System of Environmental Economic Accounting

Overview of Monetary Ecosystem Accounts in the SEEA – EA

Bram Edens, PhD

Senior Statistician, Environmental Economic Accounts Section

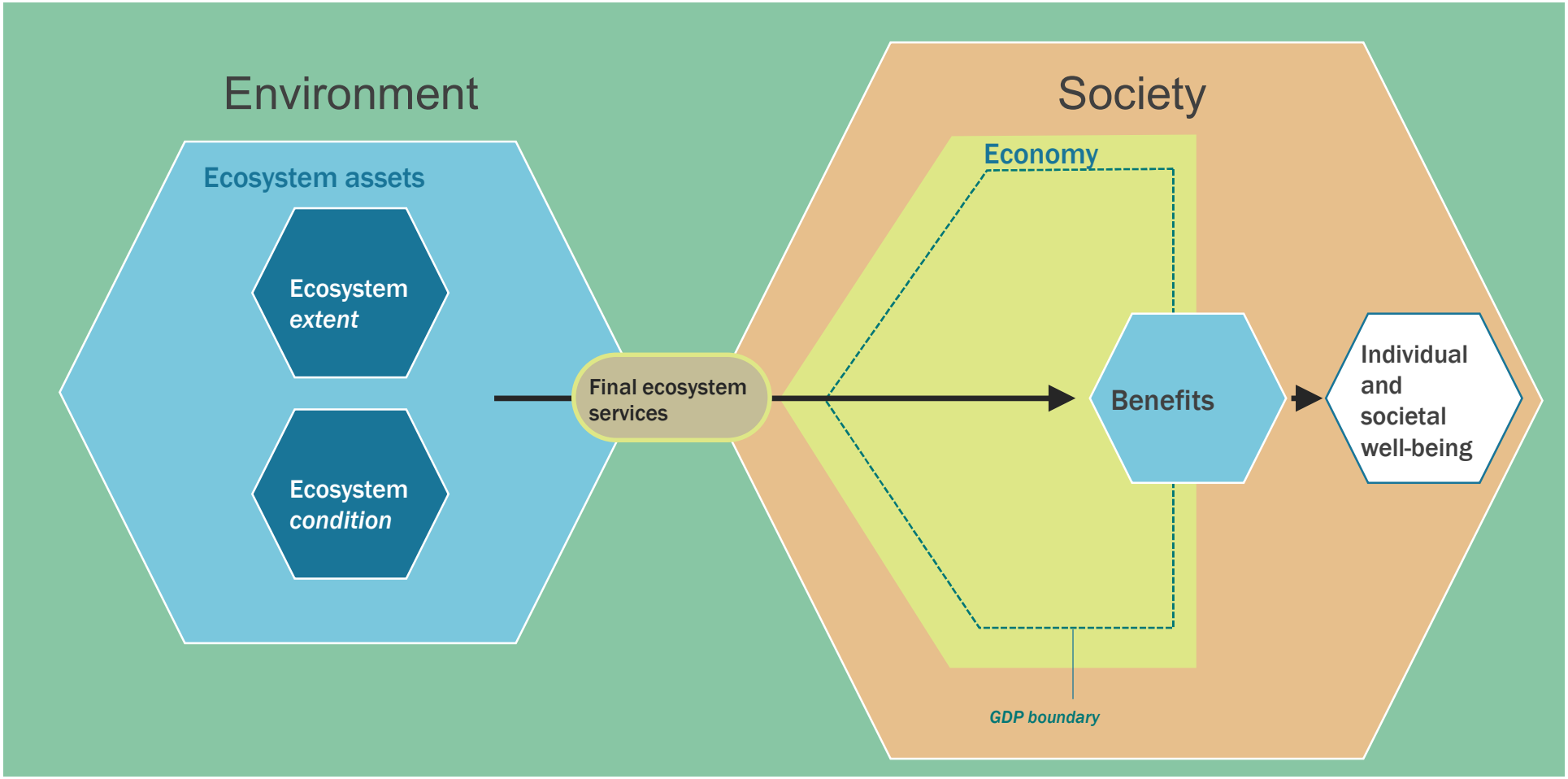
United Nations Statistics Division

United Nations

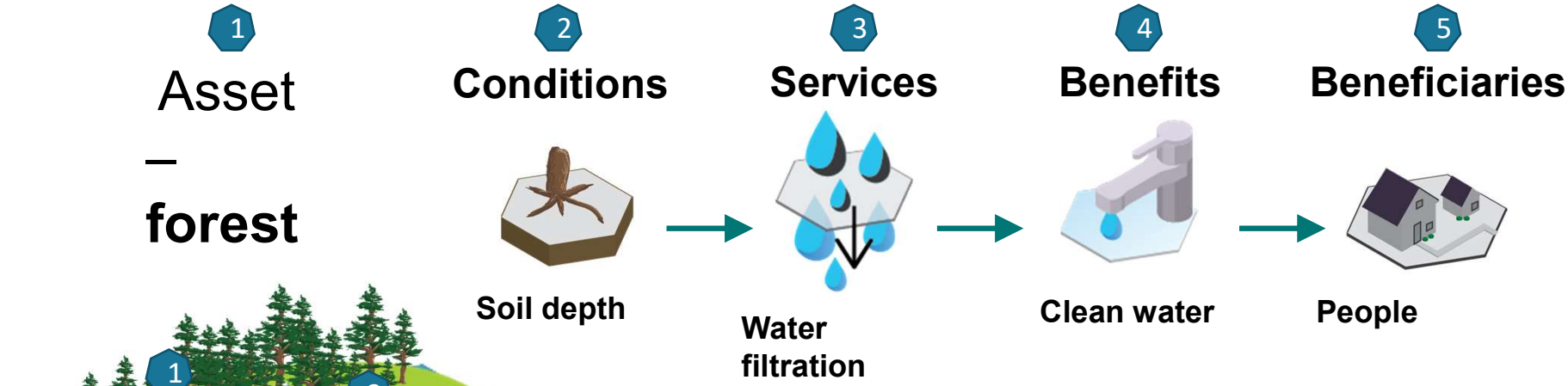
Outline

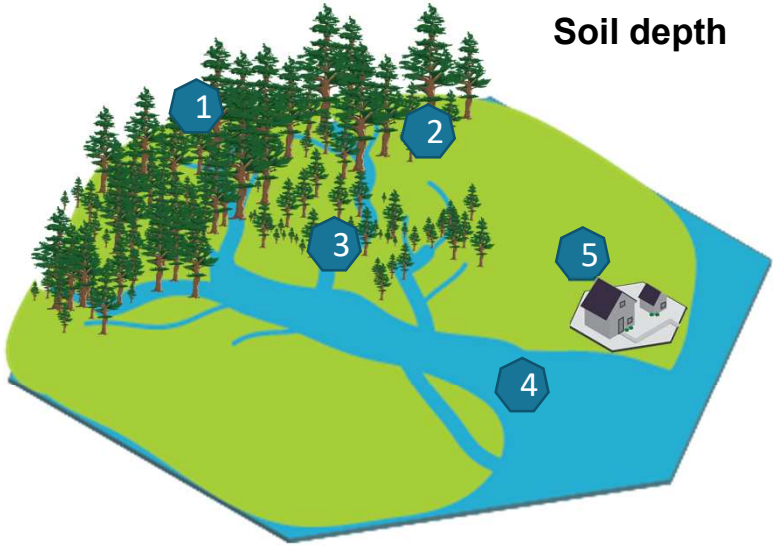
- Purpose of valuation in SEEA
- SEEA Valuation approach
- Monetary Ecosystem Accounts
  - > Monetary SUT
  - > Monetary asset account
  - > Sequence of accounts
  - > Complementary presentations
  - > Indicators
- Discussion

SEEA EA Framework (Simplified)



SEEA EEA Framework – Illustration





- Services defined in such a way as to avoid double counting (e.g. as contributions to benefits)
- Therefore also no double counting of asset values

Purpose of valuation

- Primary purpose(s)
  - > Mainstreaming in economic planning / decision-making
    - Macro-economic
    - *make ES visible / degradation /wealth - #MakeNatureCount*
    - *consistency with SNA -> exchange values*
  - > Monitoring / deriving indicators (SDGs)
- Secondary purposes
  - > Sectoral policies
  - > Land use planning
  - > Providing data for policy instruments
  - > ..
- Therefore, strong focus on **alignment/consistency with SNA principles**

SEEA valuation principles

- ***Exchange values are the values at which goods, services, labour or assets are in fact exchanged or else could be exchanged for cash*** (2008 SNA, para. 3.118).
- SNA accounts do not include consumer surplus, being based on transactions
- Externalities (not being transactions) in principle out of scope
- SNA is agnostic as to market structure
- Production boundary is leading -> imputations
- Relation to welfare?
  - GDP should not be taken as a measure of welfare
  - But… this does not mean that there is no connection:
    - The exchange value is also the marginal value of the unit, which is the wellbeing that unit provides.
    - Important: changes over time approximate relative welfare changes

Extended production boundary

- SNA is agnostic as to market structure - why not then simply value ES at 0 confirm current institutions ?
- SNA: key distinction is made between prices that are economically (in)significant -> SNA treats these as non-market producers (e.g. in case of many government provided services) and these are valued 'at cost'.
- Key difference with SNA non-market production methods is that we have **extended the production boundary** (so we cannot say, okay non-market production, we value at cost, these costs are 0, as nature provided ES at price 0).
- Need to estimate **an exchange value using a non-market valuation approach** for ES (e.g. what it would cost to produce or price ES if were to be marketed by trustee.)
- Analogous to unpaid household production (satellite accounts)
- In case of SNA benefits, ES are embedded in existing markets -> low price reflect current institutions (and would be a key message).

Monetary ecosystem accounts

- Monetary Supply Use Tables
- Monetary asset account
- Sequence of accounts
- Complementary tables

Monetary Supply Use Tables

- MSUTs:
  - Supply: depict which Ecosystem Types (e.g. wetland, forest) supply what Ecosystem Services
  - Use Table, depicts who (households, government, economic sectors) benefits
- Consistent with the Physical Supply-Use Tables for ES (value = Price x Quantity)
  - Either impute / apply P's to biophysically modelled Q's
  - Or derive value directly, and Q's as second derived step
- Ideally, valuation are spatially explicit.

Preference order for ES valuation

- i. Methods where the price for the ecosystem service is directly observable;
- ii. Methods where the price for the ecosystem service is obtained from markets for similar goods and services;
- iii. Methods where the price for the ecosystem service is embodied in a market transaction;
- iv. Methods where the price for the ecosystem services is based on revealed expenditures (costs) for related goods and services
- v. Methods where the price for the ecosystem service is based on expected expenditures or markets.

SEEA: valuation of assets

- In absence of market prices, assets valued as Net Present Value of Services they provide:

$$V_\tau(\boldsymbol{EA}) = \sum_{i=1}^{i=S} \sum_{j=\tau}^{j=N} \frac{ES_\tau^{ij}(\boldsymbol{EA}_\tau)}{(1+r_j)^{(j-\tau)}}$$

where ES_τ^{ij} is the value of ecosystem service *i* in year *j* as expected in base year τ generated by a specific ecosystem asset $\boldsymbol{EA}_\tau$, characterized by its extent, condition and management regime; S is the total number of ecosystem services; *r* is the discount rate (in year *j*, and *N* is the lifetime of the asset, which may be infinite for some ecosystem assets if used sustainably. τ is the starting period or base year, which may be referenced to 0.[3]

- SEEA CF: extends SNA asset boundary, when valuing (in monetary units) apply SNA production boundary. SEEA EA extend production boundary.
- Ecosystem degradation is the decrease in the value of an ecosystem asset over an accounting period that is associated with a decline in the condition of an ecosystem asset during that accounting period.

Monetary ecosystem asset account

Table 10.1: Ecosystem monetary asset account (currency units)

	Ecosystem type (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	TOTAL
	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	...	...	...	Derived semi-natural pastures and old fields	Permanent upland streams	...	Intermittently closed and open lakes and lagoons	Seagrass meadows	...	Coastal saltmarshes and reedbeds	
	T1.1	T1.2	T1.3	T1.4	T2.1	T2.2	...	T2.6	...	...	...	T7.5	F1.1	...	FM1.3	M1.1	...	MFT1.3	
Opening value																			
Ecosystem enhancement																			
Ecosystem degradation																			
Ecosystem conversions																			
Additions																			
Reductions																			
Other changes in volume of ecosystem assets																			
Catastrophic losses																			
Reappraisals																			
Revaluations																			
Net change in value																			
Closing value																			

Extended SNA balance sheet (Chpt. 11)

Table 11.2: Structure of an extended balance sheet

Asset class		Monetary value	
		Opening	Closing
Produced assets*	Fixed assets • Dwellings • Other buildings and structure • Machinery and equipment • Weapons systems • Intellectual property products		
	Inventories**		
	Valuables		
Environmental assets - ecosystems	Terrestrial ecosystems (IUCN GET EFG T1-T7) (includes SNA value of natural timber resources, and other non-produced biota)		
	Freshwater ecosystems (IUCN GET EFG F1 – FM1) (includes SNA value of natural aquatic resources, and other non-produced biota) (Excludes the value of water resources)		
	Marine ecosystems IUCN GET EFG M1-MFT1) (includes SNA value of natural aquatic resources, and other non-produced biota)		
	Subterranean ecosystems (IUCN GET S1-SM1)		
Environmental assets – other	Cultivated biological resources • Fixed assets • Work in progress (inventories)		
	Land (as provision of space) (includes SNA value of Land under buildings)		
	Renewable energy resources**		
	Water resources**		
	Mineral and energy resources		
	Atmospheric systems (includes SNA value of the radio spectrum)		

Features

- Main structure based on ecosystem types (IUCN GET)
- Individual env. assets subsumed under ecosystem assets
- Land kept separate (as mere provisioning of space)
- Atmosphere recognized

Sequence of accounts

Table 11.3: Models for including ecosystem services in the sequence of accounts (excluding financial account and change in balance sheet entries) (currency units)

		SNA treatment			Extended sequence of accounts			
		Sector		Total	Sector			Total
		Farmer	Household		Farmer	Household	Ecosystem trustee	
Production and generation of income acccount								
Output	Products (wheat)	200		200	200			200
	Ecosystem services (crop provisioning)				80			80
	Ecosystem services (recreation)						30	30
Total output		200		200	280		30	310
Intermediate consumption	Products	0		0	0		0	0
	Ecosystem services (crop provisioning)				80		0	80
Gross value added		200		200	200		30	230
less Consumption of fixed capital (produced assets)		10		10	10		0	10
less Ecosystem degradation					10		5	15
Degradation adjusted net value added		190		190	180		25	205
less Compensation of employees		50		50	50		0	50
Degradation adjusted net operating surplus		140		140	130		25	155
Allocation / Use of income accounts								
Degradation adjusted net operating surplus		140		140	130		25	155
plus Compensation of employees			50	50		50		50
Ecosystem service transfer in kind payable							30	30
Ecosystem services transfer in kind receivable						30		30
Degradation adjusted disposable income		140	50	190	130	80	-5	205
less Final consumption	Products (wheat)		200	200		200		200
	Ecosystem services (recreation)					30		30
Degradation adjusted net saving		140	-150	-10	130	-150	-5	-25
Capital account								
Degradation adjusted net saving		140	-150	-10	130	-150	-5	-25
plus Consumption of fixed capital (produced assets)		10		10	10			10
plus Ecosystem degradation					10		5	15
Net lending/borrowing		150	-150	0	150	-150	0	0

Complementary presentations

- Tables to show externalities and ecosystem disservices
- Alternative measures of income, wealth and degradation
  - > Polluter pays recording
  - > Restoration cost
  - > Hicksian income (capital gains)
- Bridge table towards welfare values

Table 12.1: Bridge table between accounting and welfare value of ecosystem services

	ES1 (biomass)	ES2 (recreation)	Total flow	Asset
1. Accounting value	*10*	*5*	*15*	300
2. Consumer surplus	*0*	*20*		
3. Welfare use-value	*10*	*25*	*35*	700
4. Welfare non-use value				300
Total welfare value				1000

Indicators (Chapter 14)

- Suggested monetary indicators
  - Gross Ecosystem Product (GEP): Sum of all final ecosystem services at their exchange value supplied within an ecosystem accounting area over an accounting period less imports *[proposed in post-2020 biodiversity framework]*
  - Industry value added linked to ecosystem services:
  - Monetary ecosystem asset value
  - Cost of degradation
- Combined presentations
  - GEP per hectare
  - Economic activity dependent on nature

Conclusions

Revised SEEA EA (valuation chapters):

- Clear focus on consistency with SNA in line with its main purpose
- Articulation of its value stance (instrumental, use values)
- Need for careful interpretation of monetary numbers:
  - Not the value of nature
  - Stresses to present physical and monetary data in parallel
- Open to all sorts of complementary / alternative accounts, building from the same integrated underlying datasets

THANK YOU

seea@un.org