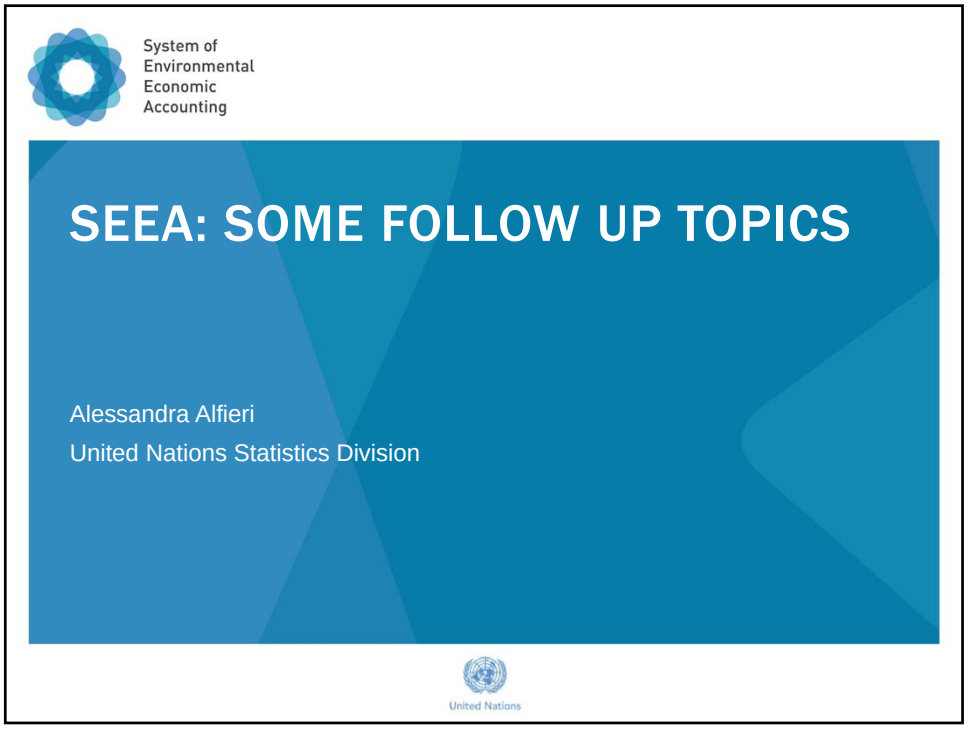

System of
Environmental
Economic
Accounting


System of
Environmental
Economic
Accounting
SEEA: SOME FOLLOW UP TOPICS
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Content

- Integrating information of SEEA
- SEEA in support of Sustainable Development Goals
- Ecosystem Accounting

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INTEGRATING INFORMATION OF SEEA

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Integration within SEEA-CF

- A primary motivation for SEEA-CF is effective integration of environmental and economic data
- Various SEEA-CF accounts capture different types of information
- Need to understand how the information in these accounts link together into one integrated system of information
- Strength of SEEA-CF: consistent application of accounting rules, principles and boundaries in organisation of physical and monetary information

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Four Key Areas of Integration

I. Linking flows of goods and services in physical and monetary terms

II. Linking changes in the stock of environmental assets with use of extracted natural resources as inputs to economic production, consumption and accumulation.

III. Connection between the measures of production, consumption and accumulation in monetary terms and measures of flows of income between sectors

IV. Identifying specific economic activities undertaken for environmental protection or resource management purposes

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I. Integration of Supply and Use Tables in Physical and Monetary Terms (1/2)

Supply table in monetary terms

	Production (incl. household production on own account) Industries – classified by ISIC				Flows from the Rest of the World	Total
Products	Output				Imports	
Total						

Use in monetary terms

	Intermediate consumption	Final consumption		Accumulation	Flows to the Rest of the World	Total
	Industries – classified by ISIC	Households	Government			
Products	Intermediate consumption	Household final consumption expenditure	Government final consumption expenditure	Gross capital formation	Exports	
Total						

Supply table in physical terms

	Production; Generation of residuals			Accumulation	Flows from the Rest of the World	Flows from the Environment	Total
	Industries (including household production on own account) – classified by ISIC	Generation of residuals by households					
Natural inputs						Flows from the environment	
Products	Output				Imports		
Residuals	Residuals generated by industry	Residuals generated by household final consumption		Residuals from scrapping & demolition of produced assets Emissions from controlled landfill sites	Residuals received from rest of the world	Residuals recovered from the environment	
Total							

Use in physical terms

	Intermediate consumption; Use of natural inputs; Collection of residuals	Final consumption		Accumulation	Flows to the Rest of the World	Flows to the Environment	Total
	Industries – classified by ISIC						
Natural inputs	Extraction of natural inputs						
Products	Intermediate consumption	Household final consumption		Gross capital formation	Exports		
Residuals	Collection and treatment of residuals			Accumulation of waste in controlled landfill sites	Residuals sent to the rest of the world	Residual flows to the environment	
Total							

I. Integration of Supply and Use Tables in Physical and Monetary Terms (2/2)

Same Groupings of Economic Units

Same Product Classification:

Supply table in monetary terms

	Production (incl. household production on own account) Industries – classified by ISIC				Flows from the Rest of the World	Total
Products	Output				Imports	
Total						

Use in monetary terms

	Intermediate consumption	Final consumption		Accumulation	Flows to the Rest of the World	Total
	Industries – classified by ISIC	Households	Government			
Products	Intermediate consumption	Household final consumption expenditure	Government final consumption expenditure	Gross capital formation	Exports	
Total						

Supply table in physical terms

	Production; Generation of residuals			Accumulation	Flows from the Rest of the World	Flows from the Environment	Total
	Industries (including household production on own account) – classified by ISIC	Generation of residuals by households					
Natural inputs						Flows from the environment	
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Total							

Use in physical terms

	Intermediate consumption; Use of natural inputs; Collection of residuals	Final consumption		Accumulation	Flows to the Rest of the World	Flows to the Environment	Total
	Industries – classified by ISIC						
Natural inputs	Extraction of natural inputs						
Products	Intermediate consumption	Household final consumption		Gross capital formation	Exports		
Residuals	Collection and treatment of residuals			Accumulation of waste in controlled landfill sites	Residuals sent to the rest of the world	Residual flows to the environment	
Total							

Same Industry Classification

The Sequence of Economic Accounts

- SNA: Sequence of economic accounts
- Derivation of balancing items (GDP, GNI etc.)
- SEEA-CF Sequence of economic accounts: Balancing items can be defined so as to take into account the **depletion of natural resources**

→ Calculation of depletion adjusted net value added, depletion adjusted net operating surplus, etc.

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Core tables and accounts

- SEEA Technical Notes developed for a number of topics (e.g. Water, Energy, Land, etc.) as requested by the UN Statistical Commission
- Aim is to provide concise information to initiate the compilation of priority accounts; references are also provided
- Contain core tables and accounts
- Countries can begin implementation based on priorities
- Minimum reporting requirements
- Relevant to the compilation of indicators (including SDGs)

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Core tables and combined presentations-water example

PHYSICAL SUPPLY TABLE	Industries (by ISIC)								Households	Flows from the Rest of the World (Imports)	Flows from the Environment	TOTAL SUPPLY
	Agriculture, Forestry & Fishery (ISIC A)	Mining and Quarrying (ISIC B)	Manufacturing (ISIC C)	Electricity, gas, steam & air conditioning supply (ISIC D)	Water collection, treatment & supply (ISIC 36)	Sewerage (ISIC 37)	Other Industries	Total Industry				
1. Sources of Abstracted Water:												
Inland Water Resources											967	967
of which: Surface water											441	441
of which: Groundwater											476	476
Other Water Sources											202	202
TOTAL SUPPLY ABSTRACTED WATER											1 169	1 169
2. Water:												
Distribution of abstracted water	0	0	0	0	378	0	0	**378**		0		**756**
Own use of abstracted water	108	34	80	404	14	100	2	**744**				**744**
3. Wastewater and re-used water:												
Wastewater to treatment	18	35	82	6	1	0	49	**192**	236			427
Own treatment of wastewater	0	0	0	0	0	0	0	**0**	0			0
Re-used water produced (for distribution)	0	3	7	0	0	43	0	**53**	0			53
TOTAL WASTEWATER AND RE-USED WATER	18	38	89	6	1	43	49	244	236			**480**
4. Return flows of water:												
To inland water resources	65	7	16	300	47	228	1	**664**	5			669
To other sources	0	2	4	100	0	256	0	**362**	0			362
TOTAL RETURN FLOWS	65	9	21	400	47	484	1	**1 026**	5			**1 031**
of which: Losses in distribution	0	0	0	0	47	0	0	**47**	0			47
5. Evaporation of abstracted water, transpiration and water incorporated into products:												
TOTAL WATER EVAPORATED, TRANSPIRED AND INCORPORATED INTO PRODUCTS	76	13	30	3	2	1	4	**128**	10			**138**
6. TOTAL SUPPLY	268	94	220	812	443	627	56	**2 520**	250	0	1 169	**3939**

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Core tables and combined presentations-water example

Core Account 2: Monetary Supply and Use Table for Water

	Industries (by ISIC)								Rest of the World	Taxes less subsidies on products, trade & transport margins	Actual Final Consumption		TOTAL
	Agriculture Forestry & Fishery (ISIC A)	Mining and Quarrying (ISIC B)	Manufacturing (ISIC C)	Electricity, gas, steam & air conditioning supply (ISIC D)	Water collection, treatment & supply (ISIC 36)	Sewerage (ISIC 37)	Other Industries	Total Industry			Households	Government	
Supply of water products (currency):													
Total Supply of Products	170 737	80 143	187 000	195 769	6 570	5 036	6 478 288	7 123 543					
of which: Natural Water (CPC 1800)	0	4	9	1	6 570	14	7	6 605	1	- 2			6 604
of which: Sewerage Services (CPC 941)	0	0	0	0	0	5 022	0	5 022	2	14			5 038
Intermediate consumption and final use (currency):													
Natural Water (CPC 1800)	406	193	450	88	1 004	100	1 229	3 470	4		3 074	60	6 608
Sewerage Services (CPC 941)	3	69	160	1	13	1	1 406	1 653	3		3 316	66	5 038
Other products	145 597	38 454	89 727	180 683	2 360	1 718	5 842 990	6 301 529			605 817	50 096	**6 957 442**

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Core tables and combined presentations-water example

Core Account 3: Physical Asset Account for Water[21]

	Type of Water Resources						TOTAL
	Surface Water				Groundwater	Soil Water	
	Artificial Reservoirs	Lakes	Rivers and Streams	Glaciers, ice & snow			
1. Opening stock of water resources	**1 500**	**2 700**	**5 000**	**0**	**100 000**	**500**	**109 700**
2. Additions to stock:							
Returns	300	0	53	0	315	0	**668**
of which: for hydro power and cooling	*100*	*0*	*0*	0	*0*	*0*	***100***
Precipitation	124	246	50	0		23 015	**23 435**
Inflows from other territories	0	0	17 650	0	0		**17 650**
Inflows from other inland water resources	1 054	339	2 487	0	437	0	**4 317**
Discoveries of water in aquifers	0	0	0	0		0	**0**
TOTAL ADDITIONS TO STOCK	**1 478**	**585**	**20 240**	**0**	**752**	**23 015**	**46 070**
3. Reductions in Stock:							
Abstraction	280	20	141	0	476	50	**967**
of which: for hydro power and cooling	*100*	*0*	*0*	0	*0*	*0*	***100***
Evaporation & actual evapotranspiration	80	215	54	0		21 125	**21 474**
Outflows to other territories			9 430	0	0		**9 430**
Outflows to the sea			10 000	0	0		**10 000**
Outflows to other inland water resources	1 000	100	1 343	0	87	1 787	**4 317**
TOTAL REDUCTIONS IN STOCK	**1 360**	**335**	**20 968**	**0**	**563**	**22 962**	**46 188**
4. Closing stock of water resources	**1 618**	**2 950**	**4 272**	**0**	**100 189**	**553**	**109 582**

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Core tables and combined presentations-water example

Combined Presentation for Water

		Industries (by ISIC)								Rest of the World	Actual Final Consumption		TOTAL
		Agriculture, Forestry & Fishery (ISIC A)	Mining and Quarrying (ISIC B)	Manufacturing (ISCED C)	Electricity, gas, steam & air conditioning supply (ISIC D)	Water collection, treatment & supply (ISIC 36)	Sewerage (ISIC 37)	Other Industries	**Total Industry**		Households	Government	
MONETARY FLOWS	**1. Intermediate Consumption and Final Use (currency):**												
	Natural Water (CPC 1800)	406	193	450	88	1 004	100	1 229	3 470	4	3 074	60	**6 608**
	Sewerage Services (CPC 941)	3	69	160	1	13	1	1 406	1 653	3	3 316	66	**5 038**
	Other Products	145 597	38 454	89 727	180 683	2 360	1 718	5842 990	6301 529	0	605 817	50 096	**6957 442**
	2. Gross Value Added (currency)	24 731	42 327	98 763	14 997	3 193	3 217	632 663	819 891				**819 891**
	3. Employment	371	663	1 548	61	41	43	8 204	10 931	0	0	0	**10 931**
PHYSICAL FLOWS	**4. Supply of water (million m3):**												
	Distribution of abstracted water	0	0	0	0	378	0	0	378	0			**378**
	Wastewater to treatment	18	35	82	6	1	0	49	192	0	236	0	**427**
	Total return flows of water	65	9	21	400	47	484	1	1 026		5	0	**1 031**
	5. Use of Water (million m3):												
	Total abstraction of water	108	34	80	404	440	100	2	1 169				**1 169**
	of which: Own use of abstracted water	108	34	80	404	3	100	2	733		11		**744**
	Use of distributed water*	51	26	60	4	0	0	51	191	0	240		**431**
	TOTAL USE OF WATER*	159	60	140	408	3	100	53	924		251		**1 175**
	6. Water Consumption (million m3)	76	13	30	3	2	1	4	128		10		**138**
	7. Total Actual Renewable Water Resources (TARWR) (million m3)												**43367**
FIXED ASSETS FOR WATER	**8. Gross fixed capital formation (currency):**												
	For water supply	582	3	13	819	2 872	0	0	4 289				**4 289**
	For water sanitation	0	0	0	0	0	2 874	0	2 874				**2 874**
	9. Closing stocks of fixed assets for water supply (currency)	6 112	13	71	9 871	25 347	0	17	41 431				**41 431**
	10. Closing stocks of fixed assets for water sanitation (currency)	0	0	0	0	0	37 457	0	37 457		10		**37 467**

*Includes re-used water (distributed re-use) and excludes wastewater received (for treatment)

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SEEA IN SUPPORT OF SUSTAINABLE DEVELOPMENT GOALS

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SDG Indicators and the SEEA

- The Statistical Commission *"recognized SEEA as an important statistical framework for the post-2015 development agenda and the sustainable development goals indicators"* in 2014.
- The SNA and SEEA are statistical standards that can be used to monitor a number of environmental-economic **SDG Indicators in an integrated way.**

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Goal 6-Targets and indicators

Target	Indicator
6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity	6.4.1 Change in water-use efficiency over time 6.4.2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources
6.5 By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate	6.5.1 Degree of integrated water resources management implementation (0–100) 6.5.2 Proportion of transboundary basin area with an operational arrangement for water cooperation
6.6 By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes	6.6.1 Change in the extent of water-related ecosystems over time

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Details on 6.4.1

$$Indicator\ 6.4.1 = \frac{total\ water\ use}{value\ of\ economic\ output}$$

- Total Water Use is the sum of water abstraction across economic activities plus water that is received from foreign economic units.
- Value added from national accounts
- Breakdown by ISIC

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Goal 7-Targets and indicators

Target	Indicator
7.1 By 2030, ensure universal access to affordable, reliable and modern energy services	7.1.1 Proportion of population with access to electricity 7.1.2 Proportion of population with primary reliance on clean fuels and technology
7.2 By 2030, increase substantially the share of renewable energy in the global energy mix	7.2.1 Renewable energy share in the total final energy consumption
7.3 By 2030, double the global rate of improvement in energy efficiency	7.3.1 Energy intensity measured in terms of primary energy and GDP

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Details on 7.3

$$Indicator\ 7.3 = \frac{energy\ supplied\ to\ the\ economy}{value\ of\ economic\ output}$$

- Total energy supply is comprised of production plus net imports minus international marine and aviation bunkers plus-stock changes
- Gross Domestic Product (GDP) is the measure of economic output

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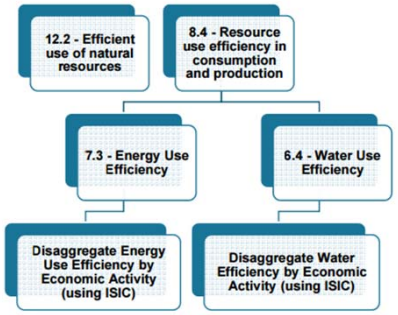
Integrated architecture for SDGs

Integrated monitoring for the SDGs requires methodological consistency.

The SEEA can be the basis for:

1. The development of coherent environmental-economic SDG indicators
2. The disaggregation of SDG indicators to inform national policy (spatial, sectoral, etc.)



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ECOSYSTEM ACCOUNTING

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One Environment: Two perspectives

Individual environmental **assets & resources:**

Timber
Water
Soil
Fish

Ecosystems: Biotic and abiotic elements functioning together:

Forests
Lakes
Cropland
Wetlands

SEEA Central Framework (SEEA_CF) starts with economy and links to physical information on natural assets, flows and residuals

+

SEEA Experimental Ecosystem Accounting (SEEA-EEA) starts with ecosystems and links their services to economic and other human activity

=

Together, they provide the foundation for measuring the relationship between the environment, and economic and other human activity

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SEEA-CF (Central Framework)	• **Assets** • **Physical flows** • **Monetary flows**	• Minerals & Energy, Land, Timber, Soil, Water, Aquatic, Other Biological • Materials, Energy, Water, Emissions, Effluents, Wastes • Protection expenditures, taxes & subsidies
SEEA Water; SEEA Energy; SEEA Agriculture, Forestry and Fisheries	Add sector detail	As above for • Water • Energy • Agricultural, Forestry and Fisheries
SEEA-EEA (Experimental Ecosystem Accounting)	Adds spatial detail and ecosystem perspective	Extent, Condition, Ecosystem Services, Thematic: Carbon, Water, Biodiversity

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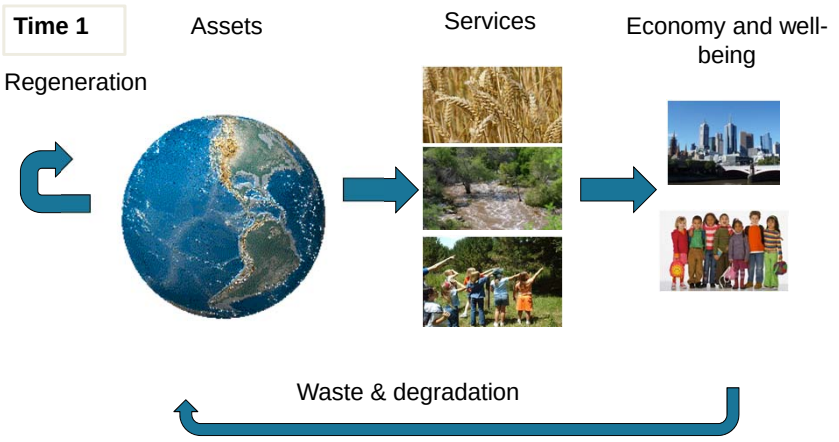
Balancing the books of environmental assets



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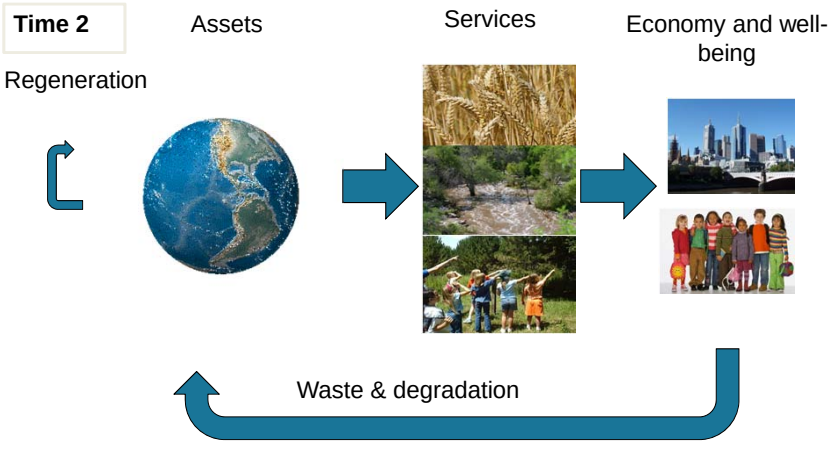
Balancing the books of environmental assets



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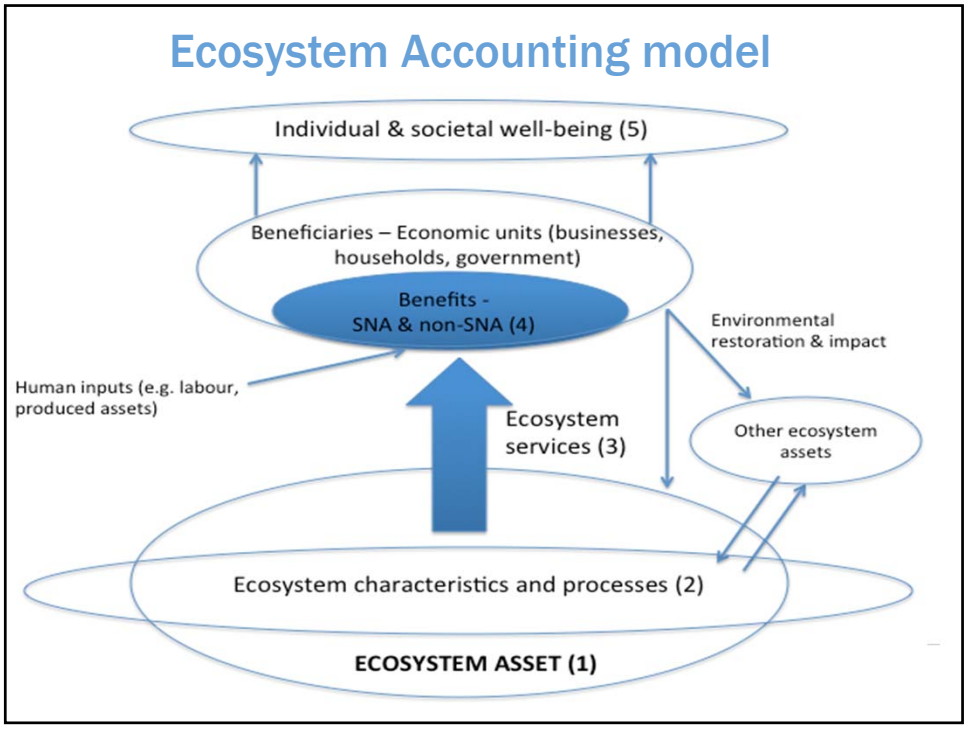
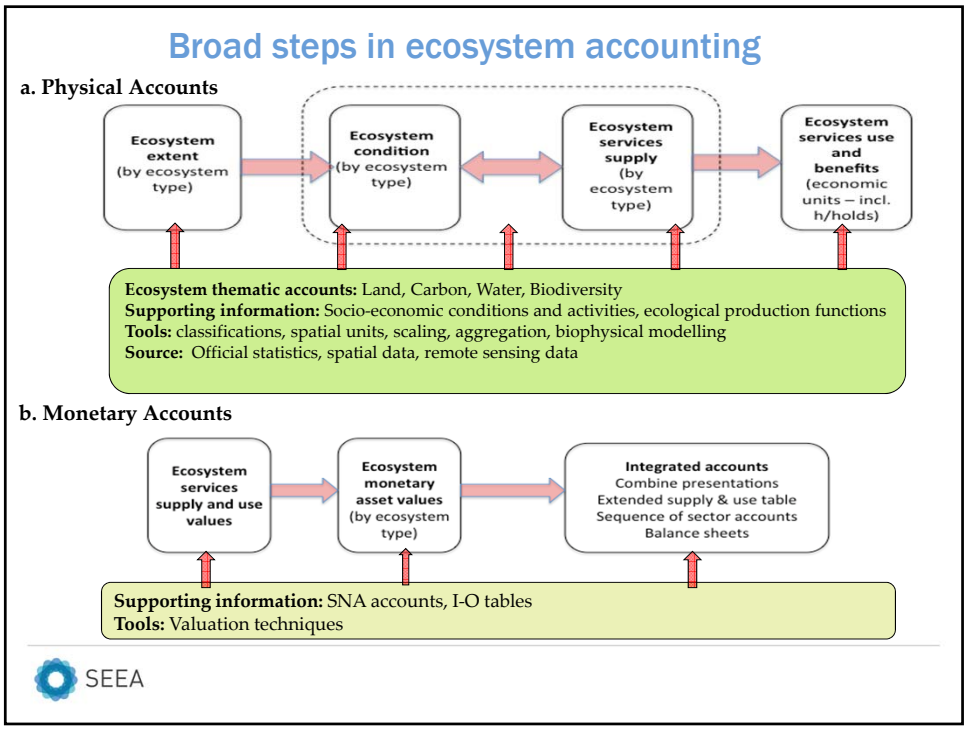

Ecosystem Accounting model
Individual & societal well-being (5)
Beneficiaries – Economic units (businesses, households, government)
Benefits - SNA & non-SNA (4)
Environmental restoration & impact
Human inputs (e.g. labour, produced assets)
Ecosystem services (3)
Other ecosystem assets
Ecosystem characteristics and processes (2)
ECOSYSTEM ASSET (1)


Broad steps in ecosystem accounting
a. Physical Accounts
Ecosystem extent (by ecosystem type)
Ecosystem condition (by ecosystem type)
Ecosystem services supply (by ecosystem type)
Ecosystem services use and benefits (economic units – incl. h/holds)
Ecosystem thematic accounts: Land, Carbon, Water, Biodiversity
Supporting information: Socio-economic conditions and activities, ecological production functions
Tools: classifications, spatial units, scaling, aggregation, biophysical modelling
Source: Official statistics, spatial data, remote sensing data
b. Monetary Accounts
Ecosystem services supply and use values
Ecosystem monetary asset values (by ecosystem type)
Integrated accounts
Combine presentations
Extended supply & use table
Sequence of sector accounts
Balance sheets
Supporting information: SNA accounts, I-O tables
Tools: Valuation techniques
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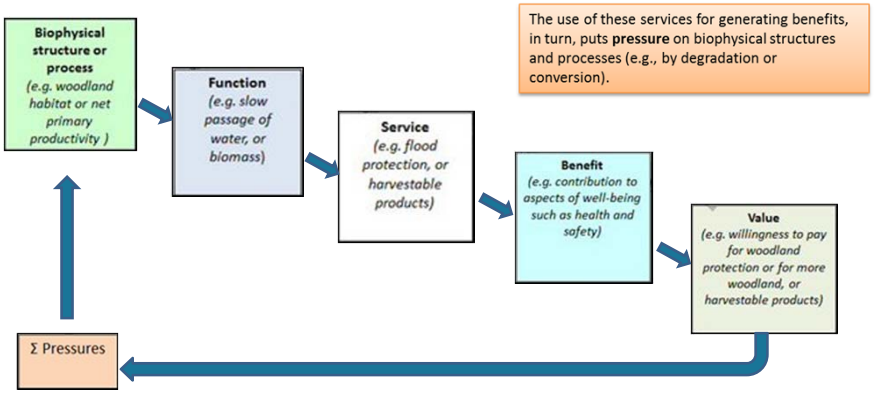
Ecosystem assets: a definition

- ***Ecosystem assets*** *are spatial areas containing a combination of biotic and abiotic components and other characteristics that function together* (SEEA-EEA Sections 2.31, 4.1)
- 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…

The Ecosystem Services Cascade

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



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 accounting is spatial

- Geographic information systems (GIS)
  - Manage spatial information as layers
  - Have tools to integrate spatial information:
    - Overlay different data where space is the common denominator
    - Aggregate point information (e.g., water sampling station) to larger areas (polygons)
    - Attribute information from larger areas to smaller ones (downsampling)
    - Geospatial statistics (interpolation, modelling)
  - Generate tables based on common properties (e.g., land cover and land cover change)

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SEEA-EEA Accounts and Tools

Ecosystem Accounts
- Ecosystem Extent Account
- Ecosystem Condition Account
- Ecosystem Services Supply and Use Account – physical terms
- Ecosystem Services Supply and Use Account – monetary terms
- Ecosystem monetary asset account – monetary terms

Thematic Accounts
- Land account
- Water Account
- Carbon Account
- Biodiversity Account

Integrated accounts
- Combined presentations
- Extended supply and use accounts
- Integrated Sector Accounts
- Balance Sheets

Tools
- Classifications
- Spatial units, scaling and aggregatio
- Biophysical modelling
- Valuation

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THANK YOU

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