SEEA_EnvAcc_M2_EN

1. Module 1 - Introduction

1.1 Welcome

WELCOME	SEEA
Module 2:	
Spatial units	
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Notes:

1.2 Welcome...



1.3 Spatial units in ecosystem accounting



1.4 Determining the approach to accounting

MODULE 2: SPATIAL UNITS

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Determining the approach to accounting

Generating the accounts requires data on, for instance, topography, vegetation, land use and hydrology. When determining the appropriate approach to ecosystem accounting, one primary question we face is whether to focus on rather more spatially detailed measurement or more aggregated, minimum spatial measurement:

- A detailed, fully spatial approach will be needed for a more comprehensive incorporation of ecological information, for example concerning ecosystem condition and measurement of ecosystem services at detailed spatial levels.
- Whereas a minimum spatial approach will be appropriate if the immediate objective is broad scale assessment of ecosystem asset values in monetary terms and integrated measurement of national income and wealth.
- A key bottleneck when producing accounts is **obtaining access to different datasets, both spatial and non-spatial, as well as integrating the data effectively.** Therefore, seeking collaboration with the various agencies holding the required datasets is of great importance. This may be time-consuming and should be pursued in an early phase of account development.



Map of the land use and land cover at global scale, compiled according to the current GAEZ (Global Agro-Ecological Zones) – 2009 approach. It was developed by FAO in collaboration with IIASA (International Institute for Applied Systems Analysis).

1.5 Land cover and land use

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1.6 Addressing policy questions

(Multiple Response, 10 points, 1 attempt permitted)

MOE	DULE 2: SPATIAL UNITS	Page 6 / 31	O SEEA
Ad	dressing policy questions		
The prod appr	minimum application of spatial analysis produces aggregated accounts whereas a fully spatial approach involves the uction of both accounting tables and maps. Do you know which policy applications only apply when a fully spatial oach is used?		
Che	ck all answer you consider to be correct!		
	Understanding how ecosystems support the economy		
	Monitoring changes in ecosystem assets over time and across space		
	Spatial and land use planning		
•	Comparing ecosystem changes in different areas (e.g. as a consequence of different policies)		
•	Support to environmental impact assessment and environmental cost-benefit analysis OK		
Ħ			Ø

Correct	Choice
	Understanding how ecosystems support the economy
х	Monitoring changes in ecosystem assets over time and across space
х	Spatial and land use planning
х	Comparing ecosystem changes in different areas
	(e.g. as a consequence of different policies)
х	Support to environmental impact assessment and
	environmental cost-benefit analysis

Feedback when correct:

A detailed, fully spatial approach will be needed for a more comprehensive incorporation of ecological information, for example concerning ecosystem condition and measurement of ecosystem services

at detailed spatial levels. A minimum spatial approach will be appropriate if the immediate objective is broad scale assessment of ecosystem asset values in monetary terms and integrated measure-ment of national income and wealth. In practice, a combination of spatial and nonspatial measure-ment approaches is a likely application, taking into account the relative data quality at

different spatial scales.

Feedback when incorrect:

A detailed, fully spatial approach will be needed for a more comprehensive incorporation of ecological information, for example concerning ecosystem condition and measurement of ecosystem services

at detailed spatial levels. A minimum spatial approach will be appropriate if the immediate objective is broad scale assessment of ecosystem asset values in monetary terms and integrated measure-ment of national income and wealth. In practice, a combination of spatial and nonspatial measure-ment approaches is a likely application, taking into account the relative data quality at

different spatial scales.

Correct (Slide Layer)



Incorrect (Slide Layer)

Addressing policy questions	
The minimum application of spatial analysis produces aggregated accounts where	eas a fully spatial approach involves the
production of both accounting tables and maps. Do you know which policy appli- approach is used?	Not quite right. Look at the solution!
Check all answer you consider to be correct!	A detailed, fully spatial approach will be needed for a more comprehensive incorporation of ecological information, for example concerning ecosystem
Understanding how ecosystems support the economy	condition and measurement of ecosystem services at detailed spatial levels. A minimum spatial
Monitoring changes in ecosystem assets over time and across space	approach will be appropriate if the immediate objective is broad scale assessment of ecosystem asse
Spatial and land use planning	values in monetary terms and integrated measure- ment of national income and wealth. In practice , a
Comparing ecosystem changes in different areas	combination of spatial and non-spatial measure-
(e.g. as a consequence of different policies)	ment approaches is a likely application, taking into account the relative data quality at
Support to environmental impact assessment and	different spatial scales.
environmental cost-benefit analysis	Continue

1.7 Principles for the delineation of spatial units



1.8 Basic spatial units



1.9 Types of spatial units

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



Drag and drop properties Return item to start point if dropped outside the correct drop target

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Snap dropped items to drop target (Snap to center)

Allow only one item in each drop target

Delay item drop states until interaction is submitted

Feedback when correct:

Ecosystem assets (EAs) represent contiguous areas covered by a specific ecosystem

(e.g. a single deciduous forest).

Ecosystem Types (ETs) are aggregations of individual EAs of a specific type of ecosystem (e.g. deciduous forests).

EAAs are geographical aggregations of EAs

that can be grouped by ETs.

Feedback when incorrect:

Ecosystem assets (EAs) represent contiguous areas covered by a specific ecosystem

(e.g. a single deciduous forest).

Ecosystem Types (ETs) are aggregations of individual EAs of a specific type of ecosystem (e.g. deciduous forests).

EAAs are geographical aggregations of EAs

that can be grouped by ETs.

Correct (Slide Layer)

Page 9 / 31 O SEEA MODULE 2' SPATIAL UNITS Types of spatial units The smallest entities of measurement, so called basic spatial units (BSU), are often provided in the form of grid squares or small polygons in maps. The purpose of Very good! BSUs is to provide a fine level frame to which a range of different information can be attributed and finally aggregated. Can you figure out the three types of • Ecosystem assets (EAs) represent contiguous aggregated spatial units used instead? areas covered by a specific ecosystem (e.g. a single deciduous forest). Drag the headlines to the explanations! • Ecosystem Types (ETs) are aggregations of individual EAs of a specific type of ecosystem (e.g. deciduous forests). • EAAs are geographical aggregations of EAs Distinct spatial areas that Aggregations of Accounts produced for that can be grouped by ETs. form the conceptual individual assets of a large administrative base for accounting and specific type of areas, such as the integration of ecosystem provinces or countries, relevant statistics or in relation to bioregions or river basins that may cross national boundaries

Incorrect (Slide Layer)



1.10 Relationships between spatial areas



Layer 1 (Slide Layer)



Layer 2 (Slide Layer)



Layer 3 (Slide Layer)



Layer 4 (Slide Layer)

Relationships between spatial areas Wherever the accounts include entries for types of ecosystems, the ifferent ecosystems need to be delineated such that no gaps or verlaps arise – i.e. the approach must be mutually exclusive and ollectively exhaustive. The figure shows the relationships between the Ecosystem Accounting Area (EAA), the Ecosystem Type (ET) nd the Ecosystem Asset (EA), where six distinct EAs (EA1-6) are elineated and have been classified to four different ETs (ET1-4). Explore the figure to find out more!	BSU The Basic Spatial Unit (BSU) may correspond to a cell in a spatial information system or to individual polygons respectively, the latter being the case whenever a vector based approach to ecosystem extent accounting is pursued. For measurement purposes, BSUs are assumed to be internally homogenous in terms of their biophysical properti ET1 (EA1) ET4 (EA4) ET2 (EA5) ET3 (EA6)

1.11 Understanding types of spatial units

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

MODULE 2: SPATIAL UNITS		Page 11 / 31	O SEEA
Understanding types of spat	ial units		
The framework consisting of three types of spatial areas and aggregated. This is akin to the role of a units model in governments) are distinguished by their types of econom types, such as industry classes and institutional sectors Can you figure out what the analogues are to these three	allows the organization of information into separate enti n economic statistics where economic units (i.e., busines ic activity and legal structure. These economic units can types of spatial units accounts within the context of nati	ties that can be compared ses, households and then be grouped into relevant onal accounts ?	
Match the pairs!	Accounts national inc	s for dustry	
Accounting for a specific EA, e.g. one wetland or farming area		Accounts for type of industry	
Accounting for a specific ET, e.g. all grasslands in a country	Acc individe	ounts for ual business	
Accounting for EEA, ideally covering the whole country			
		ок	
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Drag Item	Drop Target
Accounts for	Rechteck 4
individual business	
Accounts for	Rechteck 5
type of industry	
Accounts for	Rechteck 6
national industry	

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

Feedback when correct:

The general ambition of ecosystem accounting in the SEEA EEA is to provide more general guidance as to the changes in ecosystem related stocks and flows in larger and diverse spatial areas.

Feedback when incorrect:

The general ambition of ecosystem accounting in the SEEA EEA is to provide more general guidance as to the changes in ecosystem related stocks and flows in larger and diverse spatial areas.

Correct (Slide Layer)



Incorrect (Slide Layer)

inderstanding type	to or opation units	
he framework consisting of three typ nd aggregated. This is akin to the role overnments) are distinguished by the	es of spatial areas allows the organization of information • of a units model in economic statistics where economic • • ir types of economic activity and legal structure. These e	into separate entities that can be compared ^{II} c Not quite right. Take a look at the solution!
pes, such as industry classes and ins an you figure out what the analogues	stitutional sectors are to these three types of spatial units accounts within	The general ambition of ecosystem accounting in
latch the pairs!		the SEEA EEA is to provide more general guidance as to the changes in ecosystem related stocks and flows in larger and diverse spatial areas.
Accounting for a specific EA, e.g. one wetland or farming area	Accounts for individual business	
Accounting for a specific ET, e.g. all grasslands in a country	Accounts for type of industry	

1.12 Basic spatial units

MODULE 2: SPATIAL UNITS

Ecosystem Assets (EA)

Conceptually, for accounting purposes, each area covered by a specific ecosystem type is considered to represent an ecosystem asset:

- EAs are considered to be contiguous and bounded spatially with each asset comprising all of the relevant biotic and abiotic components within those bounds that are required for it to function and to supply ecosystem services.
- In principle, an EA can be differentiated from neighbouring EAs by both ecological and ecosystem use factors.
- It is also relevant to use information on ecosystem management and ecosystem use as part of the delineation of EAs.
- If various data on ecological and use characteristics are unavailable, a land cover based delineation of EAs may be used as a starting point.



Map of European ecosystem types: https://biodiversity.europa.eu/maes/mapping-ecosystems/mapof-european-ecosystem-types .

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1.13 Untitled Slide



1.14 Differentiating neighbouring EAs by ecology

(Multiple Response, 10 points, 1 attempt permitted)

MO	DULE 2: SPATIAL UNITS	Page 14 / 31	O SEEA
Di	fferentiating neighbouring EAs by ecology		
From betw outs and	m an ecological perspective, EAs can be differentiated by the extent to which the relationships veen biotic and abiotic components within an EA are stronger than the relationships with components side of the EA. These differences in relationships will be reflected in differences in function, structure composition. Can you imagine which characteristics can be used to delineate EAs?		
Che	ck all answers you consider to be correct!		
•	Vegetation structure and type and species composition		
	Ecological processes		
	Climate and hydrology		
	Soil characteristics and topography		
	ок		
Ħ			

Correct	Choice
х	Vegetation structure and type and species composition
х	Ecological processes
х	Climate and hydrology
х	Soil characteristics and topography

Feedback when correct:

These characteristics may be used alone but also in combination. The choice will dependent on the country, the ecosystems involved, the detail required for policy and analysis, as well as the available data.

Feedback when incorrect:

These characteristics may be used alone but also in combination. The choice will dependent on the country, the ecosystems involved, the detail required for policy and analysis, as well as the available data.

Correct (Slide Layer)

Differentiating neighbouring EAs by ecology	
rom an ecological perspective, EAs can be differentiated by the extent to which the relati etween biotic and abiotic components within an EA are stronger than the relationships utside of the EA. These differences in relationships will be reflected in differences in fur	onships Very good!
nd composition. Can you imagine which characteristics can be used to delineate EAs? Check all answers you consider to be correct!	These characteristics may be used alone but also in combination. The choice will dependent on the country, the ecosystems involved, the detail required for policy and analysis as well as the
Vegetation structure and type and species composition	available data.
Ecological processes	
Climate and hydrology	
Soil characteristics and topography	
	Continue

Incorrect (Slide Layer)



1.15 Delineation of EAs by ecosystem management

Information on ecosystem management and ecosystem use	Map 5.5: Protected areas FGGD Modulo 5: Land was patterns and land cover
may be particularly helpful in understanding the flows of ecosystem services that can be attributed with relative certainty to a particular EA:	
 For example, distinguishing between protected forests that are not logged and ecologically similar forests in which logging is permitted could be of great use. 	
 It is also noted that maps which delineate land according to different land management regimes (for example protected areas and water catchments) may be readily available and allow for the actabilichment of enatial areas 	
for ecosystem accounting.	Protected areas where aplicature Protected areas where aplicature Protected areas where aplicature shudd not be countring Non-protected areas in viand water bodies
• It should further be recognized that a higher amount of ecological and use characteristics used for delineation results in greater number of EAs that will be identified.	FGGD protected areas map provided by FAO GeoNetwork. Each pixel is classified as protected area where agriculture should not be occurring, protected area where agriculture could be occurring, or non-protected area. The data is taken from the UNEP-WCMC World database on protected areas, 2003.

1.16 Land cover based delineation of EAs



1.17 Ecosystem Type (ET)



1.18 Possible ETs per land cover classes



1.19 Treatment of marine and urban units



1.20 Ecosystem services and ETs

(Multiple Response, 10 points, 1 attempt permitted)

MOE	DULE 2: SPATIAL UNITS	Page 20 / 31	O SEEA
Ec	osystem services and ETs		
Spec latter In de supp	ifying ETs requires the consideration of land cover, land/ecosystem use as well as ecosystem services provided, the r reflecting a function of natural vegetation, institutional arrangements, location in the landscape, hydrology and/or soil t efining ETs, considering the supply of ecosystem services and aiming for a high degree of commonality in ecosystem ser ly within an ET can be helpful. Can you imagine the advantages of this approach for users and compilers?	ype. rvices	
Che	ck all answers you consider to be correct!		
•	Ecosystem account users may be more interested in information on the ecosystem services supplied by all EAs of the type "deciduous forest", rather than in services from individual patches of deciduous forests.		
•	Data may only be sufficient to provide an estimate of the total supply of an ecosystem service for a specific type of ecosystem, and hence cannot provide a meaningful indication of service supply in each associated individual EA.		
•	Grasslands located in floodplains provide an important hydrological service (water storage leading to reduced flood risk) whereas grasslands located outside of floodplains may provide less of this service.		
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х	Ecosystem account users may be more interested in information on the
	ecosystem services supplied by all EAs of the type "deciduous forest",
	rather than in services from individual patches of deciduous forests.
х	Data may only be sufficient to provide an estimate of the total supply of an
	ecosystem service for a specific type of ecosystem, and hence cannot provide a meaningful indication of service supply in each associated individual EA.
х	Grasslands located in floodplains provide an important hydrological service
	(water storage leading to reduced flood risk) whereas grasslands located outside
	of floodplains may provide less of this service.

Feedback when correct:

Even though specific EAs may have similar vegetation cover, they may provide different services.

It is helpful to attribute these areas to different

ETs, thereby facilitating a coherent linkage between ET and ecosystem service supply.

Feedback when incorrect:

Even though specific EAs may have similar vegetation cover, they may provide different services.

It is helpful to attribute these areas to different

ETs, thereby facilitating a coherent linkage between ET and ecosystem service supply.

Correct (Slide Layer)



Incorrect (Slide Layer)

MODULE 2: SPATIAL UNITS

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Page 20 / 31 O SEEA **Ecosystem services and ETs** Specifying ETs requires the consideration of land cover, land/ecosystem use as well as ecosystem services provided, the latter reflecting a function of natural vegetation, institutional arrangements, location in the Not quite right. All answers apply! In defining ETs, considering the supply of ecosystem services and aiming for a high degr supply within an ET can be helpful. Can you imagine the advantages of this approach for Even though specific EAs may have similar vegetation cover, they may provide different Check all answers you consider to be correct! services Ecosystem account users may be more interested in information on the It is helpful to attribute these areas to different ecosystem services supplied by all EAs of the type "deciduous forest", ETs, thereby facilitating a coherent linkage between rather than in services from individual patches of deciduous forests. ET and ecosystem service supply. Data may only be sufficient to provide an estimate of the total supply of an ecosystem service for a specific type of ecosystem, and hence cannot provide a meaningful indication of service supply in each associated individual EA. Grasslands located in floodplains provide an important hydrological service (water storage leading to reduced flood risk) whereas grasslands located outside of floodplains may provide less of this service.

1.21 Recommendations for specifying ETs



1.22 Working with different spatial scales



1.23 Ecosystem Accounting Area (EAA)

(Multiple Response, 10 points, 1 attempt permitted)

MOE	ULE 2: SPATIAL UNITS	Page 23 / 31	O SEEA
Ec	osystem Accounting Area (EAA)		
The At th prov	geographical aggregation for which the account is developed is labelled the ecosystem accounting area (EAA). e most aggregated levels, this involves accounting at the national or in particular cases at the continental level to ide a larger picture of ecosystems. Which of the following would be appropriate aggregations?		
Cheo	k all answers you consider to be correct!		
	EAs and ETs within specific sub-national administrative areas		
•	EAs and ETs within hydrologically defined areas within a country (such as water catchments)		
	Areas owned by specific industries or sectors, e.g. government owned land		
	ОК		
₩			Ũ

Correct	Choice
х	EAs and ETs within specific sub-national administrative areas
х	EAs and ETs within hydrologically defined areas within a country (such as water catchments)
x	Areas owned by specific industries or sectors, e.g. government owned land

Feedback when correct:

Depending on policy questions, aggregations of EAs should both provide information at a scale relevant for policy monitoring and analysis and where the accuracy of the information is considered fit for purpose.

A single EA may be classified to multiple EAA, for example to an EAA formed as using a water catchment and also to an EAA formed using an administrative region. Incorporating a single EA into different EAA will be relevant depending on the question being addressed.

Feedback when incorrect:

Depending on policy questions, aggregations of EAs should both provide information at a scale relevant for policy monitoring and analysis and where the accuracy of the information is considered fit for purpose.

A single EA may be classified to multiple EAA, for example to an EAA formed as using a water catchment and also to an EAA formed using an administrative region. Incorporating a single EA into different EAA will be relevant depending on the question being addressed.

Correct (Slide Layer)



Incorrect (Slide Layer)



1.24 Understanding EEAs

(Multiple Response, 10 points, 1 attempt permitted)

IODULE 2: SPATIAL UNITS	Page 24 / 31	O SEE
Inderstanding EAAs		
Vithin each EAA there will be multiple EAs of different ETs , e.g. individual EAs of forests, wetlands and cropland. an you figure out what an ecosystem extent account for a given sub-national administrative area would generally sho	ow?	
heck one answer you consider to be correct!		
Changing area of each individual EA		
Changing total area of each ET (e.g. forest, wetland, cropland)		
Changing areas of both EAs and ETs		
ок		
		Ĩ

Correct	Choice
	Changing area of each individual EA
х	Changing total area of each ET (e.g. forest, wetland, cropland)
	Changing areas of both EAs and ETs

Feedback when correct:

The resulting accounting structures will generally be such that measures of ecosystem extent, ecosystem condition and ecosystem services will present information for aggregations of EAs into ETs.

Feedback when incorrect:

The resulting accounting structures will generally be such that measures of ecosystem extent, ecosystem condition and ecosystem services will present information for aggregations of EAs into ETs.

Correct (Slide Layer)



Incorrect (Slide Layer)



1.25 Input data



1.26 Data sources



1.27 Main approaches to scaling

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



Drag Item	Drop Target
Downscaling	Rechteck 4
Upscaling	Rechteck 5
Transfer	Rechteck 6

Drag and drop properties

Return item to start point if dropped outside the correct drop target

Snap dropped items to drop target (Snap to center)

Allow only one item in each drop target

Delay item drop states until interaction is submitted

Feedback when correct:

Transferring information measured in one location to another location is often used in terms of benefits transfer.

Overall recommendation to scaling:

Maintain data at the highest resolution possible

Be aware that downscaling and upscaling may introduce additional error

Feedback when incorrect:

Transferring information measured in one location to another location is often used in terms of benefits transfer.

Overall recommendation to scaling:

Maintain data at the highest resolution possible

Be aware that downscaling and upscaling may introduce additional error

Correct (Slide Layer)



Incorrect (Slide Layer)



1.28 Aggregation



1.29 Summary

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Summary

Role of spatial units in ecosystem accounts

Ecosystem accounting requires the delineation of areas within a country into mutually exclusive units that represent ecosystem assets. The SEEA EEA framework has been developed to allow for the organization of information into separate entities. These entities can then be compared and aggregated.

Organising spatial data

The minimum application of spatial analysis produces aggregated accounts, a fully spatial approach involves the production of both accounting tables and maps. The smallest entities of measurement, basic spatial units (BSU), support the organization of spatial data sets for ecosystem accounting.

Delineating spatial areas

#

Wherever the accounts include entries for types of ecosystems, the different ecosystems need to be delineated such as no gaps or overlaps arise – i.e. the approach must be mutually exclusive and collectively exhaustive.

Ecosystem Assets (EA)

EAs can be differentiated by the extent to which the relationships between biotic and abiotic components within an EA are stronger than the relationships with components outside of the EA. These differences in relationships will be reflected in differences in function, structure and composition.

Ecosystem Type (ET)

An ET is defined as a specific class of ecosystem assets of comparable ecology and ecosystem use. Generally, a number of different areas (EAs) of the same ET are encountered across a country.

Ecosystem Accounting Area (EAA)

Within each EAA there will be multiple EAs of different ETs, e.g. individual EAs of forests, wetlands and cropland. A single EA may be classified to multiple EAA.

1.30 Where can I find more information?

IODULE 2: SPATIAL UNITS		Page 30 / 31	O SEE
Where can I find more informat	ion?		
FAO GeeNetwork http://www.fao.org/geonetwork/srv/en/main.home			
ESA Land Cover map http://maps.elie.ucl.ac.be/CCI/viewer/index.php			
European Environment Agency - Data and Maps https://www.eea.europa.eu/data-and-maps			
Statistics Netherlands – Ecosystem Unit Map https://www.cbs.nl/en-gb/background/2017/12/ecosystem-unit-map			
EU – Mapping and Assessing Ecosystems and their Services (MAES) https://biodiversity.europa.eu/maes/mapping-ecosystems/map-of-europe	an ecosystem-types		
Experimental Environmental-Economic Accounts for the Great Barrie http://www.abs.gov.au/AUSSTATS/abs@.nst/Lookup/4680.0Main+Featu	r Reef, 2017 tre§12017		
Canada – Measuring Ecosystem Goods and Services http://www.statcan.gc.ca/pub/16-201-x/16-201-x2013000-eng.pdf			

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