Experiences from small scale ecosystem mapping and valuation exercises from Lithuania

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Assessment design

First stage:

- Establishing of the primary national set of ESS
- Establishing PRIORITY list of ESS
- Precise mapping/evaluation of small-scale case study site
- Establishing a sufficient network of complex model areas
- Evaluation of ESS comparative degree of significance for model areas
- Selection of ESS with high/medium degree of significance for the itemization
- Evaluation of the main ESS stocks, use, quality in model areas
- Extrapolation and merging with other info from model areas network for national mapping/assessment of ESS
- Mapping of the main ESS
Assessment design

Second stage:

• *Economic value identification for the main ESS in model areas*

• Extrapolation and merging with other info from model areas network for the *national economic valuation of ESS*
Experiences from Small Scale Ecosystem Mapping and Valuation Exercises from Lithuania. CEEweb Academy on Preserving Europe’s Ecosystems and Natural Capital – Tools and Processes in Theory and Practice, 7-8 October 2013, Budapest, Hungary
Assessment design

National List of ESS

Small-scale pilot study

List of ESS for first model site (PA)

First model site (PA) assessed

Network of model sites

List of ESS for rest of Model network

Rest of network assessed

Additional data

National ESS Assessment = PA ESS + not PA ESS
Performing Pilot case study

Small-scale “Show Case” study: main added value, besides adaptation of methods and capacity building - in understandable, clear and acceptable manner introduces to community the idea of ecosystem services and their importance.

Main procedures:
• Case study site, important to local community and with recent notable changes, selected,
• ESS’s comparative degree of significance for small-case study area evaluated,
• ESS with high and medium degree of significance selected for itemization and analysis,
• Main ESS extent, use evaluated and economic value identified.
Performing Pilot case study

Impact analyzed during pilot case study: clear-cut, resulting in ceasing of important ESS and economical loses.
Performing Pilot case study

Importance valuation & specifying ESS for case study site before impact

<table>
<thead>
<tr>
<th>Service class</th>
<th>Service/goods</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Provisioning</td>
<td>1.1. Timber</td>
</tr>
<tr>
<td>1.2.1. Mushrooms</td>
<td></td>
</tr>
<tr>
<td>1.2.2. Nuts</td>
<td></td>
</tr>
<tr>
<td>1.2.3. Fish</td>
<td></td>
</tr>
<tr>
<td>2. Regulating</td>
<td>2.1. Soil erosion prevention</td>
</tr>
<tr>
<td>3. Cultural</td>
<td>3.1. Tent camping</td>
</tr>
<tr>
<td>3.2. Fishing</td>
<td></td>
</tr>
<tr>
<td>3.3. Wedding day parties – “outing to nature”</td>
<td></td>
</tr>
</tbody>
</table>

Service class
Main service/goods groups/types
Significance in study area
High | Medium | Low | Insufficient | None
---|---|---|---|---
Provisioning Food
- Anthropogenic ecosystems:
  - Food crops +
  - Livestock +
  - Capture (fishing & aquaculture) +
- Wild Foods:
  - Game +
  - Mushrooms +
  - Nuts +
  - Fish +
  - Berries +
- Fruits:
  - Timber +
  - Cotton, hemp, silk +
  - Wood fuel +
  - Paper +
  - Genetic resources +
  - Biocatalysts & Medicines +
  - Pest +
Regulating
- Air quality regulation:
  - CO2 sequestration +
  - H, F, S removal +
- Climate regulation:
  - Global +
  - Regional +
  - Local +
- Water regulation:
  - Soil water erosion +
  - Soil wind erosion +
  - Water purification +
- Soil quality regulation:
  - Detoxification of waste +
  - Disease regulation +
- Pest regulation +
- Pollution +
- Noise regulation +
- Natural hazards regulation +
Cultural
- Recreation & Aesthetics +
- Hedonic values +
- Educational values +
- Spiritual & religious values +
- Aesthetic values +
- Inspiration +
- Social relations +
- Sense of place +
Supporting
- Energy capture (primary production) +
- Nutrient cycling +
- Pollination +
- Habitat +
- Soil formation +
Performing Pilot case study

Results of economic valuation of ESS in case study site

<table>
<thead>
<tr>
<th>Service class</th>
<th>Service/goods</th>
<th>Annual monetary value, €/year</th>
<th>Immediate monetary value, €</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Provisioning</td>
<td>1.1. Timber</td>
<td></td>
<td>13900</td>
</tr>
<tr>
<td></td>
<td>1.2.1. Mushrooms</td>
<td>2200</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.2.2. Nuts</td>
<td>300</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.2.3. Fish</td>
<td>800</td>
<td></td>
</tr>
<tr>
<td>2. Regulating</td>
<td>2.1. Soil erosion prevention</td>
<td>5100</td>
<td></td>
</tr>
<tr>
<td>3. Cultural</td>
<td>3.1. Tent camping</td>
<td>5000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.2. Fishing</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.3. Wedding day parties – “outing to nature”</td>
<td>720</td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL (LT prices):** 15120 13900

**TOTAL (DE prices, appr.):** 31000
Performing Pilot case study

Limitations:

• Only final ecosystems services and goods (‘final products’) taken into account!

• Mainly actual use of services was analyzed, not the capacity of ecosystem to provide a service!

• ESS, important to the area, but not taken into account:
  - Provisioning: wild berries, wild flowers, medicine plants,
  - Regulating: hydrological regime stability,
  - Cultural: one-day camping, schoolchildren excursions, birdwatching,
  - All Supporting services, including quite important pollination and habitat provision services
Performing Pilot case study

E.g. habitat fragmentation:
Example 1:
Income loss during fishing activity shutdown period:

\[ K_t = d \times L_{1d} \]

where:

- \( K_t \) – income loss;
- \( d \) – number of days, available for fishing
- \( L_{1d} \) – per day tariff, calculated:

\[ L_{1d} = \sum (Z_t \times p) : d \]

where:

- \( Z_t \) – kg of the specific fish species (last year annual mean);
- \( p \) – market price per kg of the specific fish species (last year annual mean);
- \( d \) - number of days, available for fishing
Example 2: wild foods: mushrooms – parameters evaluated:

- Mean productivity,
- Loss by worm-eating,
- Mushroom activity type (industrial, individual),
- Productivity according forest type;
- Productivity according regional localisation;
- Productivity according season (3 seasons – starting, mushroom activity peak, growth intensity peak);
- Area of use;
- Use intensity (person/day, proximity, frequency parameters);
- Local habits.
Establishing of the Network of model sites

Main idea – in order to save costs and time, detailed and highly accurate information for majority ESS will be selected during in-deep research only in comprehensive network of model sites.

Selected model sites for national valuation of ESS represents Lithuanian territory and are based on physical, natural and social parameters:

- Forest/grassland coverage
- Coverage by wetlands and water bodies
- Density of inhabitants
- Proximity to bigger cities
- Local customs/habits

Optimal size of the site – 10,000-20,000 ha. Part of protected areas within the total area of all model sites corresponds to the proportion of PA on national scale.
Establishing of the Network of model sites

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Acknowledging protected areas difference

Main idea – the same ESS complex in *protected area* (with staff, management and infrastructure) contains *higher value*, thus, *indexing* should be performed, when extrapolating results.

**Why Protected Area?**

1) **Added value:**
   - Specific complex of ES and ESS
   - Exceptional (rare) value of individual/complex of ESS
   - Specific manner/intensity of ESS use
   - Higher responsibility/opportunities for local authorities/community
   - Precise assessment of ESS on national scale

2) **Relatively easy to identify:**
   - Clear borders, area, cover, habitat composition/biodiversity, costs
   - Opportunities to monitor use of main ESS

3) **Supporting features for use intensity/value:**
   - Infrastructure, staff

*Supporting & provisioning* (high biodiversity (genetic resources), habitats, *medicines*), cultural
Inventory and evaluation of ESS for mapping

• Primary research:

  *Biodiversity evaluation (territory mapping + expected numbers),*  
  *In-situ inventory, observations, monitoring,*  
  *Interviews/questionnaires for stakeholders;*

• Spatial data analysis:

  *Corine Land Cover data*  
  *Protected areas GIS database*  
  *Woodland Key Habitat inventory maps*  
  *Inventory of Habitats of EU importance*  
  *Territorial use potential (zoning) GIS layers*  
  *Aerial pictures for precise initial analysis*
Inventory and evaluation of ESS for mapping

• Economic evaluation:

  Market value
  Cost-based (Shadow pricing)
  Travel costs
  Hedonic pricing
  Willingness to pay

  Value/Benefit-transfer - for ESS with global or national effect, like carbon dioxide sequestration, climate change, water purification, erosion, habitat provision, etc.
First results of monetarization

<table>
<thead>
<tr>
<th>Service class</th>
<th>Service/goods</th>
<th>Annual monetary value, €/year</th>
<th>Immediate monetary value, €</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provisioning</td>
<td>Timber</td>
<td>1,057,334</td>
<td>11,029,450</td>
</tr>
<tr>
<td></td>
<td>Peat</td>
<td>70,000</td>
<td>2,800,000</td>
</tr>
<tr>
<td></td>
<td>Wild foods (forest)</td>
<td>1,025,366</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Genetic resources</td>
<td>6,338</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fish</td>
<td>5,052</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fresh water</td>
<td>152,945</td>
<td></td>
</tr>
<tr>
<td>Regulating</td>
<td>Climate regulation</td>
<td>379,951</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Air quality regulation</td>
<td>1,404,601</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Water purification</td>
<td>734,764</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pest regulation</td>
<td>38,663</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Soil erosion prevention</td>
<td>1,196,559</td>
<td></td>
</tr>
<tr>
<td>Cultural</td>
<td>Camping</td>
<td>618,026</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fishing</td>
<td>22,500</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cognitive development, nature watching</td>
<td>87,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Travel costs avoided</td>
<td>220,600</td>
<td></td>
</tr>
<tr>
<td>Supporting</td>
<td>Nutrient cycling &amp; soil formation</td>
<td>601,037</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pollination</td>
<td>792,687</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Habitat provision</td>
<td>2,719,729</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL (LT prices):</strong></td>
<td><strong>11,133,152</strong></td>
<td><strong>13,829,450</strong></td>
</tr>
</tbody>
</table>
First results of monetarization

<table>
<thead>
<tr>
<th>Service class</th>
<th>Service/goods</th>
<th>Approximate differences of annual monetary value of ESS, €/year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Value in the Protected area</td>
</tr>
<tr>
<td>Provisioning</td>
<td>Timber</td>
<td>40-60%</td>
</tr>
<tr>
<td></td>
<td>Peat</td>
<td>10-15%</td>
</tr>
<tr>
<td></td>
<td>Wild foods (forest)</td>
<td>80-90%</td>
</tr>
<tr>
<td></td>
<td>Genetic resources</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>Fish</td>
<td>85-90%</td>
</tr>
<tr>
<td></td>
<td>Fresh water regulation</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>Air quality regulation</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>Water purification</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>Pest regulation</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>Soil erosion prevention</td>
<td>100%</td>
</tr>
<tr>
<td>Cultural</td>
<td>Camping</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>Fishing</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>Cognitive development, nature watching</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>Travel costs avoided</td>
<td>100%</td>
</tr>
<tr>
<td>Supporting</td>
<td>Nutrient cycling &amp; soil formation</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>Pollination</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>Habitat provision</td>
<td>100%</td>
</tr>
</tbody>
</table>

ESS complex in PA vs regular ESS complex = 1,28
Preliminary NCI for the first area

<table>
<thead>
<tr>
<th>Habitats</th>
<th>NCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Artificial surfaces</td>
<td>0,092</td>
</tr>
<tr>
<td>Arable land and permanent crops</td>
<td>0,725</td>
</tr>
<tr>
<td>Pastures</td>
<td>2,429</td>
</tr>
<tr>
<td>Heterogeneous agricultural areas</td>
<td>3,208</td>
</tr>
<tr>
<td>Broad-leaved forest</td>
<td>3,849</td>
</tr>
<tr>
<td>Coniferous forest</td>
<td>15,26</td>
</tr>
<tr>
<td>Mixed forest</td>
<td>15,35</td>
</tr>
<tr>
<td>Transitional woodland-shrub</td>
<td>3,594</td>
</tr>
<tr>
<td>Wetlands</td>
<td>6,819</td>
</tr>
<tr>
<td>Inland waters</td>
<td>1,654</td>
</tr>
<tr>
<td><strong>Total (18159 ha):</strong></td>
<td><strong>52,98</strong></td>
</tr>
</tbody>
</table>
Priority list of ESS

**General procedure:**
Full list (up to 47 ESS), including 4 comparative degrees of significance

ESS, relevant and important (high and medium importance) in Lithuania (up to 32)

**Priority list** (up to 20 main ESS)

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**Provisioning**
Wild Foods
Fibre: Timber
       Linen
       Wood fuel
Peat
Genetic resources
Biochemicals & medicines
Freshwater
**Anthropogenized food&fuel**

**Regulating**
Air quality regulation:
   CO₂ sequestration
   N, P, S removal
Climate regulation:
   global
   regional and local
Erosion regulation:
   soil water erosion
   soil wind erosion
Water purification
Soil quality regulation
Detoxification of waste
Disease regulation
Pest regulation
Noise regulation
Natural hazard regulation

**Cultural**
Recreation & Amenity
Scientific values
Educational values
Spiritual & religious values
Aesthetic values
Inspiration

**Supporting**
Pollination
Habitat provision

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Priority list of ESS

**Important limitations:**

1. *Food crops, livestock, aquaculture, fuel crops grouped* in one group – *anthropogenized food&fuel ESS*, as being easily transformable heavily anthropogenized provisioning ESS;

2. *Not included* in the Priority List:
   - non-biotic ESS (minerals [except *peat*], energy, underground/ground water etc.)
   - urban ESS
   - *social relations and sense of place*
   - all supporting ESS, except *pollination and habitat provision*;

3. Strong emphasize on **final ecosystems services and goods**;

4. Mainly **actual use** of services and readily **available amount** of ESS is foreseen to analyze, not the *capacity* of ecosystem to provide a service
Thank You!

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