Ecosystem Natural Capital Accounting (1)

Principles and Framework

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4 sessions

1. Principles and Framework

2. Presentation of ENCA-QSP

3. Presentation of the Mauritius experimental accounts 2013

4. The way forward in the context of small developing states
What is ecosystem accounting?

What it is?
- Spatial
- Covering all ecosystems
- Combination of ecology and national accounting

How did it happen?
- Evolved over many years in academic and government agencies
- A rapidly evolving field

Where is it happening?
- Several countries are developing ecosystem accounts

Source: Michael Vardon’s presentation at the World Bank WAVES 1st Knowledge Exchange on Ecosystem Accounting, Manila, the Philippines, 23-27 February, 2015
Example: Mauritius – Experimental Ecosystems Natural Capital Accounts 2014

Key points
- A suite of accounts with land cover as a starting point
- It is complex but it can be done!
- Focuses on assets (e.g. natural capital) rather than services
- Learning by doing

Source: Michael Vardon’s presentation at the World Bank WAVES 1st Knowledge Exchange on Ecosystem Accounting, Manila, the Philippines, 23-27 February, 2015
Key concepts and links to policy

Monitoring ecosystem state and use

Understanding links ecosystem – economy

Ecosystem change and stakeholders

Designing ecosystem payment mechanisms

Ecosystem accounts

Land cover and use

Ecosystem Condition

Ecosystem service flows

Ecosystem assets (extent, capacity)

Biodiversity

Integration (e.g. supply – use)

Source: Lars Hein’s presentation at the World Bank WAVES 1st Knowledge Exchange on Ecosystem Accounting, Manila, the Philippines, 23-27 February, 2015
Why accounting for nature is important?

• Accounting = a technique to measure the “true” or net outcome of an activity, based on the complete recording of all entries and outcomes; double-entry accounting, cross-checking data

• Accounts’ “balancing items” are key indicators, strictly defined and much used: profit or loss, net income, net savings, accumulation, net worth (assets minus debts)... GDP, National Income...

• Accounting standards allow comparisons between economic agents (International Financial Standards) and between countries (System of National Accounts) as well as the measurement of change (growth, depletion, degradation, time series...)

• Accounts feed models with reliable data and statistics; models outcomes can be compared to the picture of the past and presents situation given by accounts and support policy making

• Physical accounts can be connected to the National Accounts (and to corporate, government accounts...): “carbon/CO2-eq accounts” (IPCC), “material flow accounts” (OECD Green Growth)... now ecosystem accounts

REMARK: Ecosystem accounts should combine comprehensive and perennial base accounts with more specific and detailed assessments of hot issues
How are Ecosystem Services & Assets recorded in the SNA?

- ES are input to production of goods and services, valued at the purchase price; ES are part of an economy-nature joint production...
- SNA production includes all goods produced for own account (incl. picking up berries, mushrooms, deadwood etc...).
- SNA natural assets are only economic assets, owned and managed for profit; it includes assets owned by governments but excludes ecosystem functions that benefit to others and the public: they are not taken into account.

- **ISSUES:** several prices are not rightly set.
  - Ignored: the ecosystem functions which are not economic assets are not recorded (zero price).
  - Incomplete: unlike consumption of fixed capital, consumption of ecosystem capital is not included in purchasers' prices (because economic agents don’t record it – it is for them an externality).
  - Values are not assigned to the right sectors because of rent extortion: Value Added of agriculture is very low, partly because value of food is recorded as Value Added of Agro-food industry and trade; the Value Added of molecules “discovered” via bio-prospecting is recorded as that of Pharmaceutical Industry, not of regions of origin (the ABS paradigm...).
Ecosystem Natural Capital Accounts: Key concepts

Adapted from Roy Haines-Young, Michael Vardon and Lars Hein

- What is the amount of resource flow?
- Do gains compensate for losses? (quantity)

Ecosystem capital / human capital

Economic activity

$ Benefits

Ecosystem services

Beneficiaries

(companies, households)

Ecosystem capital, stock at time 1

Stock carried over

Ecosystem capital, stock at time 2

Loss of quantity = depletion (of a resource)

Loss of quantity and quality = degradation (of a system)

Loss of stock e.g. by deforestation

Gain of stock e.g. by natural growth, afforestation

Unpaid remediation costs?

Has the quality of the stock been maintained?
Ecosystems deliver altogether **multiple services**

Some of them are input to economic goods and services

Others are public goods

**NOTE:** Excessive extraction of 1 service (here wood removal) can ruin all the others

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**Source:** Gilbert Long, 1972

A propos du diagnostic écologique appliqué au milieu de vie de l'homme.

Options Méditerranéennes, 13, CHIEAM, Montpellier, Juin 1972
**System and Services approaches**

**Ecosystem capital**

- **Productivity & resilience**

**Physical ecosystems** & **Ecosystem services**

- **Ecosystem Stocks & Flows, Extent & Condition**
  - **Ecosystem carbon, biomass**
    - Service a: e.g. Food provision
    - Service b: e.g. Timber provision
  - **Ecosystem water**
    - Service c: e.g. Fresh water provision/ blue water
    - Service d: e.g. Fresh water provision/ green water
  - **Bundle of intangible ecosystem infrastructure functional services (indirect measurement)**
    - Service e: e.g. Habitat
    - Service f: e.g. Pollination
    - Service g: e.g. Water regulation/ purification
    - Service h: e.g. Water regulation/ floods
    - Service i: e.g. Recreation
    - Service j: e.g. Tourism inputs
    - Service k: e.g. Symbolic values
    - Service l: e.g. Non-use values

**Monetary values**

- Ecosystem services valuation (market & shadow prices), Payments for Ecosystem Services Wealth assessments
- Service a $ valuation
- Service b $ valuation
- Service c $ valuation
- Service d $ valuation
- Service e $ valuation
- Service f $ valuation
- Service g $ valuation
- Service h $ valuation
- Service i $ valuation
- Service j $ valuation
- Service k $ valuation
- Service l $ valuation

**Total Ecosystem Capability**

- (in physical unit-equivalent)
- Degradation / Enhancement

**Integrity of ecosystem structures & functions**

**Sustainability of ecosystem services delivery**

- Maintenance & remediation costs, Ecological Taxes, Mitigation banking/ Offset Certificates...
Economic value vs. Ecological value

TEEB Glossary of Terms:

- **Ecological value**: non-monetary assessment of ecosystem integrity, health, or resilience, all of which are important indicators to determine critical thresholds and minimum requirements for ecosystem service provision;

- **Economic valuation**: the process of expressing a value for a particular good or service in a certain context (e.g. of decision-making) in monetary terms.”
Actual vs. Unpaid maintenance/ restoration costs

Actual expenditure:

- **UN SEEA Central Framework**
  Chapter IV Environmental activity accounts and related flows /
  Environmental protection expenditure accounts

- **The Biofin Workbook (UNDP)**
  Workbook 1b: Expenditure review of 1/ national expenditure, 2/ expenditure efficiency

  + 3/ funding needs according to scenarios

Unpaid maintenance/ restoration costs

*Estimation at the basis of offset mechanisms*

*E.g. EU Environmental Liability Directive of 2004*
Importance of measuring degradation

Example of the EU Environmental Liability Directive of 2004 (ELD2004): the “Polluter Pays Principle” is enforced regarding environmental damages with 3 purposes:

1. Avoid degradation when possible
2. Repair or restore when 1 is not possible
3. Compensate the damage elsewhere for an equivalent amount when 1 and 2 are not possible
Scope of the ELD 2004: similar to ecosystem accounts

Figure 2: Types of environmental liability and damage

- **Strict liability**
  - Annex III (examples):
    - IPPC/IED permit
    - Waste licence / permit
    - Discharges to waters
    - Dangerous substances
    - Water abstractions (WFD)
    - GMOs
    - Transport of waste
    - Mining waste
    - Carbon capture and storage
  - Land damage
  - Water damage

- **Fault-based liability**
  - Occupational activities not in Annex III
  - Damage to protected species and natural habitats
Remediation measures are then converted into Euros
Examples of offset / cap & trade schemes

• ELD2004 is a Directive ➔ country regulations (Natura 2000 context)

• USA: wetlands mitigation banking schemes...

• UNFCCC / Clean Development Mechanism: “carbon” offset permits

• Various private initiatives
  e.g. BBOP (Business and Biodiversity Offset Programme)
UNFCCD: Land-Degradation Neutral World

The LDN concept was first introduced as “zero net land degradation” in a proposal tabled at Rio+20.

• “In a land-degradation neutral world, the amount of healthy and productive land resources needed to support vital ecosystem services remains stable or increases in a given time and space.”

• “Restoring land at large scale improves watersheds and water drainage, refills aquifers, increases tree and plant cover, and helps to recover biodiversity and soil fertility.”
How an integrated accounting system works

- xlsx
Multiple approaches to environmental accounting

- Modelling (micro-economic, welfare, monetary aggregates)
- Statistics (macro-economics, accounts in money and physical units)
- Modification (+ or -) of SNA boundaries (assets, production and income)
- Accounting for multiple interacting systems
- Ecosystem Natural Capital Accounts
- TEEB, WAVES, VANTAGE

SEEA 93
SEEA 2003 & 2012
The System of Environmental-Economic Accounts “Central Framework” (SEEA-CF) adopted by the UN Statistical Commission in 2012 as an international statistical standard on par with the System of National Accounts (SNA 2008). 12) has been supplemented in 2013 by a volume on “Experimental Ecosystem Accounting” (SEEA-EEA). While the SEEA-CF is recommended for implementation, the SEEA-EEA which is a conceptual framework is now tested in various projects for which additional methodologies need to be defined. The CBD TS77 ENCA-QSP is a contribution to the development of such tests.
The SEEA and Related Accounting Frameworks

**SNA2008**
Policy targets/Indicators: Macroeconomic policies, GDP, National Income, Consumption, Investment, Savings, Assets and Liabilities...
Champions: IMF, WB, OECD, EC, all governments...

**Material Flow Accounting (OECD-Eurostat Manual, SEEA-CF ...)**
Policy targets: Resource Efficiency/Green Growth
Champions: OECD & European Commission

**IPCC guidelines ("carbon"/CO2-eq budgets), SEEA-CF**
Policy targets/indicators: Global Warming Mitigation, Commitments, "carbon" Debts and Credits, and SDG
Champions: UNFCCC, IPCC, WMO, UNEP, EC

**Natural Capital/Ecosystem Services Economic Accounts (WAVES, VANTAGE, TEEB, SEEA-EEA...)**
Policy targets/Indicators: Valuation of natural assets, Depletion, Valuation of Ecosystem Services & Assets
Champions: WB, UNEP

**Ecosystem Capital Accounts (SEEA-EEA, ENCA-QSP, MAES/ECA)**
Policy targets/indicators: Ecosystem maintenance, capability, resilience & services, liability of economic sectors, ecological debts/credits, and SDG
Champions: UNEP, CBD, UNDP? EC?
An accounting framework to put the SEEA-EEA to work NOW:
Ecosystem Natural Capital Accounts

- A response to the requirement of the CBD Aichi Target 2 call for incorporating, as appropriate and by 2020 at the latest, biodiversity values into national accounting.
- A technical accounting framework for measuring ecosystem sustainable capacity, resilience and economic sectors’ accountability to the ecosystem. It includes a set of tables and compilation guidance.
- A “distribution” (in the sense used for open source software) of the SEEA-EEA, aimed at putting it to work.
- A Quick Start Package for experimentations.
- Supported by a tutorial for technical training of experts.
An accounting framework to put the SEEA-EEA to work NOW:

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### Close correspondence between SEEA-EEA and ENCA-QSP

**Correspondence table between SEEA-EEA Technical Guidance and ENCA Quick Start Package**

<table>
<thead>
<tr>
<th>ENCA-QSP</th>
<th>SEEA-EEA Technical Guidance</th>
<th>Extent account</th>
<th>Condition account</th>
<th>Ecosystem services generation account (by CICES)</th>
<th>Ecosystem services use account (by beneficiaries)</th>
<th>Ecosystem capacity and expected ES flows</th>
<th>Ecosystem services supply ($)</th>
<th>Ecosystem services use ($)</th>
<th>Ecosystem asset account ($)</th>
<th>Augmented I-O Table</th>
<th>Integrated sector accounts and balance sheet</th>
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<tbody>
<tr>
<td><strong>QSP Core accounts</strong></td>
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<td>Core accounts/ biocarbon, water, green infrastructure</td>
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<td>Accessible resource surplus (potential service supply)</td>
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<td>Ecosystem services mapping and assessment (by CICES)</td>
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<td>Social demand for ecosystem services (by CICES)</td>
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<td>Valuation of ecosystem services</td>
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<td>Sectors accountability to ecosystem degradation</td>
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<td>Sustainable GVA induced by ES</td>
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<td>Ecological balance sheet (in capability units)</td>
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</table>


- **Fair match**
- **Partial match**
  - [1] Top-down in QSP Core, detailed in extensions
  - [3] Need of further discussion
  - [4] Possible fair match
- **No match**
  - [2] Systems vs. Services
  - [5] Different units
  - [6] Not addressed in ENCA
Next: Presentation of ENCA-QSP