Mapping and Assessing Ecosystem Services in Parque Natural do Sudoeste Alentejano e Costa Vicentina

Paula Antunes, Rui Santos, Pedro Clemente, Marta Calvache, João Fernandes

CENSE – Center for Environmental and Sustainability Research
Faculdade de Ciências e Tecnologia
Universidade Nova de Lisboa
OpenNESS…

• aims to translate the concepts of natural capital and ecosystem services into operational frameworks that provide tested, practical and tailored solutions for integration into land, water and urban management and decision making.

• is an EU funded project which runs from December 2012 to May 2017

• is coordinated by the Finnish Environment Institute (SYKE)

• consists of 35 partners, including 10 SMEs, from 14 European and four non-European countries
The OpenNESS approach is based on an iterative cycle of methodological development and refinement linked to the application in a set of real-world case studies.
The 27 OpenNESS case studies cover a range of socio-ecological systems and are clustered according to the policy and management focus for ecosystem service operationalisation.
Parque Natural do Sudoeste Alentejano e Costa Vicentina (PNSACV), is one of the few remaining well-preserved coastlines in Western Europe.

Main pressures:
- Spread of invasive species
- Polluting activities (irrigated agriculture, nearby industry)
- Tourism – though heading towards a nature-based model
Aims and objectives

Explore how NC and ES concepts can be used to support policy and land use planning to ensure a more sustainable management.

Sub-projects:

• Mapping ES supply in PNSACV
• Valuation of cultural ES
• Integration of knowledge produced into existing management tools
Case study Advisory Board

- Parque Natural do Sudoeste Alentejano e Costa Vicentina
- Administração de Região Hidrográfica do Alentejo
- Associação Rota Vicentina
- Associação de Beneficiários do Mira
- Associação Armadores Pesca Artesanal Costa Vicentina
- Liga para a Proteção da Natureza
- Paula Canha – consultora de ambiente e ativista local
Mapping ES using matrix based approaches

Individual semi-structured interviews with Advisory Board members and experts using photo-elicitation methods to identify the most relevant ES provided by the PNSACV and the capacity of different LULC classes to deliver the services

<table>
<thead>
<tr>
<th>Ecosystem services</th>
<th>Example</th>
<th>Image</th>
<th>None</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
<th>Very high</th>
<th>Don't know</th>
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<tbody>
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<td>Agriculture and livestock</td>
<td>Cereals, meat, milk, lettuce, etc.</td>
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<td>Gathering</td>
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Marine waters: (Ocean, base level of a river or stream, coastal lagoons)

<table>
<thead>
<tr>
<th>Ecosystem service</th>
<th>None</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
<th>Very high</th>
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<td>Cultural heritage and traditions</td>
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CC
Mapping ES using matrix based approaches

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<th>Farm and other materials</th>
<th>Woodfuel or plants/algae for energy use</th>
<th>Renewable abiotic energy sources</th>
<th>Minerals</th>
<th>Regulating</th>
<th>Assimilation and degradation of waste and toxins by the ecosystem</th>
<th>Protection and maintenance of soil fertility</th>
<th>Water supply and flow regulation</th>
<th>Water quality regulation</th>
<th>Global climate regulation by reduction of greenhouse gas concentrations</th>
<th>Micro and regional climate regulation</th>
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</tbody>
</table>

Matrix scores were derived from consultations with CAB (7) and experts opinions (7)

Mapping ES using matrix based approaches

Recreational habitats for reproduction and nursery from agriculture and livestock.
Deliberative mapping of ES supply

One day workshop with CAB and other stakeholders (12 total) to discuss and refine the results of the individual interviews and to map main ES, identifying hotspots, trends and drivers

**Step 1**
10 most important ES

**Step 2**
Draw ES hotspots on the maps

**Step 3**
Discuss and validate the maps
Deliberative mapping of ES supply

Food from agriculture and livestock

Habitats for reproduction and nursery

Recreation

From concepts to real-world applications
www.openness-project.eu
Deliberative mapping of ES supply

Fine-tuning the deliberative maps over satellite image - Google Earth
Comparing the methods
Food from agriculture and livestock

Matrix/GIS

Deliberative mapping

Google Earth
Comparing the methods
Habitats for reproduction and nursery

Matrix/GIS

Deliberative mapping

Google Earth
Comparing the methods
Recreation

Matrix/GIS

Deliberative mapping

Google Earth

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Mapping pollination services – testing different methods

**InVEST** – Londsdorf et al. (2009, 2011)

**ESTIMAP** – Zulian et al. (2013)

**GIS Spreadsheet matrix** – Burkhard et al. (2009, 2012)

From concepts to real-world applications

www.openness-project.eu
Mapping pollination services using ESTIMAP

Fernandes, J., et al., 2015
Collaboration with the JRC
to real-world applications
www.openness-project.eu
Mapping pollination services - Comparing different methods
Assessment of cultural ES using social media

Classification and analysis of social media photos (flickr) according to land uses and cultural ES represented, as a proxy for people’s preferences.

To identify cultural services, map ES hotspots, analyze spatial distribution patterns and identify explanatory variables.

1378 photos from 198 photographers analyzed
Assessment of cultural ES using social media

Results

By Cultural ES class

- Aesthetics: 63%
- Recreation: 25%
- Cultural heritage and identity: 7%
- Inspiration: 4%
- Spiritual and religious: 1%

By Land Cover class

- Sea, ocean: 29%
- Bare rocks (e.g. Cliffs): 2%
- Scrub and/or herbaceous vegetation associations: 14%
- Artificial surfaces: 14%
- Beaches, dunes: 12%
- Forest: 12%
- Other: 3%
Assessment of cultural ES using social media

Cultural Ecosystem Services Hotspots

Recreation

Geological Aesthetics

Spiritual and Religious
Assessment of cultural ES using social media

Cultural Ecosystem Services Diversity

Areas were 3 or more different classes of cultural ecosystem services are represented.
### Comparison of the different approaches

<table>
<thead>
<tr>
<th>Method</th>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Matrix/GIS</strong></td>
<td>- Useful to get an overall picture of ES supply</td>
<td>- Credibility and validity of expert scores</td>
</tr>
<tr>
<td></td>
<td>- Only requires LULC data and experts’ opinions</td>
<td>- Lacks spatial detail</td>
</tr>
<tr>
<td></td>
<td>- Easy to apply</td>
<td></td>
</tr>
<tr>
<td><strong>Deliberative mapping</strong></td>
<td>- Incorporates local detail and knowledge</td>
<td>- Requires stakeholders’ involvement and willingness to participate</td>
</tr>
<tr>
<td></td>
<td>- Promotes awareness about ES</td>
<td>- Subjective</td>
</tr>
<tr>
<td></td>
<td>- Interaction and social learning</td>
<td></td>
</tr>
<tr>
<td><strong>Model based</strong></td>
<td>- More accurate representation of ES delivery process</td>
<td>- Data needs</td>
</tr>
<tr>
<td></td>
<td>- Can be adjusted to local conditions</td>
<td>- Resources required</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Calibration of the models to local specificities</td>
</tr>
<tr>
<td><strong>Social media</strong></td>
<td>- Easily available information</td>
<td>- Only for cultural ES and bias towards aesthetic values</td>
</tr>
<tr>
<td></td>
<td>- Up to date</td>
<td>- Classification bias</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Subjective</td>
</tr>
</tbody>
</table>
Valuation of Rota Vicentina nature trails

Hikers questionnaire developed in cooperation with RV association

To gain a better understanding of hikers' profile, their motivations, preferences and use of local resources

• 15 questions including willingness to pay and ES preference

• 538 responses so far (444 online + 94 field)
Valuation of Rota Vicentina nature trails

Visitors by origin

- EU countries: 43%
- Portugal: 11%
- Non-EU countries: 46%

Daily expenditure

- < 25: 30
- 25 a 49: 50
- 50 a 99: 90
- 100 a 199: 70
- > 200: 10

From concepts to real-world applications
www.openness-project.eu
Valuation of Rota Vicentina nature trails

Rating the overall experience

- Landscape
- Silence and tranquillity
- Fresh air / Fragrances
- Proximity to the ocean
- Overall experience
- Route
- Route marking
- Plants and trees
- Welcoming (people's sympathy)
- Available information (maps, guides, website...)
- Gastronomy
- Accommodation
- Suitable for outdoor sports
- Wildlife
- Cultural and historical heritage
- Support given by the touristic services

From concepts to real-world applications
www.openness-project.eu
Next steps
Valuation of ES in PNSACV

Demonstrating value

• Monetary valuation
• Non-monetary valuation
Operationalising ES concept in planning

To evaluate with relevant stakeholders, the potential of ES concept in territorial planning and management

- Identify trade-offs between ES
- Application of ES concept to support preparation, implementation, assessment and monitoring of River Basin Management Plans
- Use of ES mapping and valuation results to support the development of recreational map for PNSACV
Operationalising ES concept in policy

• Extension of Portuguese Ecological Fiscal Transfer scheme to include supply of ecosystem services as an indicator to allocate funds (Santos et al., 2012)

• Design of agro-environmental measures and other payments for ecosystem services schemes (Santos et al., 2015a, b)
Thank you for your interest!