Improving ecosystem–based management of Natura 2000 sites in the Vouga River, from catchment to coast, Portugal

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In the scope of the Millennium Ecosystem Assessment that was carried between 2001 and 2005 under the auspices of the United Nations, one of the key questions identified was – “what options exist to enhance the conservation of ecosystems and their contribution to human well-being?”
Ecosystem Based Management

Image source: Making ecosystem-based management operational - Report and Executive Summary, Deliverable 8.1
Human well-being: social-ecological systems

Ecosystem functions → Ecological processes → Flows of ecosystem services → Benefits of ecosystem services

Ecosystem structure → Pressures over ecosystems → Social processes → Human Drivers of ecosystems' change

Image source: Deliverable 3.2: The AQUACROSS Assessment Framework and Executive Summary

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The social–ecological system
Main Challenge

Mitigate negative unintended impacts on biodiversity in a Natura 2000 freshwater–marine continuum

In 2018/2019, two management interventions will be implemented:

i) a dredging programme to enable hydrodynamic equilibrium and navigability in the lagoon

ii) the extension of a floodbank to disable surface saltwater intrusion into Baixo Vouga Lagunar agricultural area.

Both measures are:
Acceptable – political
Feasible – financial incentives
Institutional fitness check – governance
Understand the social-ecological system

- Policy instruments

- Casual links and vulnerability assessment
  Linkage framework between Drivers-Pressures-Ecosystem Component-Ecosystem Services vulnerability assessment with AquaLinksTool and the major concern identified by stakeholders

- Spatial Multicriteria Analysis
  Stakeholders participatory process on Ecosystem Services valuation
# Policy instruments

<table>
<thead>
<tr>
<th>Selected policy plans and programmes</th>
<th>Objectives</th>
<th>a) Link to EU Policies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>National Water Plan</strong> <em>(Decreto-Lei n.º 76/2016)</em>&lt;br&gt;Inter-ministerial Commission for Water management: APA/ARHC; ICNF; Regional Directorate for Agriculture and Fisheries (DRAP); Directorate-General for Marine Resources (DGRM)</td>
<td>Territorial management tool for the implementation of the national policy for the conservation of biological diversity, aiming at the safeguarding and enhancement of the sites and SPAs of the continental territory, as well as the maintenance of species and habitats in a favourable conservation status in these areas</td>
<td>Birds Directive (2009/147/EC); Habitats Directive (92/43/ECC)</td>
</tr>
<tr>
<td><strong>National Strategic Plan for Tourism (PENT)</strong>&lt;br&gt;Ministry of Economy and Innovation</td>
<td>Governmental cross-sectoral management for the next 10 years: Increase water productivity and promoting its rational use, with maximum respect for the territorial integrity of the river basins; Protection, conservation and rehabilitation of water resources and associated ecosystems; Meeting the needs of the population and the country’s economic and social development; Respect for relevant national and Community legislation and satisfaction of the international commitments assumed by the Portuguese State; Access to information and participation of citizens in the management of water resources</td>
<td>WFD (2000/60/EC)&lt;br&gt;Floods Directive (2007/60/EC)&lt;br&gt;MSFD (2008/56/EC)</td>
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<tr>
<td><strong>National Strategic Plan for Climate change adaptation (ENAAC)</strong>&lt;br&gt;Ministry of Environment</td>
<td>Serves as the basis for the implementation of a series of initiatives aimed at fostering sustained growth of national tourism over the coming 10 years, and guiding the activities of Portugal National Tourism Authority, as the key public body for the sector.</td>
<td>EU strategy for a smart, sustainable and inclusive growth (COM(2014) 85 final, 2014/0044)</td>
</tr>
<tr>
<td><strong>National Strategic Plan for Climate change adaptation (ENAAC)</strong>&lt;br&gt;Ministry of Environment</td>
<td>Sets the ground for the need for adaptation. Contains the National adaptation strategy, and the associated action plan, including reducing vulnerability and increasing the response capacity.</td>
<td>EU Strategy on Adaptation to Climate Change (COM (2013) 216)</td>
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## Policy instruments

### Selected policy plans and programmes

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Objectives</th>
<th>Link to Regional/local Policies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polis Litoral Ria de Aveiro APA/ARHC; ICNF</td>
<td>Integrated Operations of Rehabilitation and Recovery of Coastal Areas. Strong collaborative work between central administration and the Ria de the Aveiro Region Inter-municipal Community (CIRA)</td>
<td><strong>This study</strong> Address the regional policy instruments Contribute to the Vouga estuary management plan</td>
<td></td>
</tr>
<tr>
<td>Coastal Zone Management Programme Ovar – Marinha Grande (POC-OMG) APA/ARHC</td>
<td>Reconcile the various conflicts of uses of the coastal zone, promoting the articulation of environmental, economic and social factors related to coastal management.</td>
<td>Contribute to the Regional strategy for the specialization (RICA 2020)</td>
<td></td>
</tr>
<tr>
<td>Vouga Estuary Plan (PE Vouga – not yet developed) APA/ARHC</td>
<td>Territorial planning tool, which establish appropriate measures to support and valorisation of water resources in the area to which their sustainable use is applied in a secure manner, linking the Public Administration and users.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Key Stakeholders

### Policy / Governance

| Environment | APA/ARHCentro - Portuguese Environmental Agency
| ICNF - Institute for Nature Conservation and Forests
| DRAPC - Centro Region Department of Agriculture and Fisheries
| DGRM - Directorate-general for Natural Resources, Safety and Maritime Services |

| Fisheries and Agriculture
| Marine |

| Industry | Portucel - The Navigator Company
| Incrível Odisseia - Moliceiros boat rides
| Sterna - Solar boat tours and bird watching |

| Agriculture |
| ABBVL - Association of Beneficiaries of Baixo Vouga Lagunar
| ACRM - Association of Breeders of Marinhoa Breed
| ALDA - Association of Agriculture of the District of Aveiro |

| Fisheries |
| Aquaculture |
| Services |
| APARA - Artisanal Fishing Association of the Region of Aveiro |
| APA – Portuguese aquaculture association |
| APA - Port of Aveiro Administration (APA) |

### Public Administration

| Regional Administration |
| CCDRC - The Centro Regional Coordination and Development Commission
| CIRA - Inter-municipal Community of the Aveiro Region |

| Municipalities within the Natura 2000 classified area |
| Águeda, Albergaria-a-Velha, Anadia, Aveiro, Estarreja, Ílhavo, Mira Murtesoa, Oliveira do Bairro, Ovar and Vagos. |

| Parish within the Natura 2000 classified area |
| E.g., Angeja, Avanca, Beduido & Vieiros, Bunheiro, Cacia, Canelas & Fermalá, Esqueira, Espinhel, Fermentelos, Gafanha Da Boa Hora, Gafanha Da Encarnação, Gafanha Da Nazaré, Gafanha Do Carmo, Glória & Vera Cruz, Murtesoa, Óis da Ribeira, Ouca, Ovar Union of parishes, Pardilhó, Requeixo, Salreu, Santo André De Vagos, São Jacinto, São Salvador, Sosa, Torreira, Vagos & Santo António De Vagos, Válega. |

### Other

| Local associations |
| A VELA - Sailing club
| ADERAV - Association for the study and protection of the Natural and Cultural Heritage of Aveiro Region |

| Non-governmental organizations (NGO's) |
| CCPAV - Hunting and Fishing Club of Aveiro/Vouga |
| FAPAS - Fund for the Protection of Wild Animals |
| GEOTA - Study Group on Spatial Planning and Environment |
| LPN - League for the Protection of Nature |
| SPEA - The Portuguese Society for the Study of Birds |
| ASPEA - Portuguese Association of Environmental Education |

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Habitats and Ecosystem Services
Scenario development workflow

**Input**
- Identification of management actions to be implemented

**Research**
- **Narratives: baseline and prospective scenarios**
  - Natura 2000 freshwater–marine continuum territory
- **Stakeholder workshop**
  - Stakeholders’ perception
  - Stakeholder’s valuation of ES
  - Spatial Multicriteria Analysis (SMCA)

**Output**
- Identification of possible mitigation measures

**Scenario development workflow**

**Previous projects data sets and information**
- LAGOONS FP7
- ADAPT-MED FP7 ERA-NET
- MARSH-C-LEVEL CNRS/INEE OHMI
- LTER-RAVE FCT

**Data collection**
- Current state characterization
  - (Reports, Institutions, scientific publications, databases)

**Selection of indicators**

**Base line scenario**

**Modelling of SMCA results**
- Causal links and Risk assessment

**Prospective scenario I**
- Management actions
- Stakeholders’ perception
- Generated science base knowledge

**Prospective scenario II**
- Management actions
Ecosystem Based Management co–developed solutions

Overall policy instruments applicable to water-dependent Natura 2000 sites

- Harmonised WFD and HD monitoring programmes

Case study specific policy plans and programmes

- Development of the Vouga estuary management plan
- Engage local users and landowners in the restoration actions
- Promote the value of ecosystems services provided by tidal wetlands

Restoration of tidal wetlands, namely saltmarshes and seagrasses

http://www.tampabaywatch.org/salt-marsh.html
http://seagrassrestoration.net/zostera-restoration-in-nz/
Ria de Aveiro region illustrates the challenges of an EBM planning process in a Natura 2000 freshwater–marine continuum territory.

The applied approach follows a stepwise procedure in line with resilience principles where:

1) the baseline condition was framed taking into account the foreseen management measures under implementation in 2018/19

2) the objectives were formulated considering the undesirable pressures, as side effects of the dredging programme and the extension of the floodbank
3) the screening of measure and instruments took into account the articulation between ecological and social components, combining fundamental and applied sciences;

4) the narrative reflecting the foreseen management measures, the stakeholders’ perception on ES valuation through spatial multi-criteria analysis and the generated science-based knowledge supported the planning EBM response that consist in saltmarshes and seagrasses meadows restoration programs;

5) the proposed measures were evaluated through EBM criterion regarding policies and feasibility, showing that compliance is achievable.
Biodiversity is interlinked with habitats, namely with aquatic habitats, and in most coastal territories habitats cannot be dissociated from human activities and well-being.

Therefore, Natura 2000 sites require an active and sustainable management involving the integration of science-based knowledge, environmental related policies and people holding stakes.

In the case of Ria de Aveiro region the proposed EBM response can contribute to the Vouga estuary management plan (not yet developed) and the regional strategy for smart specialization (RIS3 Centro).
Thank you!