System of Environmental Economic Accounting

Overview of the SEEA EEA and latest insight from the revision process

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United Nations

SEEA EEA Revision Governance Structure

UN Committee of Experts on Environmental-Economic Accounting (UNCEEA)
Chair: Bert Kroese, Statistics Netherlands

SEEA EEA Technical Committee / Editorial Board
Chair: Anton Steurer, Eurostat

WG1: Spatial units
Chair: Sjoerd Schenau, Statistics Netherlands

Finalized discussion papers:
- DP1.1: An ecosystem type classification for the SEEA EEA
- DP1.2: Treatment of ecosystems assets in urban areas
- DP1.3: Treatment of the atmosphere and oceans in the SEEA EEA
- Background paper 1: to discussion paper 1.1 on option 3
- Background paper 2: A review of existing classifications

WG2: Ecosystem condition
Chair: Joachim Maes, EU JRC

Finalized discussion papers:
- DP2.1: Purpose and role of ecosystem condition accounts
- DP2.2: Review of ecosystem condition accounting case studies: Lessons learned and options for developing condition accounts
- DP2.3: Proposed typology of condition variables for ecosystem accounting and criteria for selection of condition variables
- Online supplement to Discussion paper 2.2

WG3: Ecosystem services
Chair: Lars Hein, Wageningen University

Discussion papers under development:
- DP3.1: Proposed concepts, definitions and terminology for ecosystem services for the revised SEEA EEA
- DP3.2: Initial list of ecosystem services for SEEA EEA and selected treatments

WG4: Individual ecosystem services
Chair: Rocky Harris, DEFRA, UK

Finalized discussion papers:
- Towards a definition and classification of terrestrial provisioning services related to crop cultivation and forestry
- Biomass from Fisheries: Provisioning Services and Benefits
- Soil retention (regulating) ecosystem services
- Research paper on air filtration ecosystem services
- Accounting for the water purification ecosystem service
- Defining and valuing carbon related services
- Water flow regulation for mitigating river and coastal flooding
- Water Supply Services: Biophysical Modeling and Economic Valuation in Ecosystem Accounting
- Recreation services from ecosystems
- Research paper on habitat and biodiversity related ecosystem services

WG5: Valuation
Chair: Juha Siikamaki, IUCN

Discussion papers under development:
- DP5.1: Defining exchange and welfare values, articulating institutional arrangements and establishing the valuation context for ecosystem accounting
- DP5.2: A framework for the valuation of ecosystem asset
- DP5.3: Accounting treatments when integrating ecosystem accounts in the SNA
- DP5.4: Recording degradation in ecosystem accounts
- DP5.5: Ecosystem disservices and externalities

Subgroup on accounting for biodiversity
Chair: Rosimeiry Portela & Trond Larsen, Conservation International

Drafts to be developed:
- Review of chapters
- Development of issue notes

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SEEA EEA Revision process: overall timeline

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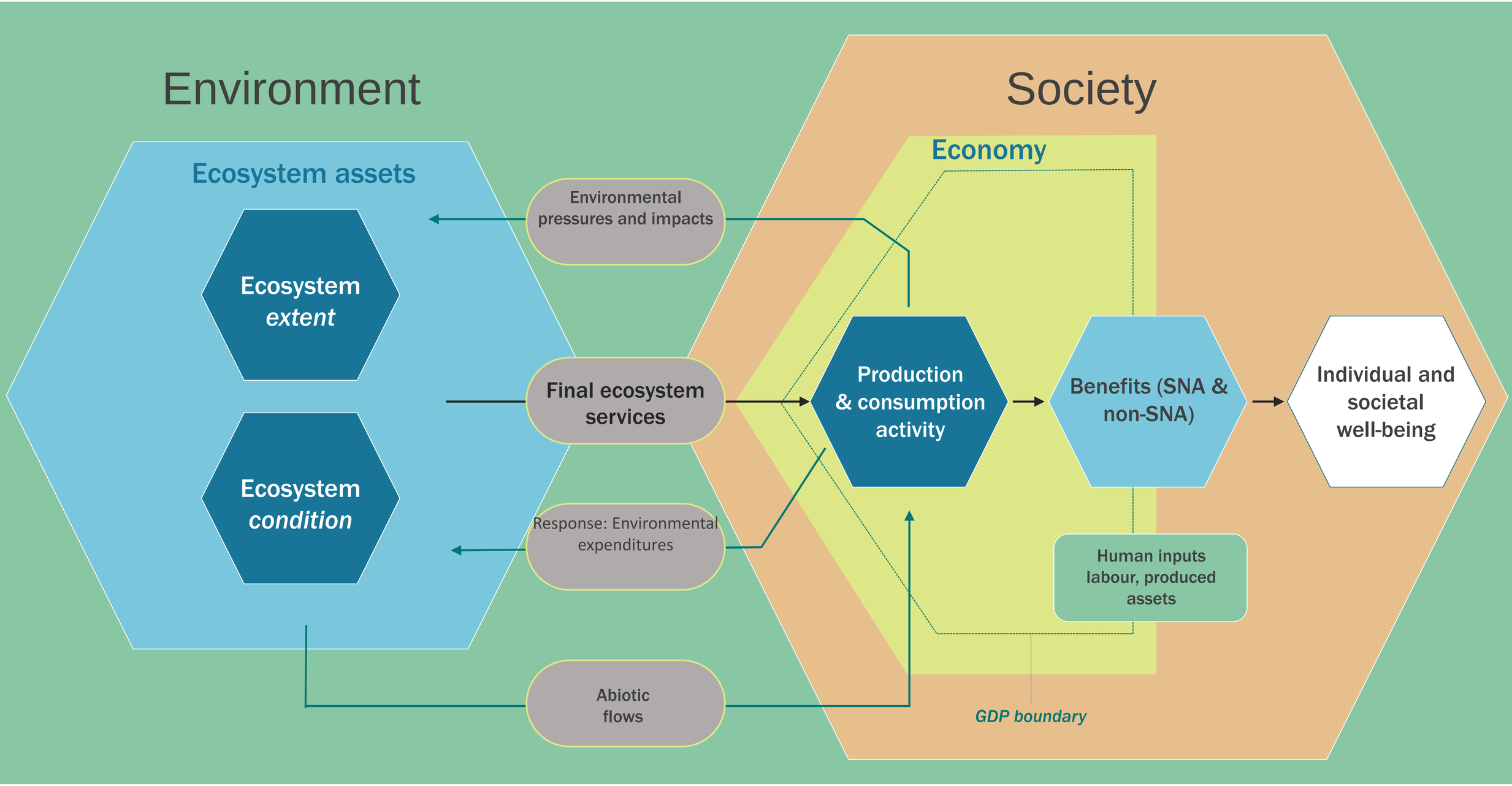
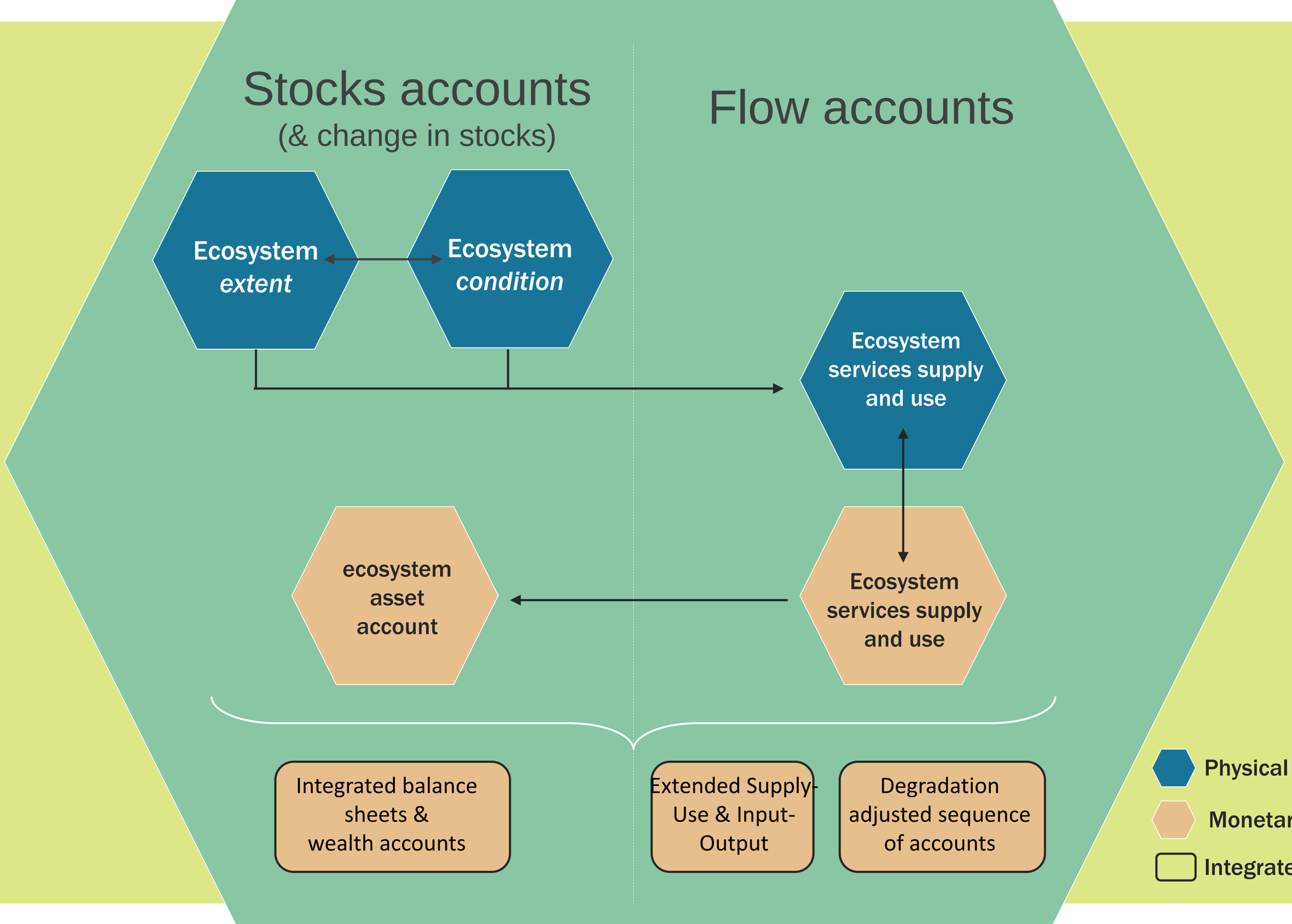

Environment
Society
Economy
Ecosystem assets
Ecosystem extent
Ecosystem condition
Environmental pressures and impacts
Final ecosystem services
Response: Environmental expenditures
Abiotic flows
Production & consumption activity
Benefits (SNA & non-SNA)
Individual and societal well-being
Human inputs labour, produced assets
GDP boundary

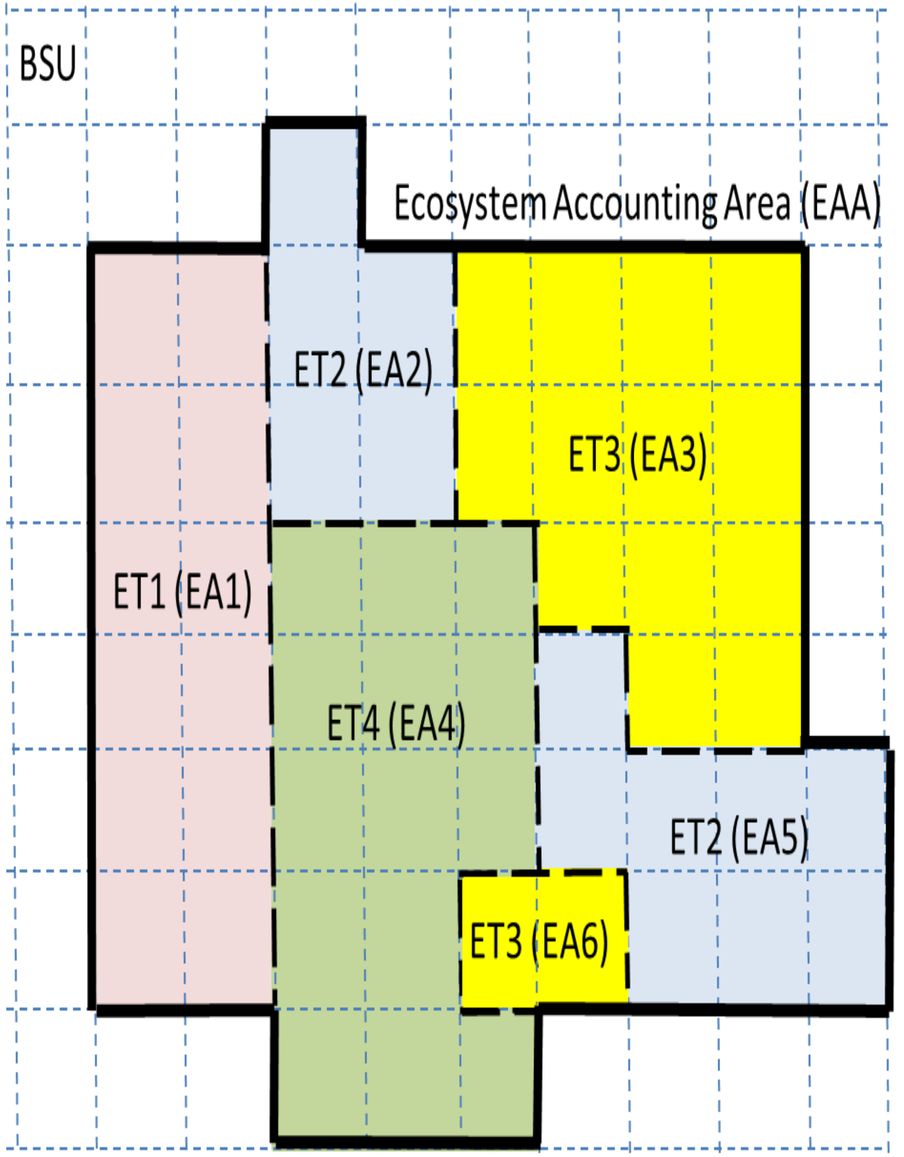

Stocks accounts
(& change in stocks)
Flow accounts
Ecosystem extent
Ecosystem condition
Ecosystem services supply and use
ecosystem asset account
Ecosystem services supply and use
Integrated balance sheets & wealth accounts
Extended Supply-Use & Input-Output
Degradation adjusted sequence of accounts
Physical accounts
Monetary accounts
Integrated accounts

Ecosystem extent

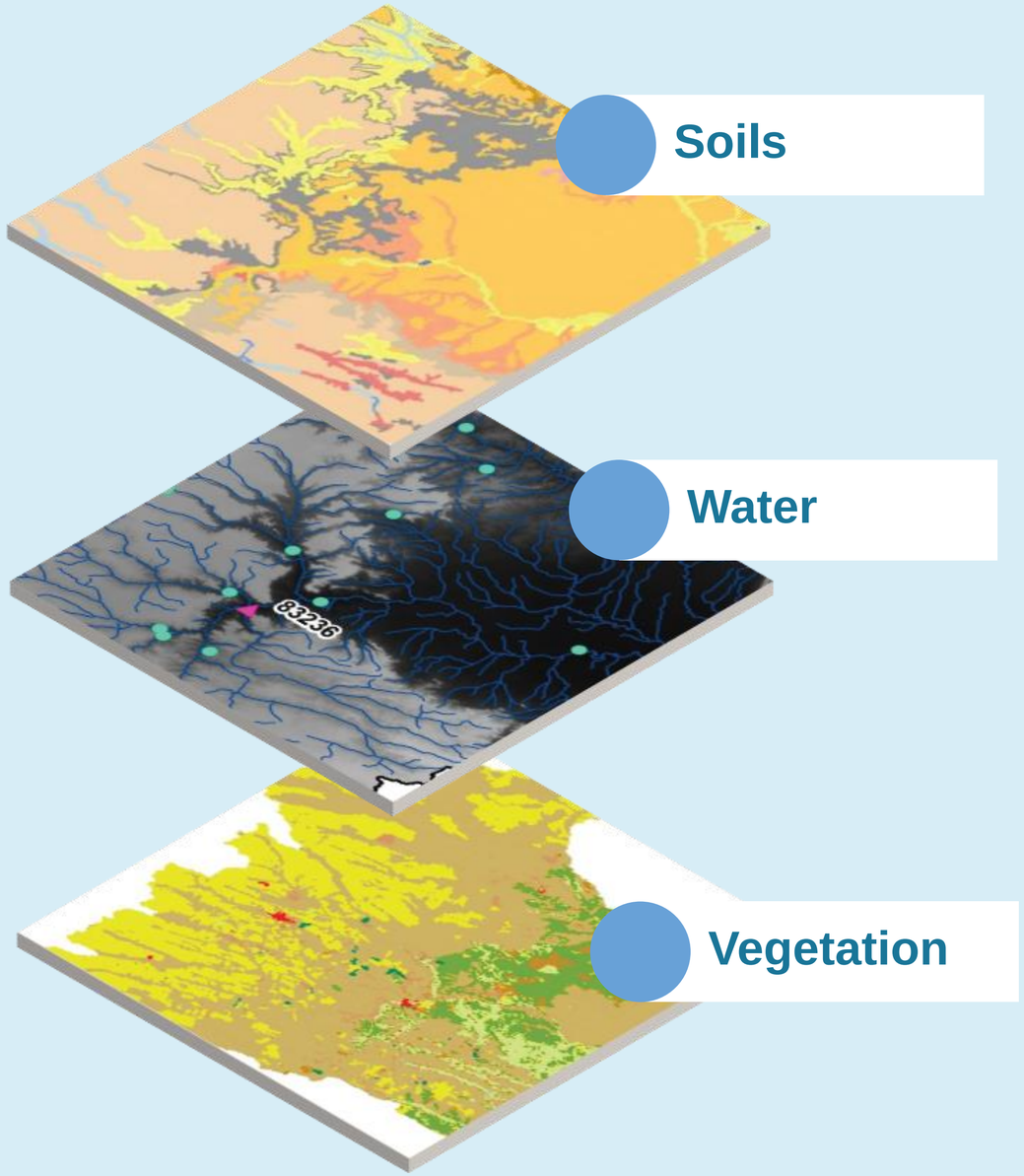
Two types of spatial units:

- Ecosystem accounting area (EAA) is the geographical scope for which ecosystem accounts are compiled.

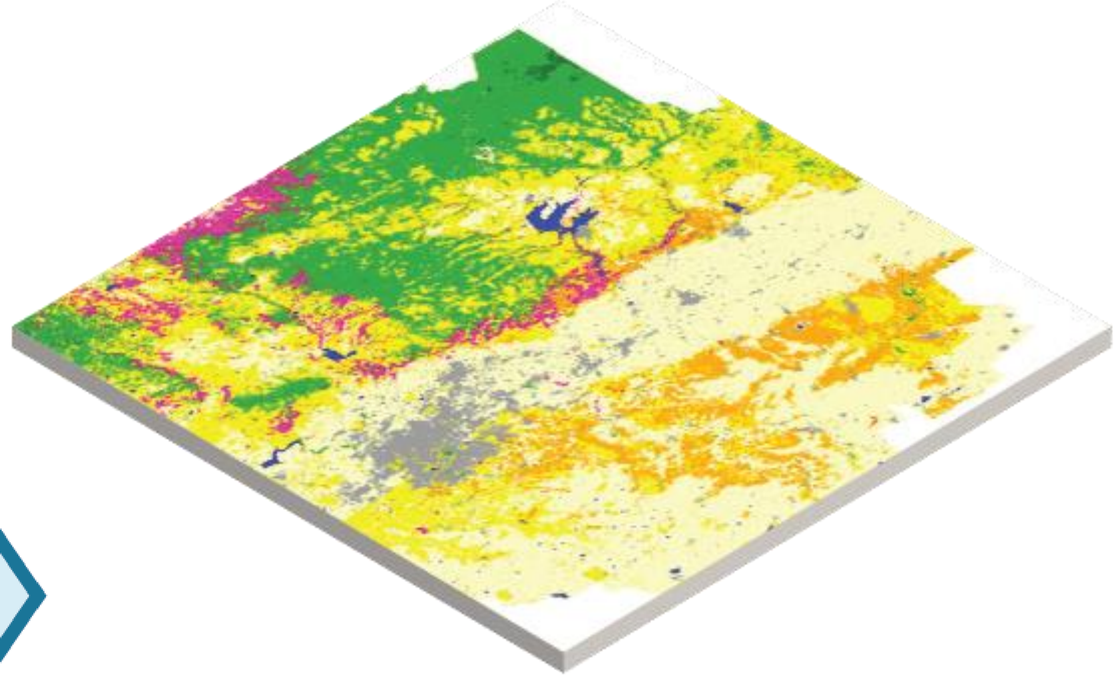
- Ecosystem assets (EA) are contiguous spaces of a specific ecosystem type (ET) comprising all of the relevant biotic and abiotic components.



Extent Account



Layers



	Grassland	Forest Areas	Herbaceous Crops
Opening Extent	1,332	645	420
Closing Extent	1,110	603	484

SEEA Ecosystem Type Reference Classification

- 3 approaches
  - Use an existing national ecosystem classification scheme that satisfies the principles outlined SEEA EEA.
  - Use the SEEA Ecosystem type reference classification, the IUCN Global Ecosystem Typology and subject to user needs and data availability, determine the classes required for local purposes.
  - Build a new classification based on user needs and data availability and the principles of ecosystem type classification.
- IUCN Global Ecosystem typology
  - a hierarchical structure consisting of six levels.
  - The top level defines four realms of the biosphere: marine (M); freshwaters and saline wetlands (F); terrestrial (T); and subterranean (S).
  - 2nd level consists of 25 biomes
  - The third EFG level of the classification (see Annex 3.2), describes functionally distinctive groups of ecosystems within a biome

Realms	RLE Biomes
Terrestrial	T1 Tropical–sub-tropical forests
	T2 Temperate–boreal forests & woodlands
	T3 Shrublands & shrub-dominated woodlands
	T4 Savannas and grasslands
	T5 Deserts and semi-deserts
	T6 Polar/alpine (cryogenic)
	T7 Intensive anthropogenic terrestrial systems*
Freshwater	F1 Rivers and streams
	F2 Lakes
	F3 Artificial Wetlands*
Marine	M1 Subtidal shelfs and shelf-breaks
	M2 Pelagic ocean waters
	M3 Deep sea floors
	M4 Artificial marine systems*
Transitional	FT1 Palustrine wetlands
	FM1 Transitional waters
	MT1 Shoreline systems
	MT2 Coastal vegetation
	MT3 Artificial shorelines*
	MFT1 Brackish tidal systems

Ecosystem extent account

Realms	RLE Biomes
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	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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Suggested issues on ecosystem extent to be further explored

- Alignment of the ecosystem extent classification in GEP and SEEA EEA
- Possible testing of SEEA EEA ecosystem extent classification in GEP work in China
- Discussion on dataset and source- Land use/cover maps/earth observation data for GEP

Ecosystem condition typology

- ***Ecosystem condition is the quality of an ecosystem measured in terms of its abiotic and biotic characteristics across temporal and spatial scales***

Ecosystem condition	ECT groups	ECT classes
	Abiotic ecosystem characteristics	1. Physical state characteristics (including soil structure, water availability)
		2. Chemical state characteristics (including soil nutrient levels, water quality, air pollutant concentrations)
	Biotic ecosystem characteristics	3. Compositional state characteristics (including species-based indicators)
		4. Structural state characteristics (including vegetation, biomass, food chains)
		5. Functional state characteristics (including ecosystem processes, disturbance regimes)
	Landscape and seascape level characteristics	6. Overall landscape characteristics (including landscape diversity)
		7. Ecosystem-specific landscape characteristics (including forest connectivity, fragmentation, embedded semi-natural elements in farmland)

- There are three condition accounts describing respectively condition variables, condition indicators and condition indexes build progressively to provide a comprehensive picture of ecosystem condition across multiple ET within an EAA.

Ecosystem condition variable account

Class	Variables	Ecosystem types					
		Ecosystem type 1			Ecosystem type 2		
			Opening condition	Closing condition		Opening condition	Closing condition
Class 1	Variable 1						
	Variable 2						
	Variable 3						
Class 2	Variable 4						
	Variable 5						
	Variable 6						

Ecosystem condition indicator account

The ecosystem condition indicator account builds directly on the ecosystem condition variable account by introducing reference levels for each variable.

ECT Class	Indicators	Ecosystem types					
		Ecosystem type 1			Ecosystem type 2		
		Reference level value	Opening condition	Closing condition	Reference level value	Opening condition	Closing condition
Class 1	Indicator 1						
	Indicator 2						
	Indicator 3						
Class 2	Indicator 4						
	Indicator 5						
	Indicator 6						

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Ecosystem condition index account

The ecosystem condition index account builds directly on the condition indicator account to record the aggregation of ecosystem condition indicators

ECT Class	Index	Ecosystem types							
		Ecosystem type 1 Natural reference condition =				Ecosystem type 2 Anthropocentric reference condition =			
		Reference level index value		Opening condition	Closing condition	Reference level index value		Opening condition	Closing condition
Class 1	Indicator 1	100				75			
	Indicator 2	100				75			
	Indicator 3	100				75			
	Sub index 1	100				75			
Class 2	Indicator 4	100				75			
	Indicator 5	100				75			
	Indicator 6	100				75			
	Sub index 2	100				75			
Ecological condition index		100				75			

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Suggested issues on ecosystem condition to be further explored

- Discussion of the concept of ecological assets index in GEP and its relevance/alignment in SEEA EEA
- Discussion of the quality index in GEP and its relevance /alignment with the condition indicator in SEEA EEA
- Possible testing of SEEA EEA ecosystem condition indicators in GEP work in China

Ecosystem services accounting

- Focus remains on recording in the accounts the flows of final ecosystem services from ecosystems to people (including businesses) where these flows are considered as contributions to the benefits that people enjoy. The challenges lie in:
  - applying this model consistently across all ecosystem services,
  - finding alignment in the use of terms (such as services and benefits) and
  - consistent descriptions and boundaries for all ecosystem services that, in turn, can support consistent choices in measurement and valuation
- To work through the issues in a consistent way, a tool referred to as a "logic chain" has been applied. The intent is to provide a standard framing for recording information relevant to the description and measurement of individual ecosystem services.

Ecosystem asset	Enabling factors and human inputs	Ecosystem service	Benefit
Forest	Atmospheric pollution Local population	Air filtration – reduction in tonnes of air pollutants	Reduced concentration of air-borne pollutants leading to reduced pollutant exposure

Basic ES Supply and Use account

- A general issue that emerges in considering appropriate treatments about ecosystem services and benefits is reaching a common understanding of recording the supply and use of ecosystem services following standard national accounting principles.
- A full supply and use recording can be a very useful tool for explaining appropriate treatments, especially for resolving concerns about double counting.
- Proposed that the scope of ecosystem services be extended beyond final ecosystem services to include flows of ecosystem services which are part of an observable and material chain of flows (intermediate services) to a final ecosystem service and associated benefits.

	Economic unit (selected)			Ecosystem asset (selected types)		
	Farmer	Government	Households	Forest	Farm land	River
SUPPLY						
ES #1: Biomass provision for melons (tonnes)					80	
ES #2: Air filtration (tonnes pollutants)				5		
IS: Pollination (pollinator visits)				2000		
USE						
ES #1: Biomass provision for melons (tonnes)	80					
ES #2: Air filtration (tonnes pollutants)			5			
IS: Pollination (pollinator visits)					2000	

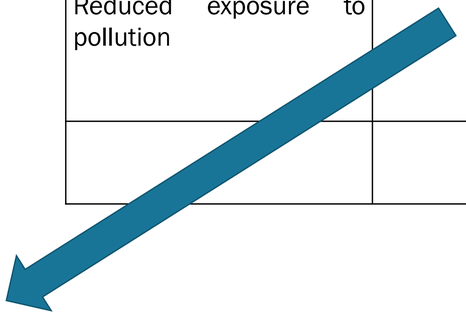
Accounting for benefits and recording the use of ecosystem services

SNA benefits

	Supply by:	**Use by:**
Ecosystem service: Timber provision	Ecosystem asset: Forest	Economic unit: Forestry company
SNA benefit: Logs	Economic unit: Forestry company	Economic unit: Paper mill

Non-SNA benefits

	Supply by:	Use by:
Ecosystem service: Air filtration	Ecosystem asset: Forest	Economic unit: ??
Non-SNA benefit: Reduced exposure to pollution	Economic unit: ??	Economic unit: Households



Three options proposed:

(i) Treat by convention the economic unit using the ecosystem service and supplying the non-SNA benefit as the same as the unit that receives the non-SNA benefit; in this example households.

(ii) Consider that a prime motivation for the accounts is to support ecosystem managers make trade-offs in the landscape and hence record the user of ecosystem services to be the relevant ecosystem manager (assume in this case the forest manager).

(iii) Consider that, by convention, all non-SNA benefits are public goods and hence record the associated ecosystem services as being used collectively by general government.

User and beneficiary

- Proposed that a change in language is adopted in the revised SEEA EEA to specify that:
  - The term **user** relates to those economic units who directly receive the ecosystem service – i.e. they are at the other end of the transaction with the ecosystem asset.
  - The term **beneficiary** relates to those economic units who consume or receive benefits (both SNA and non-SNA benefits).
  - In the description of both users and beneficiaries it will be relevant to consider their location, for example in terms of being at local, regional, national or global scale. This will extend to consideration of imports and exports of ecosystem services and associated benefits.

	Supply by:	Use by:
Ecosystem service: Biomass provision	Ecosystem asset: Farm land	Economic unit: Farm
SNA benefit: Wheat	Economic unit: Farm	Economic unit: Flour producer
(additional steps in the supply chain)		
Final good: Bread	Economic unit: Baker	Economic unit: Household

Initial reference list of ecosystem services

Provisioning services	
Biomass provision	Many types of ecosystem services might be identified within this single ES primarily by type of biomass (e.g. crop, timber, etc). Distinctions based on type of use are not proposed (e.g. wrt nutrition, energy etc). Consideration may be given to identifying the management of the growth of the biomass (cultivated or natural). Decisions here will rely, in part, on decisions taken on the conceptual treatment and measurement boundaries of biomass provision (e.g. concerning the treatment of livestock and aquaculture)
Water supply	Included here noting this is the subject of ongoing discussion wrt the boundary between ecosystem services and abiotic flows.
Cultural services (tentative proposals pending further discussion	
Recreation related services	Label subject to ongoing discussion as part of broader discussion of cultural services and the appropriate words to describe the contribution of the ecosystem
Amenity services / aesthetic appreciation	
Education, scientific and research services	
Spiritual / religious services	
Conservation of valued species	
Contributions to non-use values	The agreed scope of ecosystem accounting will be an important factor in determining the inclusion and labelling of this service. Connections to option, existence and bequest values

Regulating services	
Global climate regulation, carbon sequestration & carbon storage	These potential ecosystem services and the connections among them are the subject of ongoing discussion
Air filtration	
Soil retention	Agreement is needed on the concept and the label. Alternatives/complements include soil erosion prevention, soil stabilisation, control/regulation of erosion rates. Potential distinction needed between keeping soil in a particular location and trapping soil as it travels down a slope (link here to water purification).
Water purification	Agreement needed on the constituent services since a range may be identified. These include sediment retention (link to soil retention), nutrient retention and absorption, removal of contaminants. To the extent that separate services are identified these would be added to the list
Water regulation of base flows	Encompassing water absorption and release
Flooding and tidal surge mitigation	
Other storm mitigation	
Noise attenuation	
Pollination	
Pest control	
Local (micro and meso) climate regulation	
Nursery population maintenance	Including associated habitats

Boundary with respect to abiotic flows

- A range of environmental flows that sit on the border between biotic and abiotic.
  - Water supply, relating to the abstraction of water
  - Flows related to the generation of energy (e.g. renewable energy, etc.)
  - Flows related to the use of ecosystems for undertaking economic and other activities (e.g. navigation, recreational services, etc.)
  - Flows related to abiotic components of ecosystems in the supply of regulating services (e.g. coastal protection services, water purification services from bare soil, etc.)
  - Flows related to residuals from economic activity (e.g. ecosystem as providing mediation services for pollutants)
  - Flows related to the use of the atmosphere (e.g. atmosphere as a sink of greenhouse gases, etc.)

Suggested issues on ecosystem services to be further explored

- Discussion of concept of services, benefits and use and beneficiary and their measurement approach for services described in GEP framework
- Suggested services to be discussed
  - Biomass provisioning services
  - Water-related services
  - Carbon-related services
  - Cultural services
- Treatment of abiotic flows in the GEP framework
- Discussion of the valuation and aggregation methodology

Some thoughts on the next step in aligning SEEA and GEP for the natural capital accounting work in China and the SEEA EEA revision process

- Development of common documents, communication message and presentation slides between GEP and SEEA
- Development of common guidance documents of natural capital accounting in China
- Development of a common message for the CBD CoP 15
- Explore possible future pilot testing work
  - > Testing of SEEA ecosystem extent reference classification
  - > Testing of the SEEA ecosystem condition indicators
- Explore linkage to policy in China
  - > Ecological red lines
  - > Eco-compensation
  - > Assessment of the performance of government officials
- Explore option to incorporate GEP into the SEEA EEA revision process
- Seeking contribution from CAS and NBS to the SEEA EEA revision group