Ecosystem Services Assessment in the Basque Country

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Ecosystem Services Assessment in the Basque Country

1- Ecosystem services
2- An integrative approach
   – Mapping ES
   – People demand
3- Indicators of multifunctionality
4- Conclusions. Implementation in management strategies and politics
1 - Ecosystem Services

Benefits that ecosystems provide to society

Guide to the Millennium Assessment Reports

Full Reports
The Working Group assessment reports are between 500–800 pages in length, with a volume of summaries of about 120 printed pages. Learn more
- Current States & Trends
- Scenarios
- Policy Responses

Synthesis Reports
The first set of assessment reports consists of an overall synthesis and 5 others that interpret the MA findings for specific audiences. Learn more
- Overall synthesis
- Biodiversity
- Desertification
- Business & Industry

Millennium Ecosystem Assessment
scientific basis for action
A regional integrative approach to enhance the link between science, policy-making and society.
2- An integrative approach

ECOSYSTEMS
- BIODIVERSITY
- FUNCTIONS
- ECOSYSTEM SERVICES

SOCIAL SYSTEM
- HUMAN WELL-BEING
- VALUE
  - People perception
  - Total economical value (use, non-use)
  - socio-cultural value
  - economical value

Decision level. Politics

biophysical value
- Mapping ecosystem services

Identifying hotspots or priority areas for multiple ecosystem services to enhance sustainable land management

Biodiversity, water delivery, flood control, carbon store, pollination, aesthetic value,
Aim: contribute to the debate about the role of ecosystem services in conservation

• to what extent the conservation of biodiversity will ensure the provision of ecosystem services?.

Questions:
1- which ecosystems are the most important producers of biodiversity, carbon storage and water regulation?
2- to what extent do the biodiversity, carbon storage and water regulation hotspots overlap?

Case study: Urdaibai BR
The Plan for Landscape Management
Study area: watershed in northern Spain: Urdaibai B.R.
• Costal and mountainous landscapes. 220km²; 44,000 inh.

Coniferous plantations 44%, natural forests 15%  

Methodology

Biodiversity was calculated and valued as (CITA):
• \( B = f(r) + f(q) + f(p) \)
  richness; habitat quality (succession); degree of legal protection.

Carbon storage C (biomass and soil) was valued as (IPCC, 2003):
• Inventory of organic C stored in the soil (Neiker-Ihobe, 2004). CB (biomass)
  \( CB = V \times BEF \times (1 + R) \times D \times CF \)
  the root-to-shoot ratio; wood density; the carbon fraction of dry matter

Water flow regulation was based on the TETIS model (Vélez et al., 2009) (WC) was calculated as (mm/year):
• \( WC = Hu/R \)
  water stored in the soil; annual rainfall; corrected annual potential evapotranspiration

- A Geographic Information System-based approach was designed to estimate spatially the value of the biodiversity and ecosystem services. Spatial units were grid cells with a size of 4 m².
Results: Maps of biodiversity, carbon storage, water flow regulation, aesthetic value and recreation
- Results

• Natural forests are the ecosystems that most contribute to biodiversity, carbon storage and water flow regulation

• Conservation of natural forests should improve biodiversity, carbon storage and water flow regulation (Master Plan for Use and Management)

• Forest plantations contribute to some ecosystem services but have negative effects on the biodiversity

• Conservation based only on ecosystem services might be detrimental to biodiversity

Onaindia et al. 2013. Environmental science and policy 33: 283-294
Social demand. Case of study: metropolitan area of Bilbao (30 minutes RB). A urban/rural/natural gradient

406 km²
- 893,298 inhabitants
- 2,200 inh/km²
- (Bilbao 8,564 inhab/km²)

- High % of urban soil: services
- Primary sector
- Mixed uses: agriculture and industrial

Define multifunctional areas
Social approach: demand of ES

The most important services:
- Biodiversity
- Air quality

- Education level and age: most influential for the value given to ES

Williness to pay (WTP)
There is a great deal of permeability between the urban-rural-natural environments as well as integration of the periurban landscape in urban processes (mutual dependency).
The contribution of the municipalities to the provision of ecosystem services is not considered for economical incentives, even though they are fundamental for human well-being.

1,200 km², 250 municipalities, 2,200,000 inhabitants

Selected indicators of Ecosystem Services:
15 indicators for 11 ES

<table>
<thead>
<tr>
<th>Services</th>
<th>Indicators</th>
<th>Low performance benchmarks</th>
<th>Target</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Provisioning</strong></td>
<td></td>
<td></td>
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<tr>
<td>Food</td>
<td>DC: Density of head of cattle (N*/100 ha)</td>
<td>0</td>
<td>Max. t. s.</td>
<td>Burkhard et al., 2012; Kandziora et al., 2012</td>
</tr>
<tr>
<td></td>
<td>AP: Agricultural production (Ton/ha)</td>
<td>0</td>
<td>Max. t. s.</td>
<td>Maes et al., 2012; European Commission, 2014</td>
</tr>
<tr>
<td>Raw materials</td>
<td>Timb: Timber in forest plantations (m³/ha)</td>
<td>0</td>
<td>Max. t. s.</td>
<td>Burkhard et al., 2012; Maes et al., 2012</td>
</tr>
<tr>
<td>Freshwater</td>
<td>RO: Runoff = renewable water supply (mm)</td>
<td>Min. t. s.</td>
<td>Max. t. s.</td>
<td>MEA, 2005</td>
</tr>
<tr>
<td><strong>Regulating</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Global climate regulation</td>
<td>SCSB: Stored C in soil and biomass (Ton C/ha)</td>
<td>0</td>
<td>Max. t. s.</td>
<td>Maes et al., 2012; Kandziora et al., 2012; van Oudenhoven et al., 2012; Layke et al., 2012</td>
</tr>
<tr>
<td>Maintenance of soil fertility</td>
<td>OCS: Organic C in soil (Ton C/ha)</td>
<td>0</td>
<td>Max. t. s.</td>
<td>Maes et al., 2012</td>
</tr>
<tr>
<td>Local climate regulation</td>
<td>Et: Evapotranspiration (mm)</td>
<td>Min. t. s.</td>
<td>Max. t. s.</td>
<td>Burkhard et al., 2012; Kandziora et al., 2012; Layke et al., 2012</td>
</tr>
<tr>
<td>Water flow regulation</td>
<td>SWS: Soil water storage capacity (mm)</td>
<td>0</td>
<td>Max. t. s.</td>
<td>van Oudenhoven et al., 2012; Layke et al., 2012</td>
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<tr>
<td></td>
<td>SWI: Soil water infiltration capacity (cm/h)</td>
<td>0</td>
<td>Max. t. s.</td>
<td>Maes et al., 2012; Layke et al., 2012; Gomez-Baggethun and Barton, 2012</td>
</tr>
<tr>
<td>Water purification</td>
<td>RF: Cover of riparian forest in river margins (% in 25 m buffer)</td>
<td>0%</td>
<td>100%</td>
<td>Plieninger et al., 2012; European Commission, 2014</td>
</tr>
<tr>
<td></td>
<td>NF: Cover of natural forest (% of municipality's surface)</td>
<td>0%</td>
<td>Max. t. s.</td>
<td>European Commission, 2014</td>
</tr>
<tr>
<td>Erosion prevention</td>
<td>Eros: Areas without erosion problems (% of municipality's surface)</td>
<td>0%</td>
<td>100%</td>
<td>Kandziora et al., 2012</td>
</tr>
<tr>
<td><strong>Cultural</strong></td>
<td></td>
<td></td>
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<tr>
<td>Tourism</td>
<td>RTS: Density of rural tourism establishments (N*/km²)</td>
<td>0</td>
<td>Max. t. s.</td>
<td>Burkhard et al., 2012; Kandziora et al., 2012</td>
</tr>
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<td><strong>Biodiversity</strong></td>
<td></td>
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<td></td>
<td>SP: Special protection area</td>
<td>0</td>
<td>Max. t. s.</td>
<td>Maes et al., 2012</td>
</tr>
</tbody>
</table>

\[ \text{MESLI} = \sum_{i=1}^{11} \frac{\text{Observed value}_i - \text{Low performance benchmark}_i}{\text{Target}_i - \text{Low performance benchmark}_i} \]
Results: Multifunctionality index value for each municipality

Urban/Rural

In general: the higher the value of the index, socioeconomic status is worse
Results for management

• The indicator is a tool for measuring the multifunctionality, and to develop a system of socio-economic compensation for the provision of ecosystem services at municipality level

• Recognising the contribution of the municipalities to human well-being has the potential to improve the socioeconomic situation and reduce the differences between them
4- Conclusions

The perspective of ecosystem services contributes to develop sound land-use policies and planning actions

– Conservation Plans based on ecosystem services and biodiversity. Urdaibai (PRUG), Planning for the Metropolitan area of Bilbao (PTP), Strategy for Land Management (DOT)

– Socio-economic compensation for landscape multifunctionality. Inex

• Important issues:

  – Stakeholders’ participation and collaboration between researchers, technicians and politicians

  – Development of technical tools: mapping, indicators, others (spatially explicit accurate information).

  – Engagement in Networks
Outreach materials
The team:

- Acha, Arantza
- Ametzaga, Ibone
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- Boto, Alex
- Casado, Izaskun
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- Rodríguez-Loinaz, Gloria
- Unzueta, Jasone
- Uria, Aitana
- Viota, Nekane

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Peer review: Salvatore Arico (UNESCO) and Henrique Pereira (Lisbon University)

1 University of the Basque Country
2 County Council of Biscay
3 Basque Government
4 Urdaibai Biosphere Reserve
5 UNESCO Etxea
Thank you
Eskerrik asko

Think global and act local

.......Sustainable Development Goals....