Forum of Experts in SEEA Experimental Ecosystem Accounting
Session 1: Ecosystem Accounting Units

Advancing the SEEA-EEA Project
Overview: Spatial units

1. Why spatial units?
2. Criteria for spatial units
3. The SEEA-EEA representation
4. Issues
5. An example
6. Recommendations for testing
7. Recommendations for further research
Why spatial units?

Why?

- Units + classifications = structure

  - Accounting needs **statistical units** about which information is compared and aggregated
    - e.g., business statistics are built on locations, establishments, companies and enterprises
  - Need a common definition of Spatial Units for all accounts (Assets, Condition, Services, Water, Carbon, Biodiversity…)
    - i.e., scale, compile, analyse, compare and report on same spatial units
  - Information is collected on many **spatial levels**
    - Different information available at different levels
    - Needs to be consolidated and compiled
Criteria for spatial units (provisional)

- Available globally & frequently
- Homogenous at some level
  - Represent “optimal units” in terms of patterns
  - With respect to ecosystem services (processes?)
- Represents all ecosystem types, including gradients between them (ecotones)
- Hierarchical & scalable
- **MECE**: Mutually Exclusive, Collectively Exhaustive
- Time-invariant?
The SEEA-EEA representation

Three levels: hierarchical and mutually exclusive:

1. Basic Spatial Unit (BSU): Pixel or grid cell
2. Land Cover Ecosystem Functional Unit (LCEU): Homogenous according to criteria (e.g., cover, slope, drainage area, elevation...)
   • Consolidate for tables by LCEU type
3. Ecosystem Accounting Unit (EAU)
   • For reporting (e.g., sub-drainage area, administrative area...)
Issues

- Does it represent all ecosystems?
  - If only land cover:
    1. How to treat freshwater, coastal and marine?
       - Upstream/downstream, benthic vs pelagic
    2. May exclude vertical dimension
       - Wetlands, soil, mountain areas
    3. Not homogenous for conditions: quality, management regime, use, ownership
    4. Excludes connective phenomena:
       - Airsheds, migration routes, water networks…
    5. Classification may exclude ecotones
More issues

- Homogenous?
  6. LCEUs may not represent “optimal” unit in terms of capturing spatial patterns
  7. Large BSUs may hide important patterns
     ▫ “averaging” may introduce unnecessary uncertainty
  8. How to deal with other sources of uncertainty: spatial interpretation?

- If based only on land cover, LCEUs are not homogenous “ecosystems” from an ecological perspective
An example...
An example...
An example...
Recommendations for testing

- Use multiple criteria to delineate LCEUs
  - e.g., land use, ownership, hydrology, infrastructure networks, topography, protected areas, species habitats
  - e.g., existing ecological classifications

- Test other “intermediate” spatial units:
  - e.g., landscape, viewscape, river units, coastal and marine units

- Maintain data at the appropriate scale rather than transforming to one scale
  - e.g., as above → scale for specific analysis

- Test effects of BSU size
  - e.g., compare interpretation and results of 30m vs 1km

- Test land cover data from alternative sources
  - e.g., different sensors & seasons, recent aerial photography, ground truthing
Recommendations for testing

- Link spatial levels with appropriate information, e.g.,

<table>
<thead>
<tr>
<th>Spatial scale</th>
<th>Data</th>
<th>Type of analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSU</td>
<td>Land cover, location</td>
<td>Land cover change</td>
</tr>
<tr>
<td>LCEU</td>
<td>Land use, soil type, slope, elevation, location within catchment, species abundance, biomass</td>
<td>Local service production, local service-beneficiary linkages</td>
</tr>
<tr>
<td>Landscape</td>
<td>Barriers, habitats, ecological interactions, beneficiaries, micro-climate, local drivers of change (e.g., population, industry), visitor rates, streamflow, erosion rates</td>
<td>Fragmentation, heterogeneity, inter-ecosystem flows, biodiversity</td>
</tr>
<tr>
<td>Drainage area</td>
<td>Freshwater availability, recharge rates</td>
<td>Water-based phenomena such as flow of water, pollutants and nutrients.</td>
</tr>
<tr>
<td>EAU</td>
<td>Management regime, environmental activities (expenditures, management), beneficiaries</td>
<td>Aggregate of all of the above.</td>
</tr>
<tr>
<td>National</td>
<td>Socio-economic drivers, beneficiaries</td>
<td>Trends in all of the above; national beneficiaries</td>
</tr>
<tr>
<td>Global</td>
<td>Climate, socio-economic drivers, beneficiaries</td>
<td>Global trends in all of the above; global beneficiaries;</td>
</tr>
</tbody>
</table>
Recommendations for testing

- Report sources of error in spatial data
  - Ground-truthing to minimize interpretation errors
  - Record uncertainty in underlying data
- Assess how spatial units, scaling and aggregation are treated in spatial ecosystem services models
Recommendations for research

- Develop coherent approaches for treatment of:
  - freshwater, coastal, marine (benthic, pelagic) ecosystems
  - connective phenomena (airsheds, hydrological networks, disjoint habitats)
  - uncertainty in land cover interpretation
- Develop link between soil classification and ecosystem condition and capacity
- Research on “optimal” spatial units for ecosystem accounting that meet the criteria suggested (service providing units?)
Conclusions

- The existing approach (BSU, LCEU, EAU) is a pragmatic starting point if only land cover data are available

- Meets many criteria:
  - Availability
  - Homogeneity
  - Representativeness
  - Hierarchical & scalability
  - MECE
  - Time-invariance

- Testing can work around some of the issues, but research can develop better solutions...
Suggestions for breakout groups

- Priority issues, criteria, options for testing of Spatial Units in accounts for:

1. **Land/Asset** (delineation criteria, measurement of error)
2. **Water** (freshwater, coastal, marine, wetlands, quality)
3. **Carbon** (including stock, sequestration)
4. **Biodiversity** (indices, species, habitats)
5. **Condition & Capacity** (quality, biophysical)
6. **Services** (provisioning, regulating, cultural)
Acknowledgements

- This project is a collaboration of The United Nations Statistics Division, United Nations Environment Programme and the Secretariat of the Convention on Biological Diversity and is supported by the Government of Norway.