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Issue 5: Carbon accounting

1. How should carbon accounting be related to ecosystem accounting? What overlaps exist and where is discussion best placed?

2. What is the appropriate scope for carbon accounting?

3. What parts of carbon accounting remain to be articulated?

4. Draft Chapter 3 of SEEA Experimental Ecosystem Accounts outlines a method for measuring ecosystem services related to carbon sequestration. Is this method appropriate, are there alternatives, and what are the links to carbon accounts?

SEEA CF Table 5.3.1 General structure of the physical asset account for environmental assets (physical units) with adjustments (in red) for carbon asset accounts.

Tonnes C			Geo carbon	Biocarbon				Atmosphere	Water in oceans	Accumulation in economy		Country TOTAL
			Rocks	Ecosystems natural	Ecosystems semi-natural	Ecosystems agriculture	Ecosystems other			Inventories	Fixed assets	
Opening stock			oil									
Additions			Gas									
Growth	**Natural expansion**		Coal									
	Managed expansion		Other									
Discoveries												
Upward reappraisals												
Reclassifications												
	Imports											
Total additions												
Reductions in stock												
Extractions		**Managed contraction**										
Normal reductions		**Natural contraction**										
~~Catastrophic losses~~												
Downwards reappraisals												
Reclassifications												
		Exports										
Total reductions												
Closing stock												

1. **How should carbon accounting be related to ecosystem accounting? What overlaps exist and where is discussion best placed?**

    1. Biodiversity links carbon to ecosystem accounts which should reflect ecosystem functioning where biodiversity is a key variable.

    2. Carbon accounts need a reservoir (where carbon is stored) stability-longevity classification – ie ecosystem ranking.

    3. The land cover unit is the point of linkage.

Reservoir		Stability	Restoration time	Carbon density	Rank
Geocarbon		High	Geological	High	A. High
Biocarbon	Ecosystems natural	High-moderate	Decades to millennia	High	A. High
	Ecosystems semi-natural	Moderate	Years to centuries	Potentially high	B. Moderate
	Ecosystems agriculture	Low	Annual to decades	Low - moderate	C. Low-moderate

Ecosystem classifications; land classifications and the need for consistency

Ecosystems natural: are largely the product of natural and ongoing evolutionary, ecological and biological processes. The key mechanism of 'management' in natural ecosystems is natural selection operating on populations of species which has the effect over time of optimizing system level properties and the traits of component species. System-level properties which are naturally optimized with respect to, among other things, environmental conditions include canopy density, energy use, nutrient cycling, resilience, and adaptive capacity. Natural processes dominate natural ecosystems within which human cultural and traditional uses also occur. Natural ecosystems include terrestrial and marine ecosystems.

Ecosystems semi natural: are human modified natural ecosystems. Natural processes, including regenerative processes, are still in operation to varying degrees. However, the system is often prevented from reaching ecological maturity or is maintained in a degraded state due to human disturbance and land use. Thus, the vegetation structure may not reflect natural optima, and the taxonomic composition may be depauperate.

Ecosystems agricultural: are human designed, engineered and maintained systems that grow animals and crops mainly for food, wood and fibre and as feedstocks for biofuels and other materials on agricultural lands. Plantations of trees (commonly defined as woody perennial plants greater than two metres tall at maturity) are a type of agricultural ecosystem. Agricultural lands incorporate some natural ecosystem processes to varying degrees (e.g. pollination, mineralization).

Ecosystems other: include settlements and land with infrastructure.

2. What is the appropriate scope for carbon accounting?

1. As a component of ecosystem accounts linked through LCU?

    - Needs ecosystem type classification
    - Opportunity to broaden policy from sequestration (a flow) to include stock maintenance – ie facilitates understanding about limits and land use trade-offs

2. As an asset account within SEEA Central Framework?

    - Opportunity to generate comprehensive carbon stock and flow accounts through collaboration with IPCC/UNFCCC/scientists (global carbon cycle & ecologists)
    - Substantial gains for research and policy
    - Big information gains for not much more work than needed for (1)

3. What parts of carbon accounting remain to be articulated?

1. Soil carbon
2. Ecosystem type classification made implementable
3. Atmosphere and oceans common reservoirs
4. Separation of anthropogenic from non anthropogenic stock changes
5. Disentangling anthropogenic stock changes where regrowth takes longer than a year (UNFCCC netting)
6. Linkages with SNA – accumulations in economy (inventories, fixed assets), imports and exports
7. Monetary values

4. Draft Chapter 3 of SEEA Experimental Ecosystem Accounts outlines a method for measuring ecosystem services related to carbon sequestration. Is this method appropriate, are there alternatives, and what are the links to carbon accounts?

Issues

1. What does 'sequestration' mean: annual removal from the atmosphere (flow) and/or the stock of carbon stored?

    - Stock maintenance means avoided emissions – an ecosystem service
    - Annual removals is also an ecosystem service
    - They measure very different things.

2. Net carbon balance (NCB) measures

    - What does 'balance' mean? (here it means a stock – in a system that is open)
    - Disaggregate measurements for ecosystem type
    - Carbon 'left in ecosystem' = opening stock + NPP – (ecosystem turnover + heterotrophic respiration) – human extraction

3. Can this stock figure be generated using the asset account framework in slide 3?

NPP = carbon uptake from photosynthesis over a defined period minus respiration. Turnover is emissions from plant death and heterotrophic respiration is soil microbial respiration.