

System of Environmental Economic Accounting

Integrated accounting treatments and recording degradation for ecosystem accounting

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Link to valuation research agenda

- Issue 4: Valuation concepts for ecosystem services and ecosystem assets
- Issue 5: Valuation methods for key ecosystem services
- Issue 6: Accounting for ecosystem capacity, degradation and enhancement



Key issues for accounting treatments

- Recording of ES in PSUT -> solved
- Definition of degradation of ecosystems
 - > Vis a vis physical descriptions
 - > Role of "capacity"
- Recording ecosystems as separate institutional unit (Model A and Model B)
 - > Integration of Ecosystem asset values with balance sheet
 - > Allocation of degradation to units (cost-caused vs. borne)
- Treatment of restoration costs
 - > Links to defensive expenditures / Env. Protection Expenditure Accounts
 - > Liabilities / environmental debt
- Other recording issues e.g. disservices (*not treated here*)
- Developing a complementary table for broader ranges of values (not treated here)



Extended PSUT

ECOSYSTEM SERVICES SUPPLY TA	BLE																								
		Type of economic unit				Proxy ecosystem type (based on land cover)																			
	Measurement Units	Agriculture, forestry and fisheries	Electricity, gas supply	Water collection, treatment and supply	Other industries	Governmens	Households	Accumulation	Rest of the world - Imports	Artficial 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 show and glaciers	Inland water bodies	Coastal water and inter-tidal areas	Sea and marine areas	TOTAL SUPPLY
										1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Ecosystem services																									
Provisioning services																									
Biomass accumulation																									
- Timber																									
- Crops				// III																					
- Grass / fodder			"""																						
- Fish																									
Water abstraction																									
Regulating services						£											В								
Carbon sequestration																									
Water regulation																									
Water purification																									
Air filtration																									
Nutrient/waste remediation				/////																					
Soil retention				//###					1110																
Cultural services				9777																					
Enabling tourism and																									
recreation		1113																							
Enabling nature based																									
education and research																									
Enabling nature based																									
religious and spiritual																									
experiences																									
Products					(:											D								



Definition of degradation ecosystems

- Degradation is not simply the change in value of the asset in two points in time
- In an asset account, change in value is decomposed in various elements
 - > Important to identify the part that is due to using up of the asset -> exclude changes in value due to price changes
 - Distinguish between human and non-human induced degradation
- Link also to physical measures :
 - > Deterioration of condition of the ecosystem
 - > Link to the capacity of the ecosystem to supply services



Capacity and degradation



Time

- Situation over overuse: actual ES flows > Sust. ES flows (capacity flows)
- NPV act. ≠ NPV cap. (e.g. larger when discount rate high)
- Degradation: $\triangle NPV_act \text{ or } \triangle NPV_sust$
- NB: Capacity has benefit of not needing projections of future flows



Capacity and degradation

- Q1: Which value do we want to show in the accounts (as opening stock)? NPV_act or NPV_sust?
- Q2: how do we record degradation?
 - > Δ NPV_act
 - > Δ NPV_sust
 - > Physical concept (change in condition)
- NPV_act is in line with accounting practices .
- NPV_sust: hypothetical, but more intuitive ->
 - > degrading the capacity of the asset to provide sustained services over time
 - > Linked to change in condition of the asset
- Mixed recording? -> introduce a liability in the accounts.



Sequence of accounts

- Focus on the institutional sector level (i.e. corporations, governments, households) and measures of income, saving, investment and wealth.
- One of the main functions demonstrate linkages between incomes, investment and balance sheets
 - > a key feature of the standard SNA sequence of accounts is the attribution of consumption of fixed capital (depreciation) to economic activities and institutional sectors as a cost against income
 - > In the SNA, only depreciation is deducted to provide a measurement of net domestic product (NDP).
- A choice is required whether (i) ecosystems should be treated as producing units in their own right - Model A; or (ii) treated as assets owned and managed by existing economic units – Model B.



			Mo	del A	Model B			
		Farmer	Household	Ecosystem	Total	Farmer	Household	Total
P	roduction and generation of							
ir	ncome accounts							
0	Output - Products	200			200	200		200
0	Output – Ecosystem services			110	110	30		30
T	Total Output			110	310	230		230
Ir	nt. consumption – Products	0		0	0	0		0
Ir	nt. consumption – Ecosystem services	80		0	80	0		0
G	Fross value added	120		110	230	230		230
L	ess Consumption of fixed capital	10			10	10		10
L	ess Ecosystem degradation (non- NA)			15	15	15		15
D A	9egradation adjusted Net Value Added	110		95	205	205		205
L S	ess Compensation of employees – NA	50			50	50		50
D S	egradation adj. Net Operating urplus	60		95	155	155		155
<u>A</u>	llocation and use of income ccounts							
D Si	Degradation adj. Net Operating urplus	60		95	155	155		155
C	compensation of employees		50		50		50	50
E	cosystem transfers	80	30	-110	0	-30	30	0
D	bisposable income	140	80	-15	205	125	80	205
FL	ess Final consumption - Products		200		200		200	200
	Final consumption - Eco. serv.		30		30		30	30
D	egradation adjusted net saving	140	-150	-15	-25	125	-150	-25

Table 8.2: Simplified sequence of accounts for ecosystem accounting

Allocation of degradation to units

- Caused: "polluter pay's principle"
- Impact: (costs borne)
- Issue 1: allocation to multiple economic units
 - > apart in time
 - > apart in space
 - (goes back to SEEA 1993)
- Possible solution?
 - > "Cause based" recording in production account (Bonn)
 - > Record "transfers" (income accounts) to ensure impacts are allocated to correct assets
 - > Apart in time?? Liability?

 Table 4.1
 Imputed and actual environmental costs of economic activities in the SEEA: numerical example

(Monetary units)

		Imputed en	vironmental sts	Actual environmental costs			
		Production activities of industries	Household consumption activities	Production activities	Household consumption activities		
		1	2	3	4		
	Costs caused	59.9	17.1	54.1	8.8		
1	Depletion costs	17.5	0.7	0.0	0.0		
	Degradation costs						
2	Use of land etc.	9.0	0.8	0.0	0.0		
	Discharge of residuals			and page 1			
3	Current activities	33.3	13.3	47.7	7.7		
4	Use of produced assets	5.1	2.3	6.4	1.1		
5	b/ Restoration costs	-5.0	0.0				
	Costs borne	20.5	75.6	78.7	21.5		
6	a/ Depletion costs	11.3	0.3	0.0	0.0		
	Degradation costs		e de la factoria.				
	b/ Prevention costs						
7	Use of land etc.			0.0	0.0		
	Discharge of residuals						
8	Current activities			47.7	7.7		
9	Use of produced assets			6.4	1.1		
	b/ Repercussion costs						
10	Use of land etc.	1.1	12.3	0.0	0.0		
11	Discharge of residuals	10.1	63.0	19.6	12.7		
	a/ Restoration costs						
12	Non-market producers	0.0		5.0			
13	Others	-2.0		0.0	0.0		



Recording of restoration and enhancement costs

Reciprocal issue: treatment (recording) of activity that <u>maintains</u>, restores or <u>enhances</u> ecosystem condition (e.g. defensive expenditures)

- 2008 SNA: Cost of land improvements, affecting the parcel of land being considered directly, is treated as gross fixed capital formation, recorded as land improvements
- Land improvements: result of actions lead to major improvements in quantity, quality or productivity of land, or prevent its deterioration (e.g. land clearance, land contouring, creation of wells that are integral to the land in question)
- Q1: is that activity a good measure of the level of investment in the ecosystem asset? Or is the increase in NPV of the asset resulting from the expenditure a better measure of investment?



Maintenance costs as liability

2. Target level of natural capital

- Corporate NCA Framework
 (EFTEC 2015)
- Maintenance costs (legal provision or EPEA) for specific environmental assets recorded as liability (NPV).







Restoration and enhancement costs

- Option 1: Broader interpretation of SNA (land-> ecosystem) hence record all costs as investment (e.g. rather than as final government consumption)
 - > However, what type of asset?
 - > Not inconsistent with degradation approach where we look at the output side (NPV of ES)?
- Option 2: distinguish between investment costs and maintenance costs (defensive expenditures)
 - > NPV of maintenance costs as liability
- Option 3: no change / current treatment (e.g. other changes in volume)



Summary – key questions

- Q1: Defining degradation? NPV_Act, NPV_sust, physical measure(s)?
- Q2: Model A versus Model B? ecosystem as quasi-institutional sector?
- Q3: Cost allocation (caused versus borne)
- Q4: Enhancement as investment? If yes, based on NPV or actual costs ?
- Q5: If yes, all costs or differentiate maintenance costs and restoration costs?
- Q6: Environmental liability? (apart in time) other uses of liability?



Disservices

- Recorded as positive or negative contribution
- Cannot use welfare to make the distinction
- Example (elephant trampling maize):

		Ecosystem	Isic A	Isic B	Househol	Total
Supply						
Ecosysten	n service A	70				70
Ecosysten	n service B	-20				-20
Product X			200			200
Product Y	-> restorat	tion				0
Use						
Ecosysten	n service A		70			70
Ecosysten	n service B		-20			-20
Product X					200	200
Product Y	-> restorat	tion				0
Value add	ed (supply	50	150	0		200
					200	

