

Session 6: Carbon, nitrogen, phosphorus and soil

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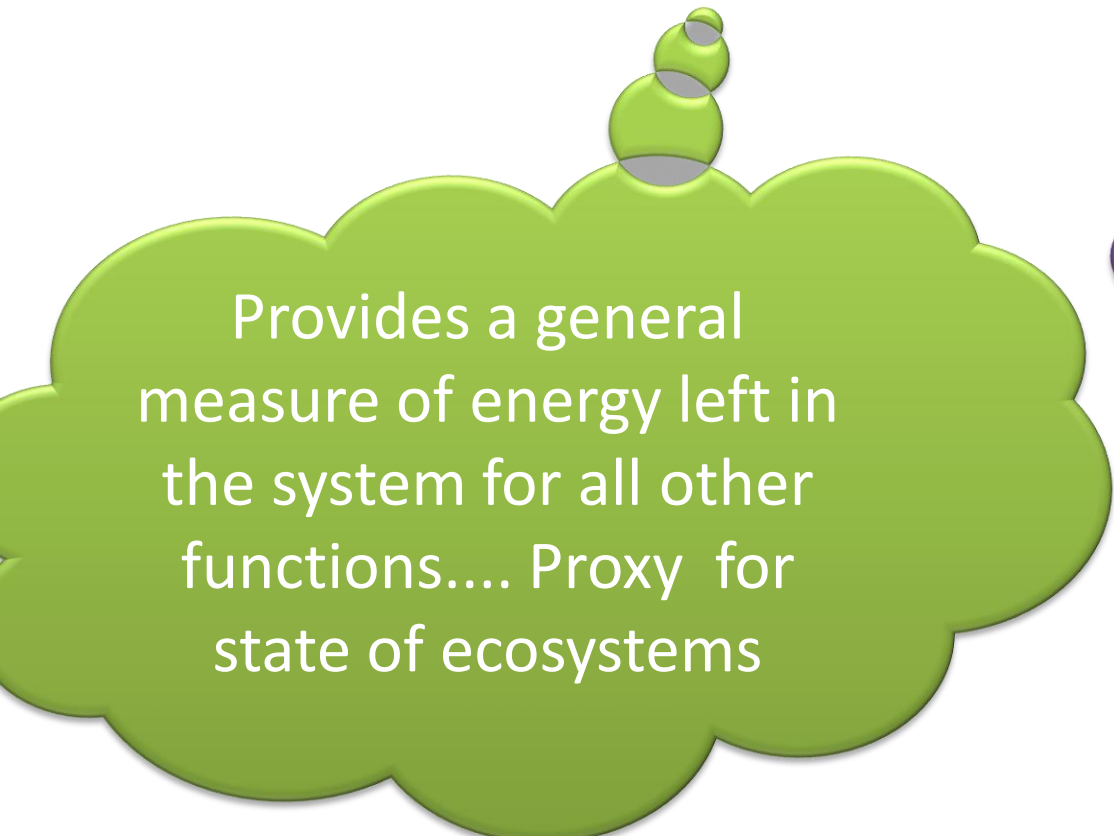
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Road Map Tasks for Carbon

- Describe measures for net primary productivity (NPP) and for the net carbon balance by accounting units.
- Outline data requirements for compiling the underlying stocks and flows for net ecosystem carbon (asset) accounts.
- Investigate current data availability to meet these requirements and identify potential data gaps or related challenges for producing accounts globally.

NPP & Net Carbon Balance (NCB)

$$\text{NCB} = \text{NPP} - \text{Removals}$$

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Provides a general measure of energy left in the system for all other functions.... Proxy for state of ecosystems

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Harvesting of crops, timber and via grazing

NCB for Forests in India

Gundimeda has shown:

- Carbon balance can be calculated using forest statistics data plus conversion factors to estimate biomass and carbon
- Data can be used to produce monetary accounts
- Approach compatible with SEEA framework
- But *complications....*

| | VALUE ACCOUNT | | | |
|--------------------------------------|-----------------------|--------------------|----------|-------------|
| | Timber ^(a) | Carbon | Timber | Carbon |
| | Million. Rupees | Million. Rupees | % of GDP | % of GDP |
| <i>Opening Stocks</i> | 90667058.45 | 3202313 | 489.04 | 17.27 |
| <i>Changes due to econ. activity</i> | -6434664.47 | -197785 | -34.71 | -1.07 |
| Logging | 5965309.13 | 202407.1 | 32.17 | 1.09 |
| Logging damage | 596530.91 | 0.1 | 3.22 | 0.000001 |
| Afforestation | 127175.57 | 4621.73 | 0.686 | 0.025 |
| Other volume changes | 627201.08 | 11478.95 | 3.38 | 0.062 |
| Forest fire | 203.87 | 3.91 | 0.0011 | 2.108E-05 |
| Stand mortality | 10667.92 | 2.89 | 0.057 | 0.00002 |
| Grazing | 17781.88 | 0 | 0.096 | 0 |
| Shifting cultivation | 171482.62 | 6368.82 | 0.92 | 0.034 |
| forest encroachments | 427064.78 | 5103.33 | 2.30 | 0.027 |
| Other accum | 5285276.81 | 139298.9 | 28.51 | 0.75 |
| Natural growth | 5677338.82 | 133947.2 | 30.62 | 0.72 |
| Regeneration | 53142.00 | 4077.72 | 0.29 | 0.022 |
| Transfer of land | -445204.02 | 1273.95 | -2.40 | 0.007 |
| <i>Net Changes</i> | -1776588.75 | -115968 | -9.58 | -0.62 |
| <i>Closing Stocks</i> | 88910549.61 | 3086346 | 479.56 | 16.65 |

Removals

Gains

Carbon Balance for Europe

- Ivanov et al. have:
 - Attempted to construct spatially specific carbon balance based on range of statistical and biophysical measurements:
 - *Role of **downscaling** techniques need to be considered*
 - *Stock estimates could be based on **all** land cover/use types.....*
 - *But note **NCB is NNP minus Removals** (not a direct stock change estimate)..... Conceptually equivalent to **HNAP***

Carbon Balance for Europe

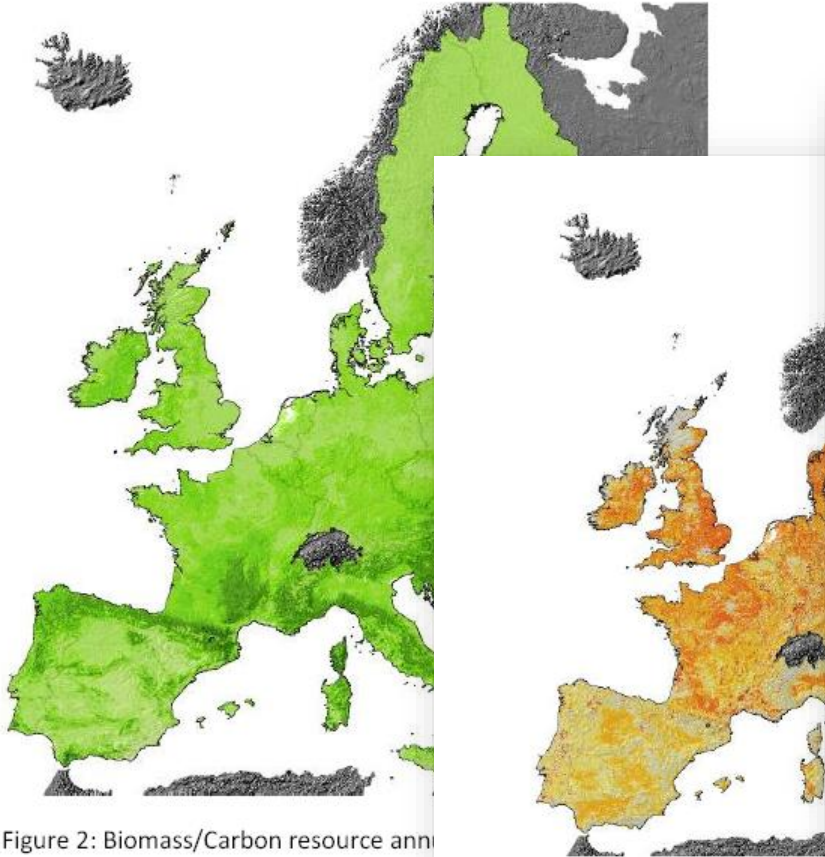


Figure 2: Biomass/Carbon resource annual net ecosystem carbon balance (NECB) in 2000



Figure 3: Human use of biomass in 2000

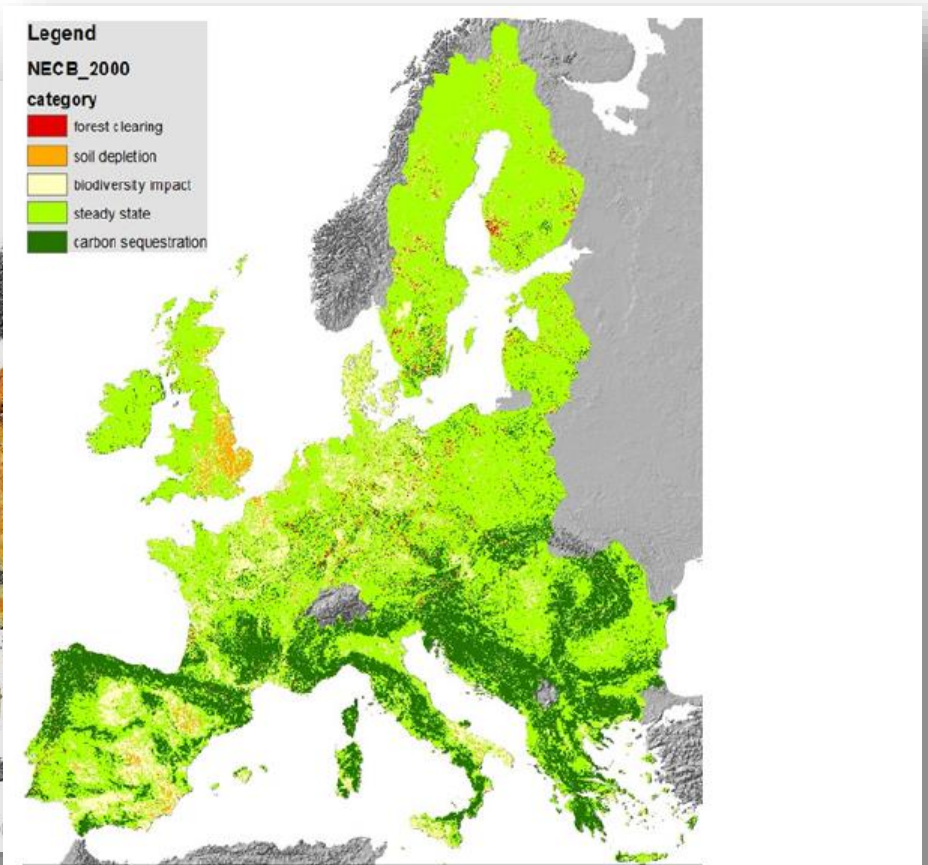


Figure 4: Net Ecosystem Carbon Balance and Figure 5 Interpretation of the NECB

The Need for Carbon Stock Accounts

- Explored by Ajani and Muukkonen
 - IPCC guidance: Impacts of ‘Land Use, Land Use Change’ reported in terms of net changes in stock.... *But opening and closing balances are not reported.....Comparison with SEEA*
 - Carbon accounts in SEEA more ‘comprehensive’
 - Includes stocks and flows
 - Includes ‘unmanaged areas’
 - Carbon accounts in SEEA potentially more ‘relevant’ (Policy framing in terms of stocks....)

The Need for Comprehensive Carbon Stock Accounts



Carbon Carrying Capacity (CCC)

Table 4 Comparison of some features of SNA, NGGI and comprehensive carbon accounts

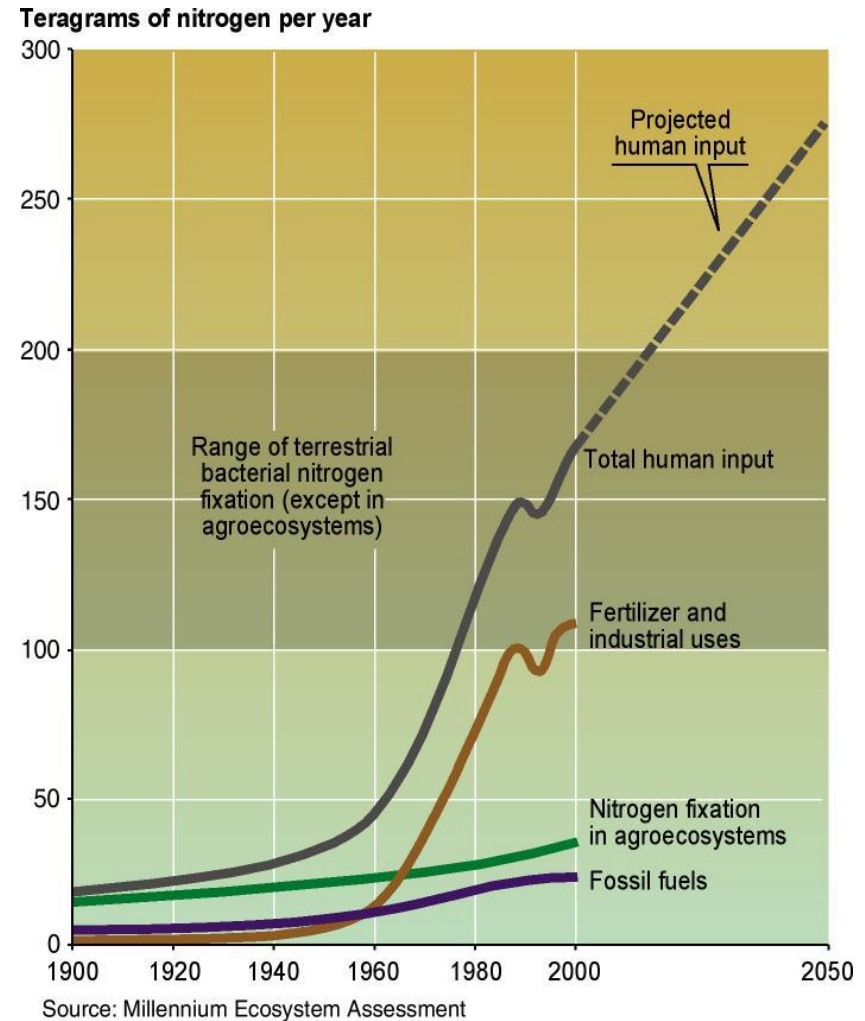
| | System of National Accounts (European Commission <i>et al.</i> , 2009) | National Greenhouse Gas Inventories (IPCC, 2006) | Comprehensive stocks and flows carbon accounts |
|----------------------------------|--|--|--|
| Jurisdiction | UN Statistical Commission | Intergovernmental Panel on Climate Change | Policy-independent institution |
| Structure | Stocks and flows | Flows | Stocks and flows |
| Data | Economic activity | Net CO ₂ e emissions | Carbon stocks and stock changes |
| Place where activity is recorded | Resident nationality of the institutional unit | National territory where emissions and removals occur (with exceptions. e.g. | National territory where stocks are held |

Adjani: Key questions

1. What form should a carbon account take, keeping in mind likely data sources, the needs of policy and maintaining accounts integrity?
2. What is the potential for integrating a carbon account with SEEA land, water, energy and environment protection expenditure accounts and possibly biodiversity account?
3. What is the priority for establishing ecologically meaningful land units tagged with land use history, and carbon stock and flow information covering an entire region or country?
4. How can carbon stocks in the oceans be included?

Further questions....

- How do we handle soil?
 - *Should soils be valued according to their individual properties?*
- How do we handle nutrients?
 - *N: The missing account?*



Conclusions:

Road Map Tasks for Carbon

- Describe measures for net primary productivity (NPP) and for the net carbon balance by accounting units.
 - Is NCB as currently framed useful? What other aggregates do we need (CCC)?
 - Broader understanding/agreement of decision making contexts for accounts is needed.
 - How robust is the downscaling and reassembly of data in appropriate accounting units?
- Outline data requirements for compiling the underlying stocks and flows for net ecosystem carbon (asset) accounts.
- Investigate current data availability to meet these requirements and identify potential data gaps or related challenges for producing accounts globally.
 - Integration of 'data' and 'model' based information to construct accounts
 - Need for database of rating/conversion factors...