System of Environmental Economic Accounting

SEEA and Post-2020 GBF: Using SEEA to derive **indicators on nature's contribution to people (Goal B and Target 9-11)** *Methodology and metadata*

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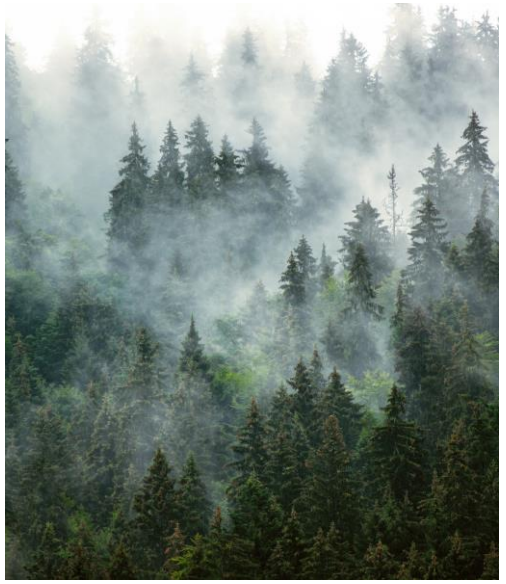
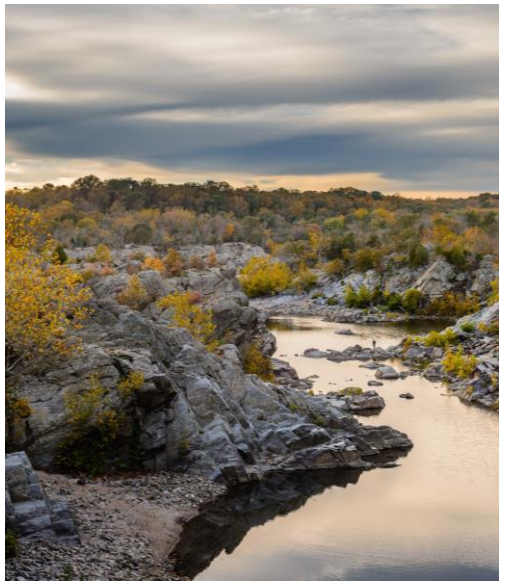
Outline

- Context and recap on SEEA
- SEEA EA and GBF (Goal B)
  - > Ecosystem accounting
  - > Key concepts
  - > Ecosystem Services Flow Accounts
  - > Deriving indicators for Goal B and Targets 9-11
- Measurement
- EU Example
- Conclusions

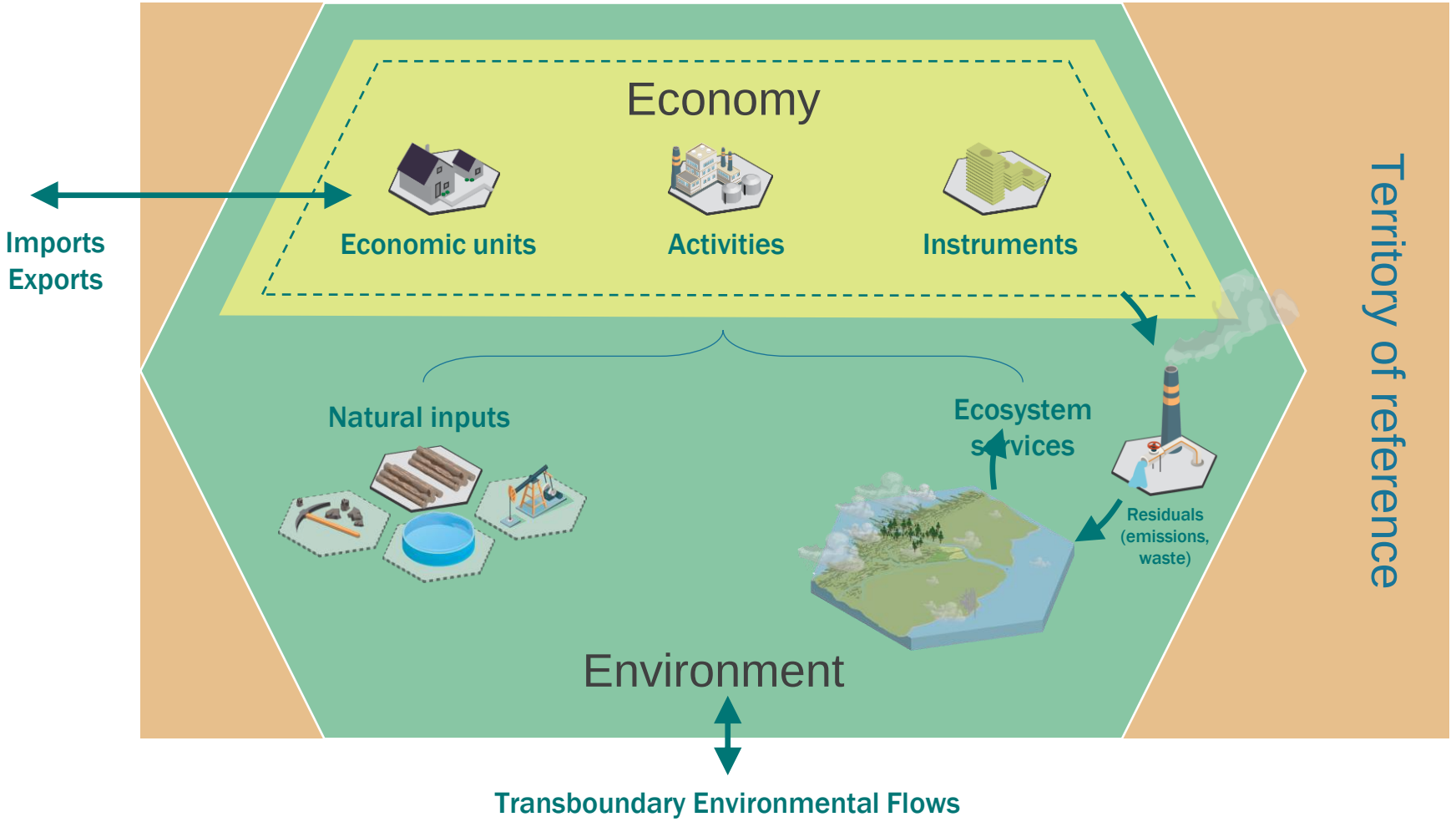
The Need

- Our economy and well-being crucially depends on nature
- But headline indicators like GDP do not capture these vital contributions.
- As a result, decision makers don't have access to key information necessary to effectively pursue and track sustainable development.
- The System of Environmental Economic Accounts (SEEA) fills that gap.
- SEEA integrates information on the economy and the environment showing their interrelationship complementing the System of National Accounts



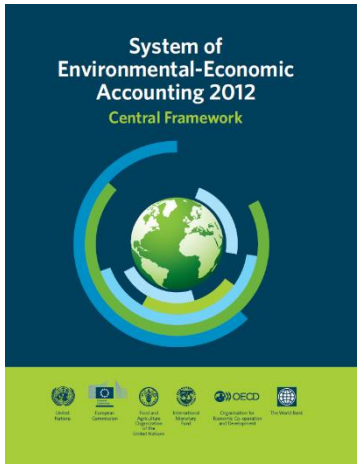


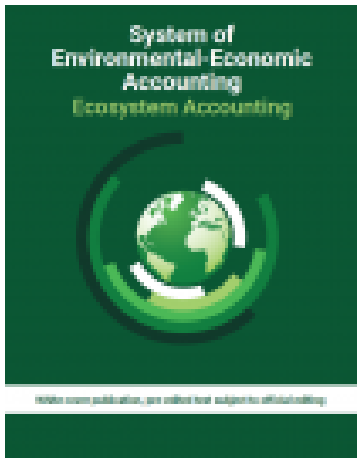
SEEA Conceptual Framework



Standardisation of measurement of the environment

- SEEA Central Framework adopted as statistical standard through an intergovernmental process (ECOSOC / United Nations Statistical Commission) in 2013
- SEEA Ecosystem Accounting discussed in March 2021
  - > chapters 1-7 describing the accounting framework and the physical accounts adopted as an international statistical standard
  - > chapters 8-11 recognized as describing internationally recognized statistical principles and recommendations for the valuation of ecosystem services and assets in a context that is coherent with the concepts of System of National Accounts
- SEEA status of implementation 2020:
  - > 89 countries implementing the SEEA Central Framework
  - > 34 countries compiling SEEA Ecosystem Accounts
  - > 27 countries planning to start implementation of the SEEA





SBSTTA-24

- The Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) at its recent meeting in May 2021 :
  - > *"Recognizes* the value of aligning national monitoring with the **United Nations System of Environmental-Economic Accounting statistical standard** in order to mainstream biodiversity in national statistical systems and to strengthen national information and monitoring systems and reporting"

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Source: Non-Paper on SBSTTA-24 Agenda item 3
https://www.cbd.int/doc/c/13e9/73d6/0de346d7d3433024a3ef1441/sbstta-24-nonpaper-item-03-v1-en.pdf

Goal B (CBD/WG2020/3/3/Add.1 - 11 July 2021)

Proposed goal or target	Proposed indicators	Proposed disaggregation	Existing national reporting/ validation process	Methodological basis	Global data set for national disaggregation
Goal B. Nature's contributions to people have been valued, maintained or enhanced through conservation and sustainable use supporting the global development agenda for the benefit of all.	B.0.1 National environmental economic accounts of ecosystem services*	By ecosystem type and type of service		UN System of Environmental Economic Accounting: https://seea.un.org/ecosystem-accounting. This indicator would be measured in physical and monetary terms and links with the concept of a Gross Ecosystem Product.	Near ready**

•[1] Indicators marked with an asterisk "*" are not yet developed.
[2] Two asterisks (**) indicate that additional information will be provided for the third meeting of the Working Group on the Post-2020 Global Biodiversity Framework in an information document.

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Targets 9 - 11

Target 9. Ensure benefits, including nutrition, food security, medicines, and livelihoods for people especially for the most vulnerable through sustainable management of wild terrestrial, freshwater and marine species and protecting customary sustainable use by indigenous peoples and local communities.	9.0.1 National environmental-economic accounts of benefits from the use of **wild species**	SEEA: https://seea.un.org/ecosystem-accounting (disaggregation of accounting information from Goal B)	Near ready **
Target 11. Maintain and enhance nature's contributions to regulation of air quality, quality and quantity of water, and protection from hazards and extreme events for all people	11.0.1 National environmental-economic accounts of **regulation of air quality, quality and quantity of water, and protection from hazards and extreme events for all people,** from ecosystems	SEEA: https://seea.un.org/ecosystem-accounting (disaggregation of accounting information from Goal B)	Near ready**

Ecosystem accounting approach

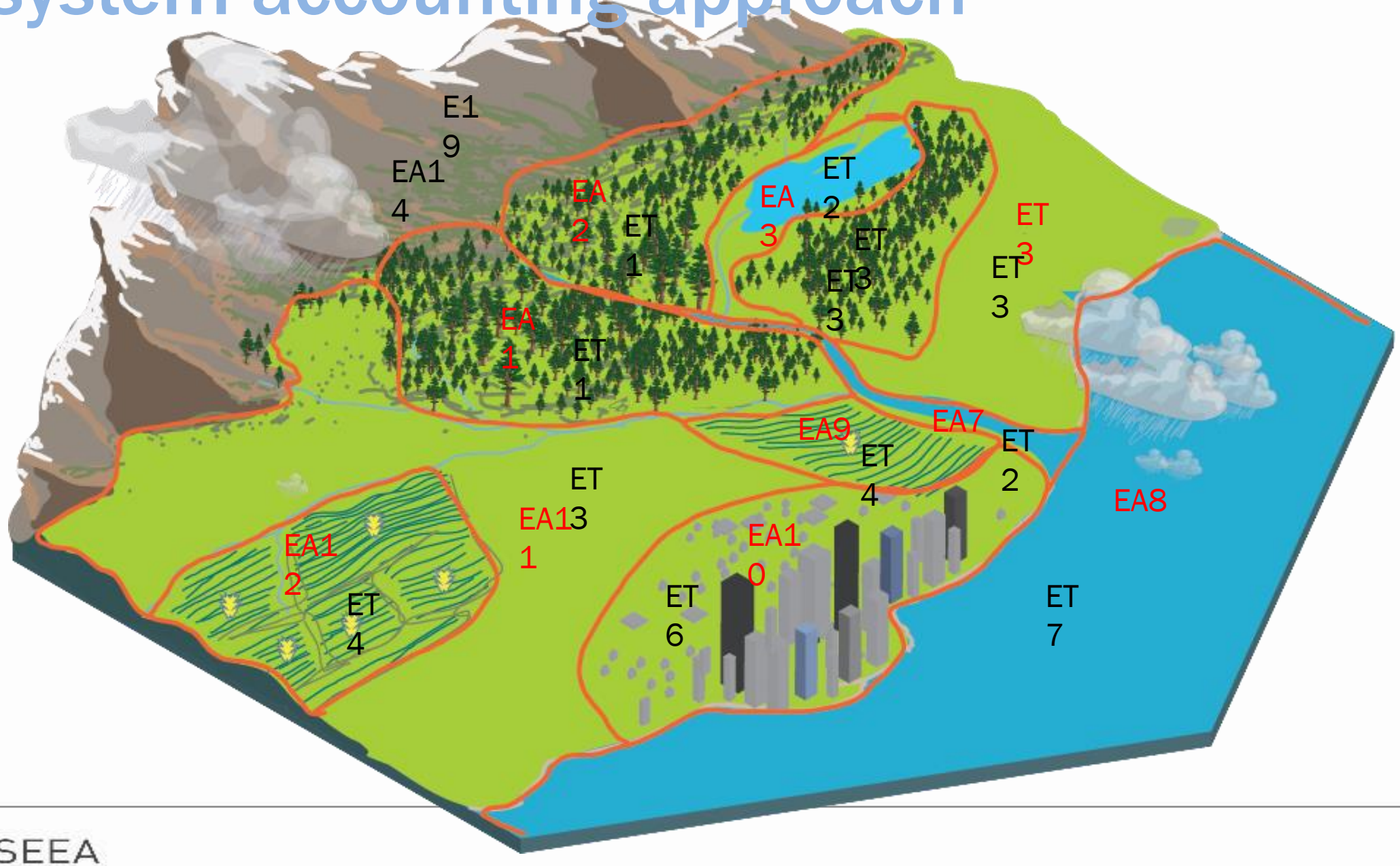

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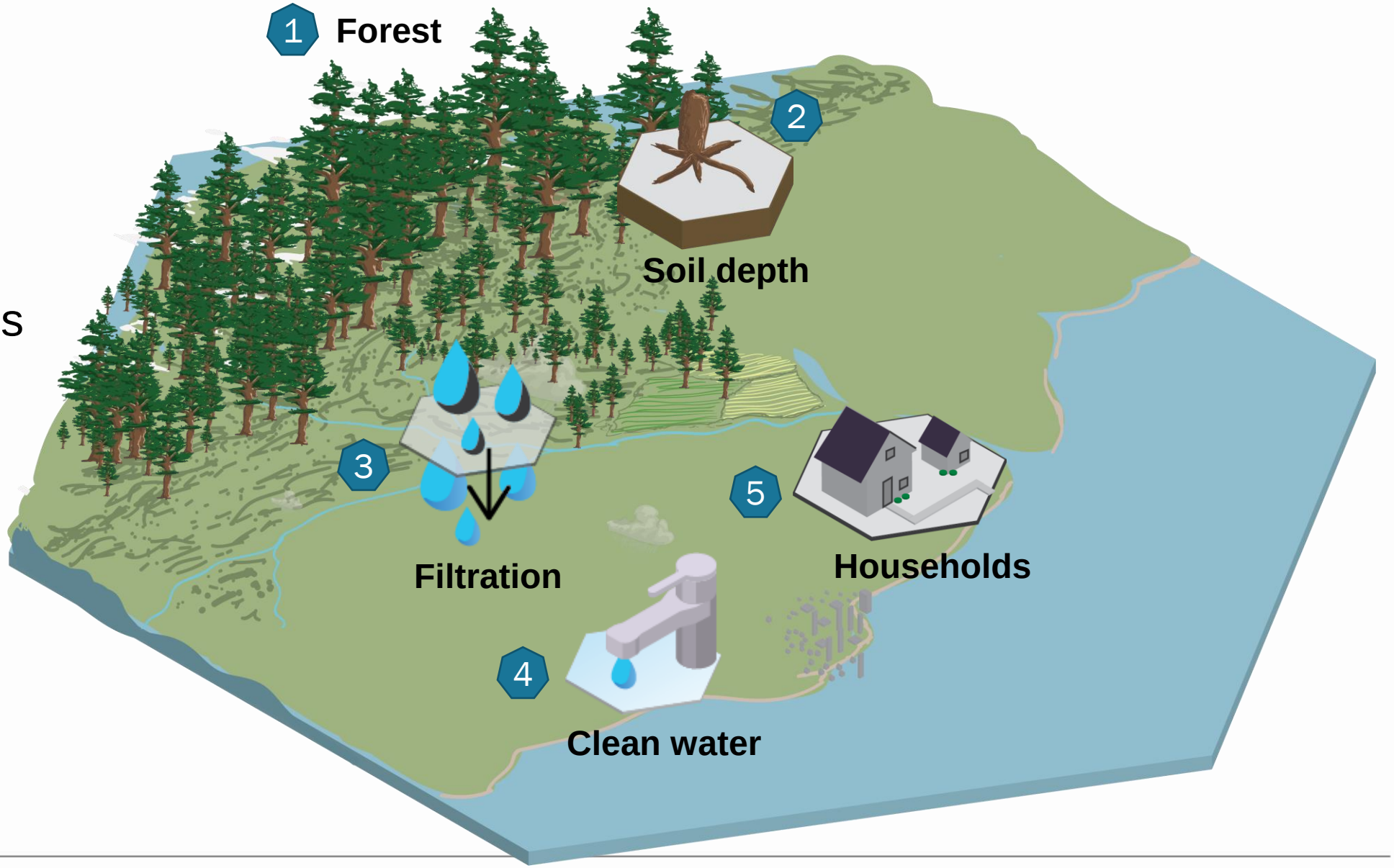
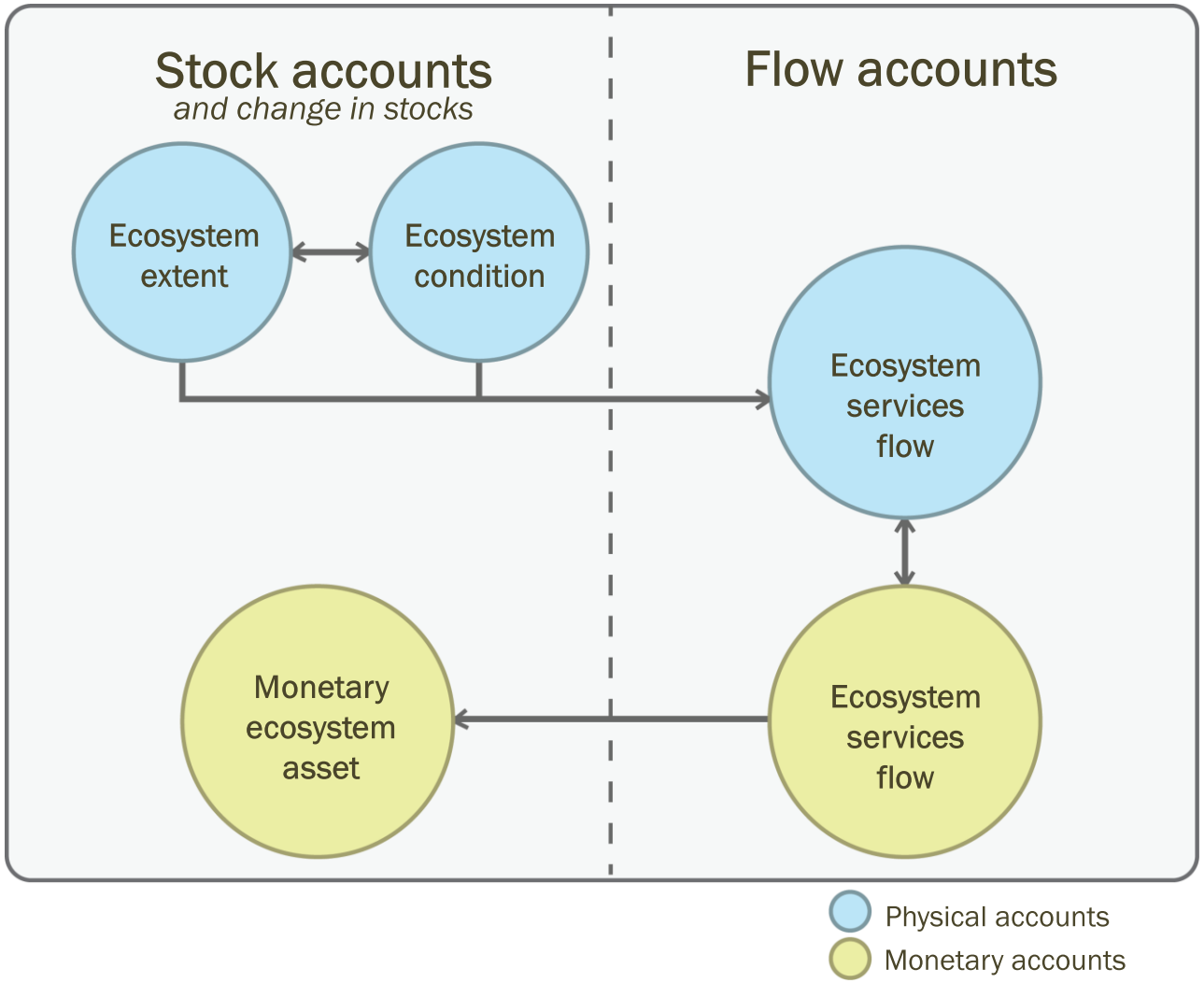
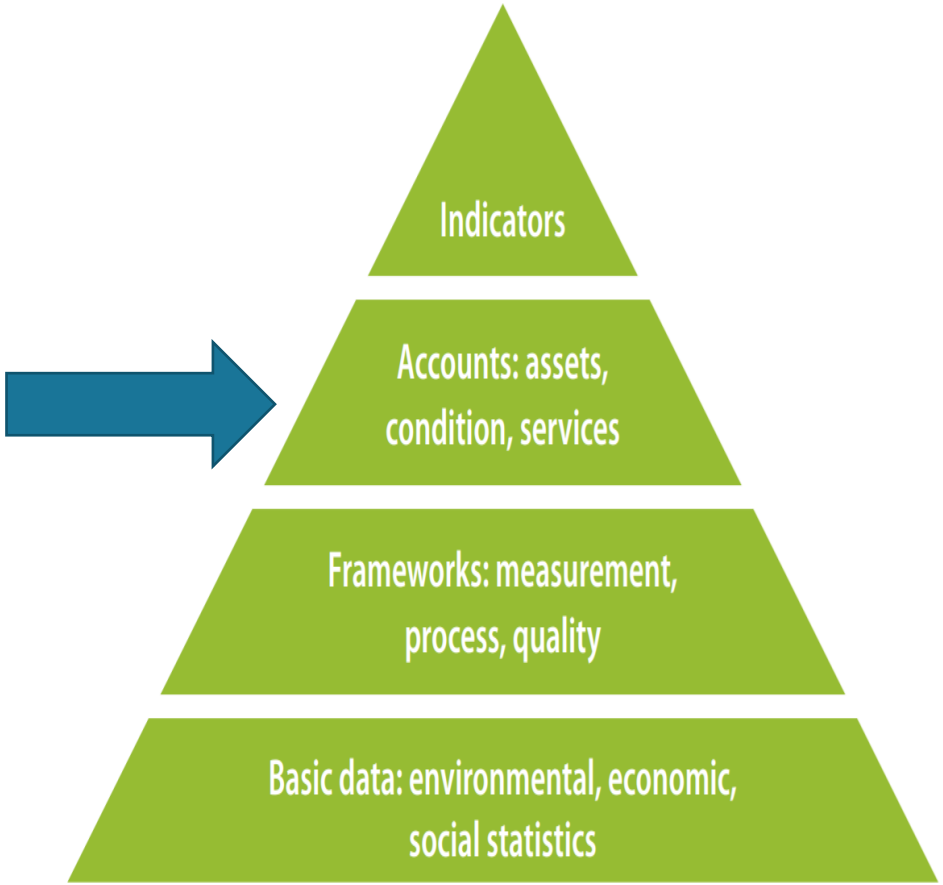
Illustration

1. Asset
2. Condition
3. Service
4. Benefit
5. Beneficiaries



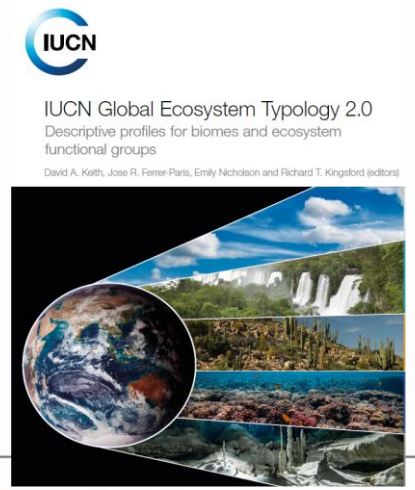
SEEA EA - Core Accounts

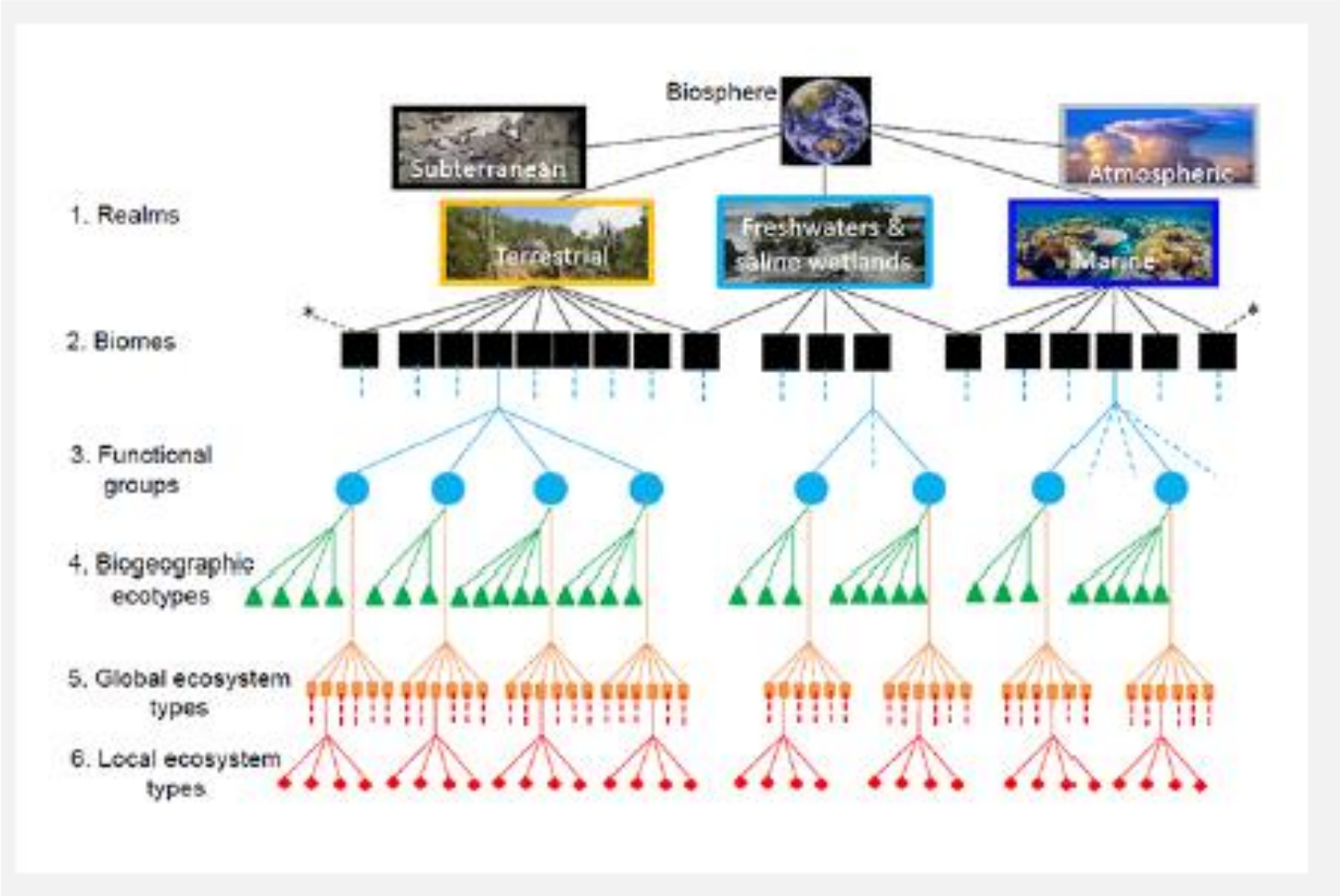




Ecosystem types

- SEEA EA endorses the IUCN GET as international reference classification
- 6 levels – accounts are compiled at level of the Ecosystem Functional Groups (e.g. tropical lowland rainforest)





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Ecosystem services

- **Ecosystem services (ES)** are the contributions of ecosystems to the benefits that are used in economic and other human activity.
  - > Distinction between final (the user of the service is an economic unit – i.e., business, government or household) and intermediate ecosystem services (user is another ecosystem e.g pollination)
  - > Logic chain per ES

Table 6.2: Generic logic chain (with example of air filtration services)

Ecosystem Service	Common ecosystem type/s	Factors determining supply		Factors determining use	Potential physical metric(s) for the ecosystem service	Benefits	Main users and beneficiaries
		Ecological	Societal				
Air filtration services	Forest and woodland	Type and condition of vegetation, especially Functional State (e.g. Leaf Area Index) and Chemical State (e.g. ambient pollutant concentration)	Ecosystem management; location type and volume of released air pollutants	Behavioural responses; and location and number of people and buildings affected by pollution	Tonnes of pollutants absorbed by type of pollutant (e.g., PM10; PM2.5)	Reduced concentrations of air pollutants providing improved health outcomes and reduced damage to buildings (non-SNA benefit)	Households; businesses (through reduced damage to buildings)

Reference list of ecosystem services

ECOSYSTEM SERVICE		DESCRIPTION
Provisioning services		
Biomass provisioning services	Crop provisioning services *	Crop provisioning services are the ecosystem contributions to the growth of cultivated plants that are harvested by economic units for various uses including food and fibre production, fodder and energy. This is a final ecosystem service.
	Grazed biomass provisioning services *	Grazed biomass provisioning services are the ecosystem contributions to the growth of grazed biomass that is an input to the growth of cultivated livestock. This service excludes the ecosystem contributions to the growth of crops used to produce fodder for livestock (e.g., hay, soyameal). These contributions are included under crop provisioning services. This is a final ecosystem service but may be intermediate to livestock provisioning services.
	Livestock provisioning services *	Livestock provisioning services are the ecosystem contributions to the growth of cultivated livestock and livestock products (e.g., meat, milk, eggs, wool, leather), that are used by economic units for various uses, primarily food production. This is a final ecosystem service. No distinct livestock provisioning services to be recorded if grazed biomass provisioning services are recorded as a final ecosystem service.
	Aquaculture provisioning services	Aquaculture provisioning services are the ecosystem contributions to the growth of animals and plants (e.g. fish, shellfish, seaweed) in aquaculture facilities that are harvested by economic units for various uses. This is a final ecosystem service.
	Wood provisioning services	Wood provisioning services are the ecosystem contributions to the growth of trees and other woody biomass in both cultivated (plantation) and uncultivated production contexts that are harvested by economic units for various uses including timber production and energy. This service excludes contributions to non-wood forest products. This is a final ecosystem service.
	Wild fish and other natural aquatic biomass provisioning services	Wild fish and other natural aquatic biomass provisioning services are the ecosystem contributions to the growth of fish and other aquatic biomass that are captured in uncultivated production contexts by economic units for various uses, primarily food production. This is a final ecosystem service
	Wild animals, plants and other biomass provisioning services	Wild animals, plants and other biomass provisioning services are the ecosystem contributions to the growth of wild animals, plants and other biomass that are captured and harvested in uncultivated production contexts by economic units for various uses. The scope includes non-wood forest products (NWFP) and services related to hunting, trapping and bio-prospecting activities; but excludes wild fish and other natural aquatic biomass (included in previous class). This is a final ecosystem service
Genetic material services		Genetic material services are the ecosystem contributions from all biota (including seed, spore or gamete production) that are used by economic units, for example (i) to develop new animal and plant breeds; (ii) in gene synthesis; or (iii) in product development directly using genetic material. This is most commonly recorded as an intermediate service to biomass provisioning.
Water supply *		Water supply services reflect the combined ecosystem contributions of water flow regulation, water purification, and other ecosystem services to the supply of water of appropriate quality to users for various uses including household consumption. This is a final ecosystem service.
Other provisioning services		

Target 9

Target 11

Regulating and maintenance services		
Global climate regulation services		Global climate regulation services are the ecosystem contributions to the regulation of the chemical composition of the atmosphere and oceans that affect global climate through the accumulation and retention of carbon and other GHG (e.g., methane) in ecosystems and the ability of ecosystems to remove (sequester) carbon from the atmosphere. This is a final ecosystem service.
Rainfall pattern regulation services (at sub-continental scale)		Rainfall pattern regulation services are the ecosystem contributions of vegetation, in particular forests, in maintaining rainfall patterns through evapotranspiration at the sub-continental scale. Forests and other vegetation recycle moisture back to the atmosphere where it is available for the generation of rainfall. Rainfall in interior parts of continents fully depends upon this recycling. This may be a final or intermediate service.
Local (micro and meso) climate regulation services		Local climate regulation services are the ecosystem contributions to the regulation of ambient atmospheric conditions (including micro and mesoscale climates) through the presence of vegetation that improves the living conditions for people and supports economic production. Examples include the evaporative cooling provided by urban trees ('green space'), the role of urban water bodies ('blue space') and the contribution of trees in providing shade for humans and livestock. This may be a final or intermediate service.
Air filtration services		Air filtration services are the ecosystem contributions to the filtering of air-borne pollutants through the deposition, uptake, fixing and storage of pollutants by ecosystem components, particularly plants, that mitigates the harmful effects of the pollutants. This is most commonly a final ecosystem service.
Soil quality regulation services		Soil quality regulation services are the ecosystem contributions to the decomposition of organic and inorganic materials and to the fertility and characteristics of soils, e.g., for input to biomass production. This is most commonly recorded as an intermediate service.
Soil and sediment retention services	Soil erosion control services	Soil erosion control services are the ecosystem contributions, particularly the stabilising effects of vegetation, that reduce the loss of soil (and sediment) and support use of the environment (e.g., agricultural activity, water supply). This is may be recorded as a final or intermediate service.
	Landslide mitigation services	Landslide mitigation services are the ecosystem contributions, particularly the stabilising effects of vegetation, that mitigates or prevents potential damage to human health and safety and damaging effects to buildings and infrastructure that arise from the mass movement (wasting) of soil, rock and snow. This is a final ecosystem service.
Solid waste remediation services		Solid waste remediation services are the ecosystem contributions to the transformation of organic or inorganic substances, through the action of micro-organisms, algae, plants and animals that mitigates their harmful effects. This is may be recorded as a final or intermediate service.
Water purification services (water quality regulation)	Retention and breakdown of nutrients	Water purification services are the ecosystem contributions to the restoration and maintenance of the chemical condition of surface water and groundwater bodies through the breakdown or removal of nutrients and other pollutants by ecosystem components that mitigate the harmful effects of the pollutants on human use or health. This may be recorded as a final or intermediate ecosystem service.
	Retention and breakdown of other pollutants	
Water flow regulation services	Baseline flow maintenance services	Water regulation services are the ecosystem contributions to the regulation of river flows and groundwater and lake water tables. They are derived from the ability of ecosystems to absorb and store water, and gradually release water during dry seasons or periods through evapotranspiration and hence secure a regular flow of water. This may be recorded as a final or intermediate ecosystem service.
	Peak flow mitigation services	Water regulation services are the ecosystem contributions to the regulation of river flows and groundwater and lake water tables. They are derived from the ability of ecosystems to absorb and store water, and hence mitigate the effects of flood and other extreme water-related events. Peak flow mitigation services will be supplied together with river flood mitigation services in providing the benefit of flood protection. This is a final ecosystem service.
Flood control services	Coastal protection services	Coastal protection services are the ecosystem contributions of linear elements in the seascape, for instance coral reefs, sand banks, dunes or mangrove ecosystems along the shore, in protecting the shore and thus mitigating the impacts of tidal surges or storms on local communities. This is a final ecosystem service.
	River flood mitigation services	River flood mitigation services are the ecosystem contributions of riparian vegetation which provides structure and a physical barrier to high water levels and thus mitigates the impacts of floods on local communities. River flood mitigation services will be supplied together with peak flow mitigation services in providing the benefit of flood protection. This is a final ecosystem service.
Storm mitigation services		Storm mitigation services are the ecosystem contributions of vegetation including linear elements, in mitigating the impacts of wind, sand and other storms (other than water related events) on local communities. This is a final ecosystem service.
Noise attenuation services		Noise attenuation services are the ecosystem contributions to the reduction in the impact of noise on people that mitigates its harmful or stressful effects. This is most commonly a final ecosystem service.
Pollination services		Pollination services are the ecosystem contributions by wild pollinators to the fertilization of crops that maintains or increases the abundance and/or diversity of other species that economic units use or enjoy. This may be recorded as a final or intermediate service.
Biological control services	Pest control services	Biological control services are the ecosystem contributions to the reduction in the incidence of species that may prevent or reduce the effects of pests on biomass production processes or other economic and human activity. This is may be recorded as a final or intermediate service.
	Disease control services	Disease control services are the ecosystem contributions to the reduction in the incidence of species that may prevent or reduce the effects of species on human health. This is most commonly a final ecosystem service.
Nursery population and habitat maintenance services		Nursery population and habitat maintenance services are the ecosystem contributions necessary for sustaining populations of species that economic units ultimately use or enjoy either through the maintenance of habitats (e.g., for nurseries or migration) or the protection of natural gene pools. This service is an intermediate service and may input to a number of different final ecosystem services including biomass provision and recreation-related services.
Other regulating and maintenance services		

Target 11

Cultural services		
Recreation-related services		Recreation-related services are the ecosystem contributions, in particular through the biophysical characteristics and qualities of ecosystems, that enable people to use and enjoy the environment through direct, in-situ, physical and experiential interactions with the environment. This includes services to both locals and non-locals (i.e. visitors, including tourists). Recreation-related services may also be supplied to those undertaking recreational fishing and hunting. This is a final ecosystem service.
Visual amenity services *		Visual amenity services are the ecosystem contributions to local living conditions, in particular through the biophysical characteristics and qualities of ecosystems that provide sensory benefits, especially visual. This service combines with other ecosystem services, including recreation-related services and noise attenuation services to underpin amenity values. This is a final ecosystem service.
Education, scientific and research services		Education, scientific and research services are the ecosystem contributions, in particular through the biophysical characteristics and qualities of ecosystems, that enable people to use the environment through intellectual interactions with the environment. This is a final ecosystem service.
Spiritual, artistic and symbolic services		Spiritual artistic and symbolic services are the ecosystem contributions, in particular through the biophysical characteristics and qualities of ecosystems, that are recognised by people for their cultural, historical, aesthetic, sacred or religious significance. These services may underpin people's cultural identity and may inspire people to express themselves through various artistic media. This is a final ecosystem service.
Other cultural services		

Crosswalk (ES – CICES - NCP – MA - TEEB)

SEEA	SEEA (Subtypes)	SEEA Code	CICES (v5.1) Class	CICES Code	IPBES	IPBES Reporting Categories of Nature's Contribution to People	MA
Water supply		1.9	Regulation of the chemical condition of freshwaters by living processes	2.2.5.1	Regulation of freshwater and coastal water quality	7	Fresh water
			Surface water for drinking	4.2.1.1	Not assigned		No equivalent
			Surface water used as a material (non-drinking purposes)	4.2.1.2	Not assigned		No equivalent
			Freshwater surface water used as an energy source	4.2.1.3	Not assigned		No equivalent
			Coastal and marine water used as energy source	4.2.1.4	Not assigned		No equivalent
Global climate regulation services		2.1	Regulation of chemical composition of atmosphere and oceans	2.2.6.1	Regulation of climate	4	Atmospheric / Climate regulation
Rainfall pattern regulation services (at sub-continental scale)		2.2	Hydrological cycle and water flow regulation (Including flood control, and coastal protection)	2.2.1.3	Regulation of freshwater quantity, location and timing	6	Water regulation

Ecosystem services flow account

Table 7.3: Basic Ecosystem services physical supply and use account #2

	Unit of measure	Economic unit (selected)			Ecosystem asset (selected types)		
		Farmer	Government	Households	Forest	Farmland	Grassland
SUPPLY							
ES #1: Biomass provisioning services (rice)	Tonnes					100	
ES #2: Air filtration services (PM2.5)	Tonnes				50		
USE							
ES #1: Biomass provisioning services (rice)	Tonnes	100					
ES #2: Air filtration services (PM2.5)	Tonnes			50			

Note: Grey cells indicate not applicable

Source: SEEA EA

Ecosystem services flow account

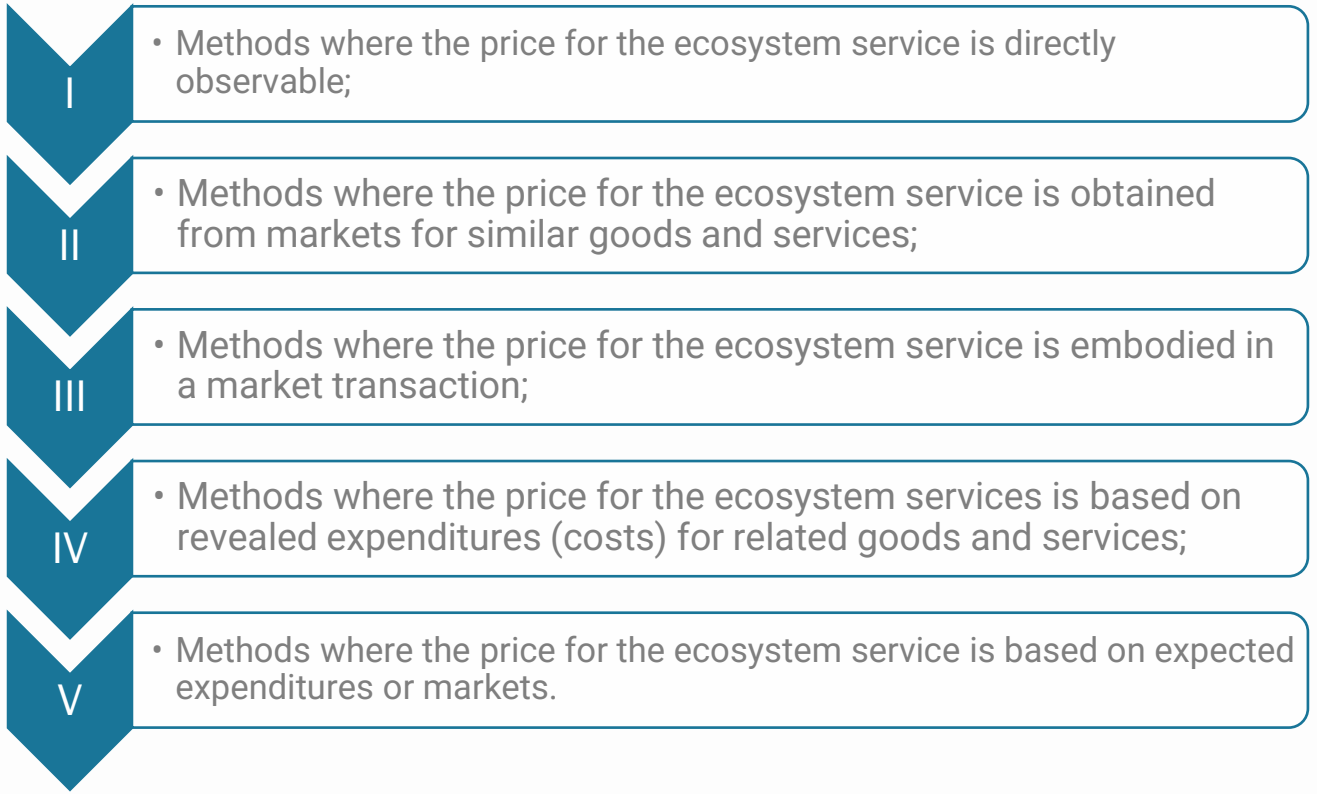
Ecosystem types

Ecosystem services

				Selected ecosystem types (based on Level 3 - EFG of the IUCN Global Ecosystem Typology)																		
				Terrestrial												Freshwater			Marine			
				T1 Tropical-subtropical forests				T2 Temperate-boreal forests and woodlands				...		T7		F1	...	FM1	M1	...	MFT1	
SUPPLY			UNITS OF MEASURE	Tropical-subtropical lowland rainforests	Tropical-subtropical dry forests and scrubs	Tropical-subtropical montane rainforests	Tropical heath forests	Boreal and temperate high montane forests and woodlands	Deciduous temperate forests	...	Temperate pyric sclerophyll forests and woodlands	...	...	...	Derivied semi-natural pastures and old fields	Permanent upland streams	...	Intermittently closed and open lakes and lagoons	Seagrass meadows	...	Coastal saltmarshes and reedbeds	Total Supply resident ecosystem assets
				T1.1	T1.2	T1.3	T1.4	T2.1	T2.2	...	T2.6	...	...	...	T7.5	F1.1	...	FM1.3	M1.1	...	MFT1.3	
Selected ecosystem services (reference list)																						
Provisioning services																						
	Biomass provisioning	Crop provisioning																				
		Timber provisioning																				
		...																				
	Water supply																					
	...																					
Regulating and maintenance services																						
	Global climate regulation services																					
	Air filtration services																					
	Soil erosion control services																					
	...																					
Cultural services																						
	Recreation-related services																					
	...																					

Valuation (monetization)

- **Make nature count in (macro) economic planning**
  - > Make value of ES visible
  - > Estimate cost of degradation and enhancement (restoration)
- **Consistent with principles of the System of National Accounts (e.g. GDP)**
  - > **Exchange values:** the values at which goods, services, labour or assets are in fact exchanged or else could be exchanged for cash
  - > **Preference order** for valuing ecosystem services

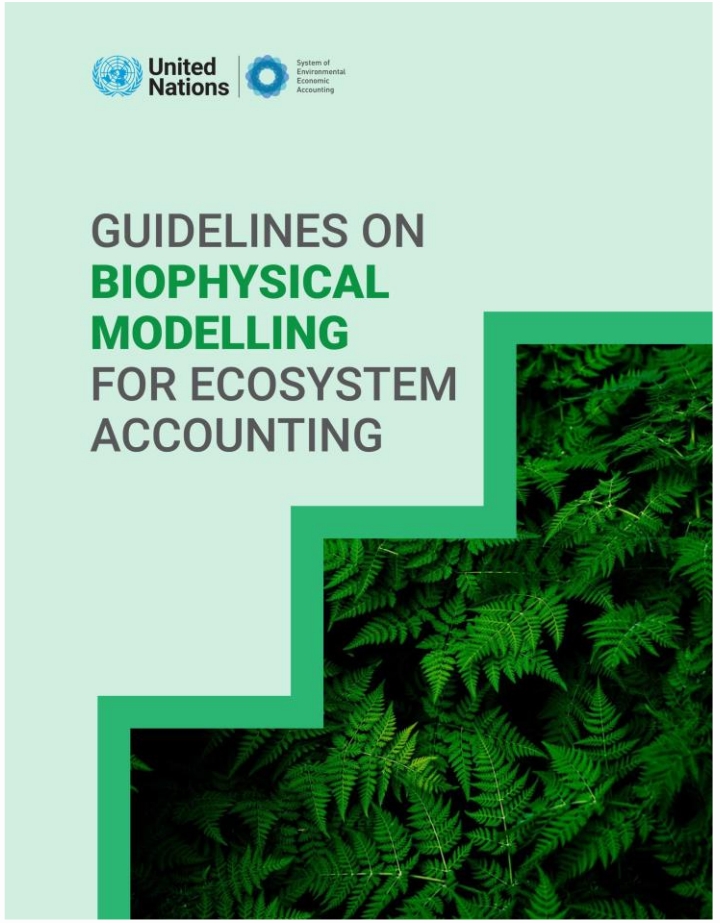


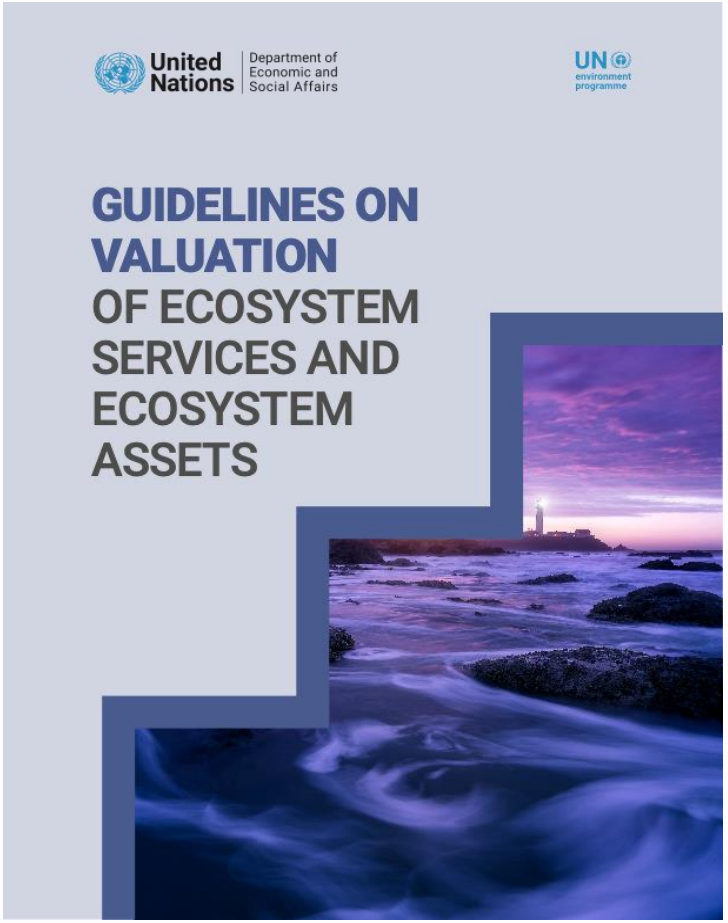
Deriving indicators

	Description	Metrics (physical)	Valuation
Target 9	**Wild fish / wild species**	Gross tonnes of aquatic products harvested / Tonnes of biomass harvested	Money unit ($) - Resource rent approach - Prices proxy markets
Target 11	**Air filtration services**	Tonnes of pollutants absorbed by type of pollutant (e.g., PM10; PM2.5)	Money unit ($) - Avoided costs
.	..		
Goal B	Gross Ecosystem Product (GEP)		Money unit ($) - Sum value of all final ecosystem services supplied (by area or ecosystem type)

Measurement

- Guidelines in development for most commonly measured ES
  - > in physical units and
  - > monetary units
- Prepare metadata sheets for selected indicators of the monitoring framework
- Tools to jumpstart accounts compilation (e.g.) Aries for SEEA Explorer





Example: European Union

Table 5: Economic value provided by ecosystem services in the EU (EU28, 2012, million EUR)(')

	Urban	Cropland	Grassland	Woodland and forest	Wetland	Heathland and shrub	Sparsely vegetated land	Rivers and lakes	Marine inlets and transitional waters
Crop provision	0	20 795	0	0	0	0	0	0	0
Timber provision	0	0	0	14 739	0	0	0	0	0
Crop pollination	:	4 517	:	:	0	:	0	0	0
Carbon sequestration	0	0	0	9 189	0	0	0	:	:
Flood control	89	1 015	3 129	11 388	333	357	1	:	:
Water purification	1 105	31 041	4 128	15 374	330	312	170	3 114	:
Nature-based recreation(')	77	4 073	7 482	30 723	22 96	3 097	1 351	1 015	279

Source: JRC

Note: (:) not available.

(') The scope of nature-based recreation was restricted to daily trips within 4 km from human settlements and the highest natural quality sites.

- The total supply of the seven considered ecosystem services amounts to EUR 172 billion
- Forests deliver 47.5% of the total supply
- Water purification is the ecosystem service with the highest aggregated value

Source:

SEEA

Conclusions

- **SEEA adopted as statistical standard major milestone**
- **Makes nature count** within economic planning and decision-making
- **Standardization is important** in order to obtain high-quality, and comparable statistics
- **Provides framework for deriving indicators** to support various monitoring and reporting frameworks such as SDGs, Biodiversity, Climate Change, Green Economy
- **SEEA EA implementation strategy:**
  - **Guidelines and tools** are developed to facilitate accounts compilation
  - Enhanced collaboration between various communities (statistical, geospatial, biodiversity, policy makers)