System of Environmental Economic Accounting

Introduction to Ecosystem Accounting

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Content

- Overview and background
- Basic concepts and definitions
- Accounts

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The System of Environmental Economic Accounting (SEEA)

- The **SEEA Central Framework** was adopted as an international statistical standard by the UN Statistical Commission in 2012 to measure the environment and its relation with the economy
- The **SEEA Experimental Ecosystem Accounting** complements the Central Framework and represents international efforts toward coherent ecosystem accounting

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Two Different Perspectives

SEEA Central Framework:

Individual environmental assets/ resources

- Timber
- Water
- Soil
- Fish

SEEA Experimental Ecosystem Accounts:

Ecosystem assets (spatially based)

- Forests
- Lakes
- Agricultural areas

Ecosystem Assets are environmental assets viewed from a systems perspective

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SEEA EEA: Background

- Complements SEEA Central Framework with focus on ecosystems perspective
- Developed as part of broader process of revising SEEA 2003
- Integrated statistical framework for accounting for ecosystem assets and associated ecosystem services
- Not a statistical standard – "Experimental" for now
- "Technical Recommendations in support of the System of Environmental-Economic Accounting 2012–Experimental Ecosystem Accounting" published in 2017
- EEA Revision by 2020 launched

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Relationship to SEEA Central Framework

- Extends range of flows (production boundary) for accounting compared to SNA and SEEA in physical and monetary terms
- Many flows from Central Framework also included in Experimental Ecosystem Accounting (e.g. flows of timber), but extension of EEA is to attribute flows to spatial areas
- Some Central Framework natural input flows are excluded from Experimental Ecosystem Accounting (e.g. mineral and energy resources)

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Key concepts: definitions

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Ecosystem assets: definition

Ecosystem assets are spatial areas containing a combination of **biotic and abiotic components** and other characteristics that function together:

- Ecosystems are considered assets because they support **not only economic production**, but also our **well-being, health and security**.
- Potential ecosystem assets include **forests, wetlands, agricultural areas, rivers and coral reefs**.

- Example: A **forest** is an area that:
  - Can be located on a map (spatial)
  - Contains trees, shrubs, grasses, soil biota, birds, mammals, insects… functioning together with
  - The soil, water, geology (rocks), sunlight, wind…

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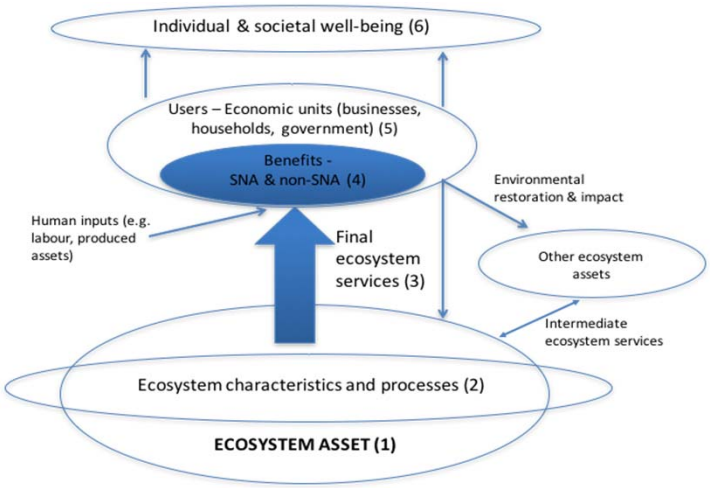
Ecosystem accounting framework



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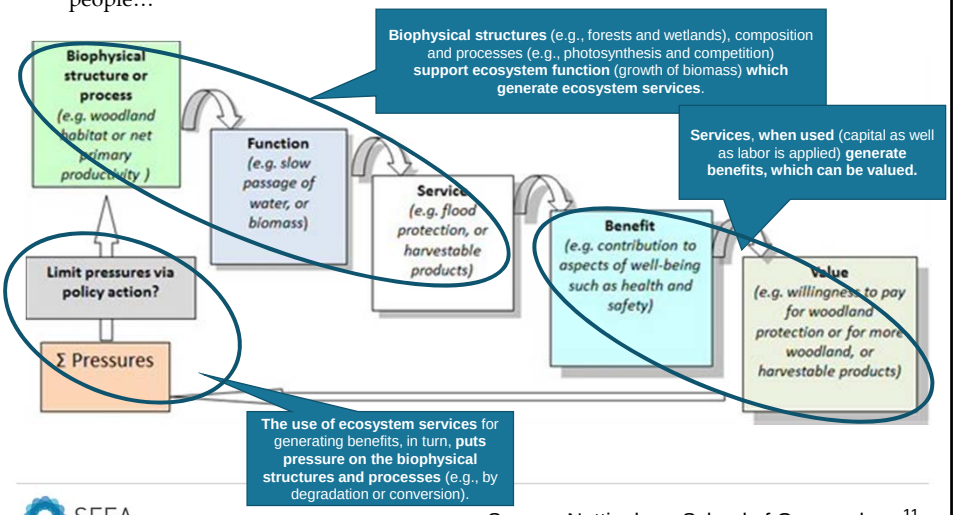
The Ecosystem Services Cascade

Ecosystem services are the contribution of ecosystems to benefits for people…



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Source: Nottingham School of Geography

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Ecosystem accounting is spatial

- Ecosystems are different and function differently depending on **where** they are
- Their capacity to supply services depends on their **location**
- The benefits of many services depends on whether or not the ecosystems are **accessible**
- Therefore…Ecosystem accounting needs to integrate **spatial** and **non-spatial** data
- For example, wetlands in northern Canada may have the **capacity** to purify water, but there is no population there to benefit from it.

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Ecosystem accounts

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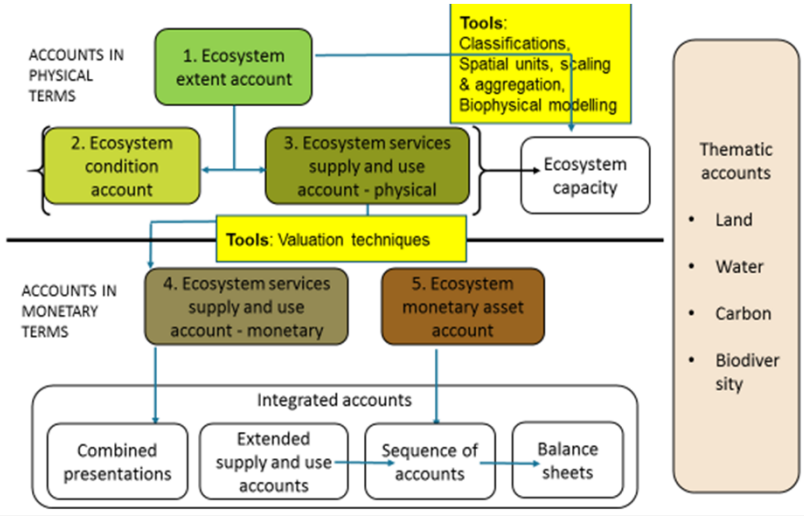
Connections between ecosystem and related accounts and concepts



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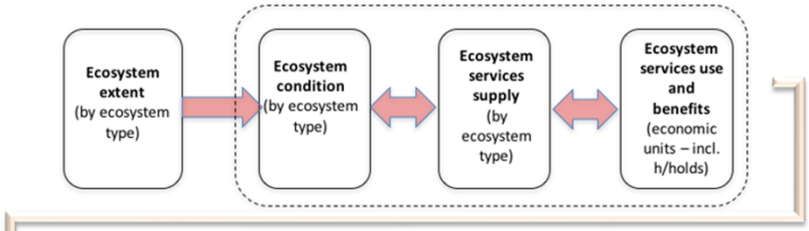
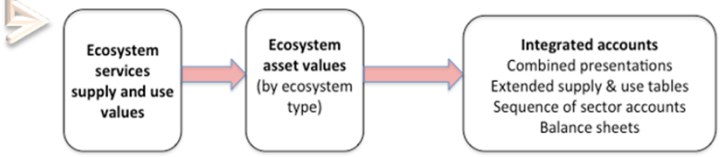
Broad steps in ecosystem accounting

a. Steps in physical terms



b. Steps in monetary terms



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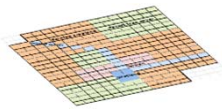
Ecosystem extent account

Maps



Ecosystem type

Spatial units
Classifications

	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																

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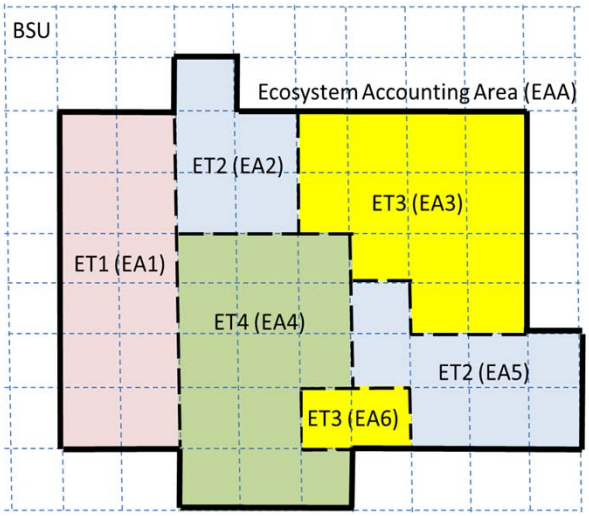
Types of spatial units



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Ecosystem condition account

- What?
  - Ecosystem condition reflects the overall quality of an ecosystem asset, in terms of its characteristics. (SEEA EEA paragraph 2.34)
- Why?
  - Policies to limit degradation of natural heritage, rehabilitation of degraded ecosystems
  - Links to capacity to produce services (Services Supply)
  - Indicators:
    - Indices of condition ➔ change over time ➔ where changes
    - Good/bad condition (exceeding "safe" levels) ➔ where

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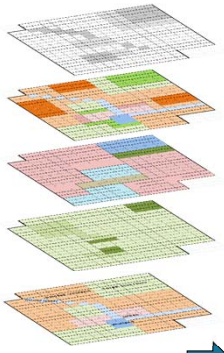
Ecosystem condition account

- **What does a Condition Account look like**

Maps



Scaling & aggregation

Tables

		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
Example indicators of condition		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Vegetation (e.g. native cover)	Opening condition															
	Closing condition															
Water quality (e.g. turbidity, pH)	Opening condition															
	Closing condition															
Soil (e.g. erosion, pH, nutrients)	Opening condition															
	Closing condition															
Carbon (e.g. net primary productivity)	Opening condition															
	Closing condition															
Biodiversity (e.g. species richness)	Opening condition															
	Closing condition															
Habitats (e.g. fragmentation)	Opening condition															
	Closing condition															
Overall index of condition	Opening condition															
	Closing condition															

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Ecosystem services supply

- **What?**
  - Physical flows of "final" ecosystem **services** from ecosystems to beneficiaries
  - Directly used by (or affect) people
- **Why?**
  - Inform policies of contribution of ecosystems to human well-being
  - Assess trade-offs between development and conservation
  - Link to standard economic production measures in SNA
  - Link to other SEEA-EEA accounts (**Condition, Services Use, Monetary Ecosystem Services; Ecosystem Monetary Asset** valuation)
  - Indicators:
    - Flows of individual services (physical and monetary) ➔ change
    - Indices of aggregated services by ecosystem type ➔ change

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Types of ecosystem services

Provisioning Services	= goods that can be harvested from, or extracted from ecosystems	Example: providing fish for fisheries, or providing wood for timber harvest
Regulating Services	= the regulation of climate, hydrological, ecological and soil processes	Example: pollination, carbon sequestration, flood control
Cultural Services	= the non-material benefits provided by ecosystems	Example: recreation, tourism, providing a setting for cultural or religious practices

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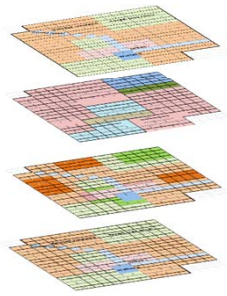
Ecosystem services supply account

Maps



Tables

	Ecosystem type			
Type of service	Urban and associated	Forest tree cover	Agricultural land	Open wetlands
Provisioning		e.g., tonnes of timber	e.g., tonnes of wheat	
Regulating	e.g., tonnes of CO_2 stored / released	e.g., tonnes of CO_2 stored / released	e.g., tonnes of CO_2 stored / released	e.g., tonnes of P absorbed
Cultural	e.g., hectares of parkland	e.g., number of visitors / hikers		e.g., hectares of duck habitat

Look up tables
Biophysical modelling

Valuation

Monetary Services Supply

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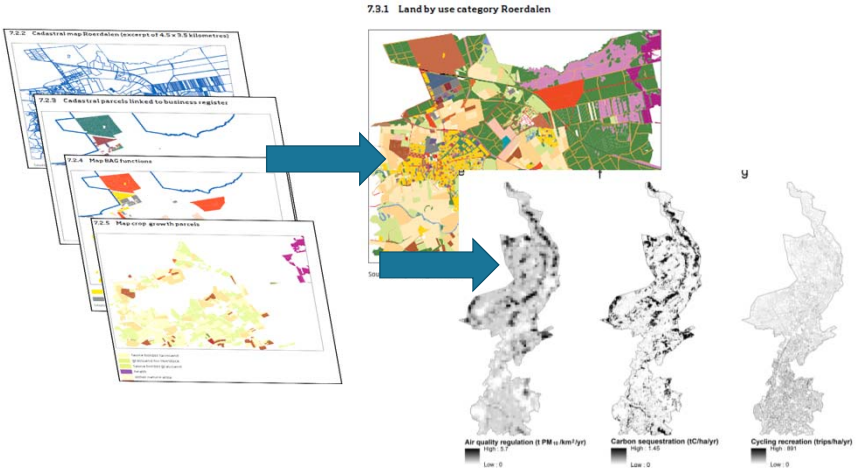
Example: Netherlands



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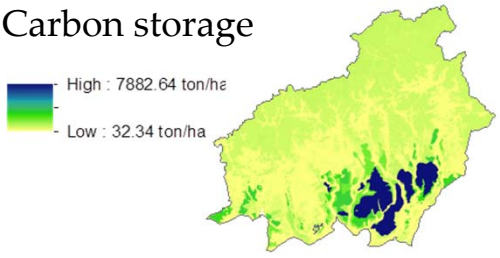
Example: Central Kalimantan

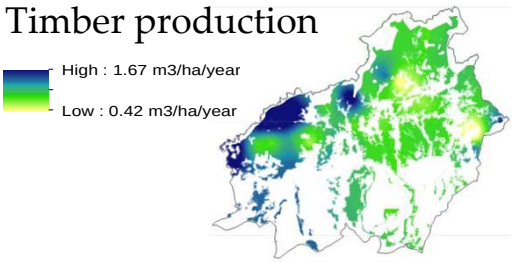
Carbon storage



Model used

Look Up Tables (every land cover class is attributed a specific carbon storage value)

Timber production



Kriging
(values are interpolated from samples)

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Source: Sumarga and Hein, 2014

Other issues

- Valuation in monetary terms
- Thematic accounts
  - Biodiversity
  - Carbon
  - Water

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THANK YOU

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