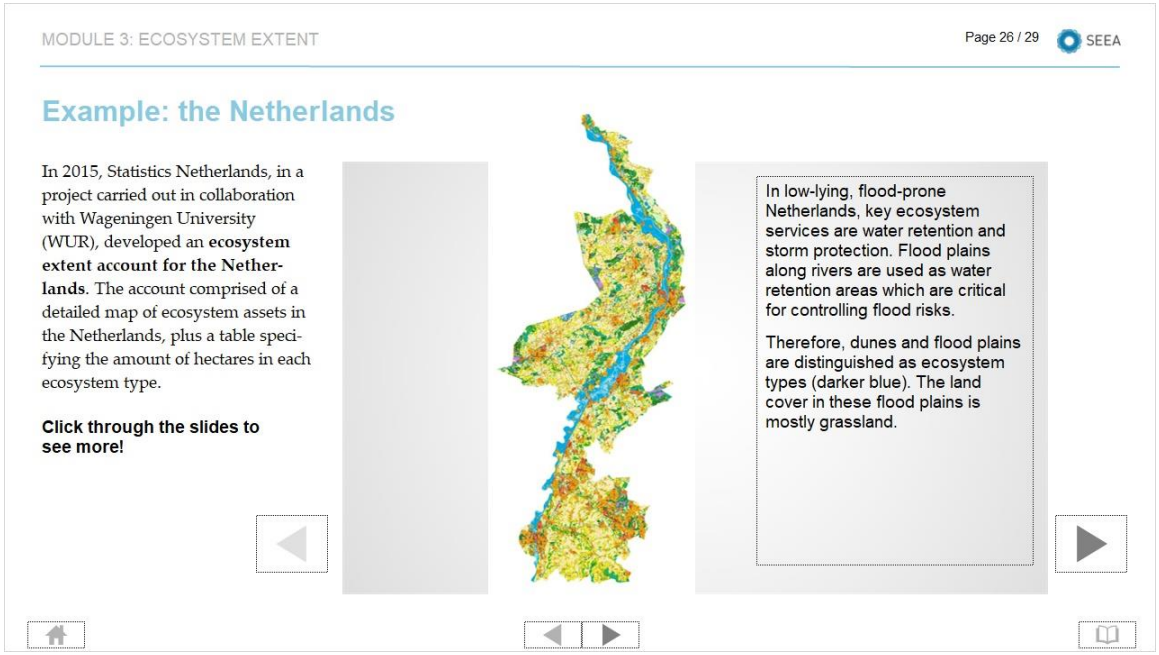
In 2015, Statistics Netherlands, in a project carried out in collaboration with Wageningen University (WUR), developed an **ecosystem extent account for the Netherlands**. The account comprised of a detailed map of ecosystem assets in the Netherlands, plus a table specifying the amount of hectares in each ecosystem type.

Click through the slides to see more!

The map classifies ecosystem assets on the basis of land cover and ecosystem use. Mapping was done, as far as possible, consistent with the SEEA EEA ecosystem types.

Ecosystem use was defined on the basis of the management of the ecosystems as well as on the basis of the services provided by ecosystems.

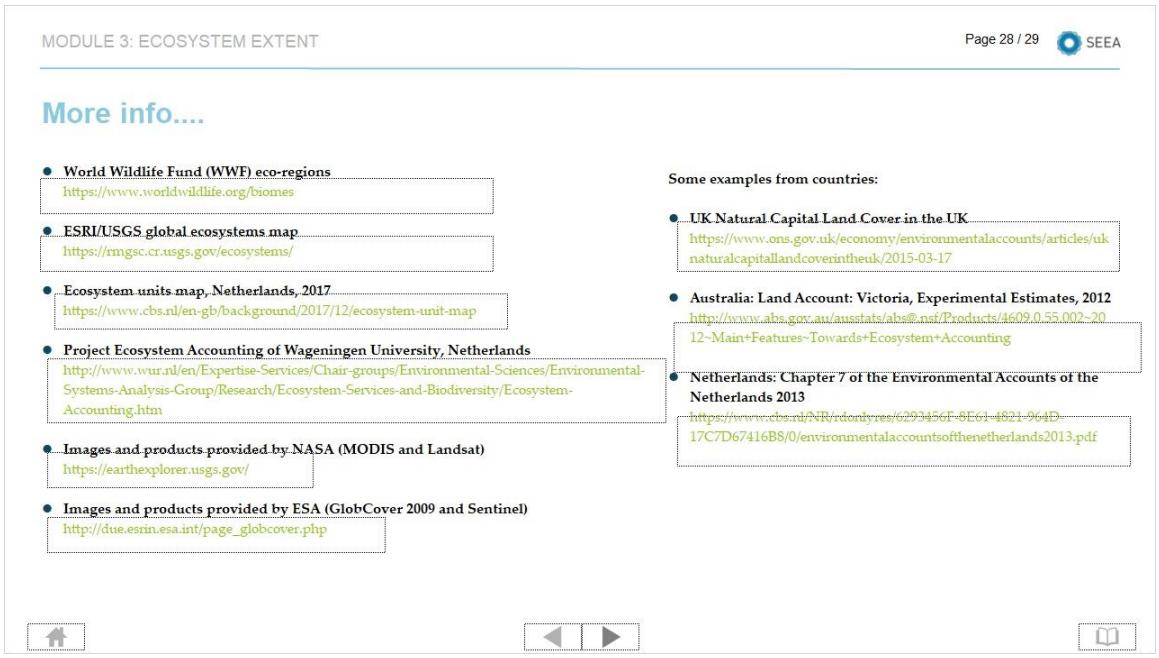
Untitled Layer 1 (Slide Layer)



Untitled Layer 2 (Slide Layer)

1.27 Summary

1.28 More info....



1.29 Module units