Management scenarios and integrated information tools applied to Ria Formosa Lagoon - PT

1. Policy Objective & Theme

- SUSTAINABLE USE OF RESOURCES: Preserving coastal environment (its functioning and integrity) to share space
- SUSTAINABLE USE OF RESOURCES: Sound use of resources and promotion of less resource intensive processes/products
- SUSTAINABLE ECONOMIC GROWTH: Balancing economic, social, cultural development whilst enhancing environment

2. Key Approaches

- Knowledge-based
- Ecosystems based approach
- Socio-economic

3. Experiences that can be exchanged

The development of Ecosystem Models and Decision Support Systems, that simulate various policy options applied to a multi-use ecosystem and ranking them in terms of ecological and economic benefits.

4. Overview of the case

This case describes the development of information tools applied to a multi-use meso-tidal lagoon, that integrates ecological and social-economic aspects, their interaction and impacts in the ecosystem and dependant activities (e.g. shellfish production). This type of information system can be a useful decision-support tool for management strategies by comparing different policy scenarios in terms of ecological and economic benefits.

5. Context and Objectives

a) Context

The Ria Formosa is a shallow meso-tidal lagoon, 105 km2 and located in the South of Portugal. It comprises several meandered channels and an extensive intertidal area, mainly sand, muddy sand-flats and salt marshes. This ecosystem is considered a nursery for a large number of coastal species, and its intertidal areas are used as a growth bank for clams and aquaculture ponds. The main economic activities are tourism, fishery and aquaculture (mainly clams and oysters). The economical annual revenue is the main source of income for approximately 5000 families. Being a multi-use area, the human land activities (agriculture, tourism, commerce, industry) can impact negatively on the aquatic activities (fisheries, shellfish farming, salt and sand extraction) which are highly dependent on the ecosystem's ecological equilibrium. For instance, sources of treated and untreated domestic waste (with a seasonal variation due to tourism), together with agricultural run-off, contributes to changes in the ratio of nutrients and episodic eutrophication in the lagoon. Therefore an integrated management of all activities affecting and depending on the environment becomes essential to assure a sustainable development.

b) Objectives

The objective of the approach was to develop scientific and operational bases for a sustained and rational utilisation of the

available resources in Ria Formosa. This included integrating all relevant impacts from agriculture, urban and economic activities that affect the aquatic environment, by developing information technology tools tailored for these types of ecosystems.

6. Implementation of the ICZM Approach (i.e. management, tools, resources)

a) Project Management

The development of the information tools was led by the University of Fernando Pessoa and the National Institute of Fisheries and Sea Research (IPIMAR). Ria Formosa Natural Park (RFNP) is the entity responsible for the management of the lagoon and the end-user of the outcomes of the initiative. During the development of the tools, the RFNP was involved at different levels such as providing environmental data and defining management scenarios to be analysed during the project.

b) ICZM tools

Relevant data on the lagoon ecosystem (coastal waters, watershed, sediment, biologic and climatic) was collected into a single database. A Geographic Information System (GIS) tool was used to display the data and get initial conditions for computer models. The mathematical models included a soil and water assessment tool which simulated land drainage to the coastal ecosystem, providing forcing conditions to an ecosystem model (EcoDynamo) that simulated the hydrodynamic and biogeochemical processes and variables in Ria Formosa.
EcoDynamo provided the opportunity to simulate various policy options. The model was coupled with a Decision Support System (DSS) to rank the mentioned options in terms of ecological and economic benefits. The scenarios included various dredging operations and changes in bivalve cultivation practices. A key aspect of the approach was the proper inclusion of the financial aspects of the various initiatives, such as the economic revenue of shellfish estimated yield.
Throughout the duration of the initiative, there were several informal meetings between the researchers and staff of the RFNP to facilitate the exchange of ideas and data and define different management scenarios to be used in the simulations.

7. Cost and resources

The budget allocated to the Portuguese partners involved was approximately €247,000. There were approximately 10 researchers working in the development of the tools over a period of three years.

8. Effectiveness (i.e. were the foreseen goals/objectives of the work reached?)

Most of the objectives defined were achieved. One of the main outcomes was the analysis of several realistic management options from an ecological and an economic perspective which resulted in a set of recommendations that are available to support the management planning of the lagoon. For example, increasing bivalve culture density might not be a good management option, considering its implications in water quality and reduction in bivalve growth. On the other hand, deepening some channels seemed to potentially improve both water and sediment quality.

The tools produced can also be useful for other coastal ecosystems within the framework of ICZM since they integrate land drainage and its interactions with coastal processes and simulation with DSS software.

Meanwhile, a collaborative network for lagoon researchers and practitioners has been established to help identify future applications of the tools developed to other Portuguese lagoons and they are currently working in compiling data and information about all those natural systems.

9. Success and Fail factors

The project put considerable emphasis on model validation and on detailed and realistic socio-economic assessment of management options, through a close participation of economists and stakeholders, in order to end with a reliable information tool.

The dissemination and incorporation of these tools was facilitated not only through the early involvement of the end-user but also in special information events (e.g. international workshops).

10. Unforeseen outcomes

After the project was concluded, there was no further interaction between the research group and the RFNP, in part because the staff from the latter involved in the actions had been hired only for the duration of the work. Furthermore, it was intended that these tools would be made easily available to the RFNP but there has not yet been the chance to install the software in their local servers.

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13. Sources

- "Development of an Information Technology Tool for the Management of European southern Lagoons under the influence of river-basin runoff, Synthesis Report". (2003). M., Falcão, L. Fonseca, D. Serpa, D. Matias, S. Joaquim, P. Duarte, A. Pereira, C. Martins and M.J. Guerreiro. (Available online through the website http://www.dittyproject.org/)

Development of an Information Technology Tool (1.71 MB)