
ALTERNATIVE STRATEGIES FOR INTEGRATED COASTAL ZONE MANAGEMENT

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1. Introduction

The term “Alternative Strategies” refers to an updatable suite of options concerning policies, practices, and data requirements that would facilitate an application of the [System Approach Framework \(SAF\)](#) methodology, developed during the [SPICOSA EU FP6](#) Integrated Project. The SPICOSA IP had the goal of developing the SAF for [Coastal Zone](#) applications in support of [Sustainable Development](#) in Coastal Areas and in the context of [ICZM](#). This objective was accomplished through SAF applications in [18 Study Sites throughout the European Region](#). In addition to the SAF, the Project provided support for its development (supplementary information), archiving (model library and documentation), and dissemination (training and public outreach).

The “Alternative Strategies” discussed herein represent an essential supplement to expedite and enrich SAF applications, which are designed to simulate an issue in a coastal zone system and provide quantitative and qualitative information on various scenarios concerning

the resolution of the Issue. The goal Alternative Strategies is to make readily accessible to potential SAF users, information regarding political strategies, technical options, and intelligent monitoring that can support the SAF simulation itself and enrich the quality of the simulation of the Policy Issue and enrich its associated scenarios.

As an example, a user starts by identifying a critical **policy issue** and/or identifying an **Impact** in a Coastal Zone. The Alternative-Strategy database will quickly locate the key processes that influence the properties of the system and then suggest the right "set" of tools (political, technical and monitoring) for the issue. This set can be used for all the four stages of the SAF, i.e. from the initial design phase of Issue/scenario identification until the final evaluation to the output phase for the delivery of results concerning the requested management scenarios.

2. Alternative Strategies classification

The structure of the Alternative Strategies is centered around the three main categories of information support: **policy options**, **technical options** and **intelligent monitoring**. Each of these are briefly described in this article and their contents gathered into a public database available under SPICOSA's data portal.

2.1 Policy Options

The Policy Option category consists of the classification, inventory, and assessment in terms of advantages and disadvantages of **policy instruments** (e.g. instruments of planning, taxes and subsidies, market instruments, etc.) and related schemes (eg. centralized, decentralized, polycentric approach, etc..) regarding the international framework on integrated management of coastal areas.

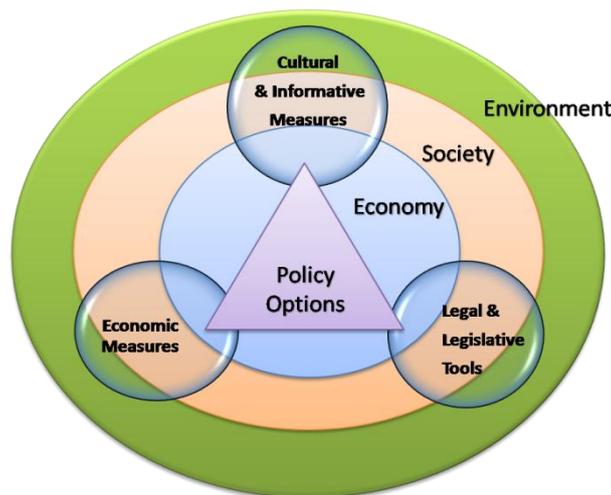


Fig. 1 Policy options are crucial in relation to cause-effect connections in the spheres of the Economy, Society and Environment. Depending on their type they can influence these aspects at different levels increasing the long term sustainability.

The reference base for the Policy Option category is based on literature references, acquisition of information, and material produced by global institutions on sustainable development of the territory, and for the implementation of ICZM policies.

Web-resources

See policy option database tool. (hyperlink@ <http://www.spicosa.eu/dataportal/index.htm>)

Further Readings on Policy Options

http://www.coastalwiki.org/coastalwiki/Policy_instruments_for_integrated_coastal_zone_management

Downloadable Readings ()

Vernier Françoise, [Agriculture in coastal areas: environmental issues, impacts and regulation tools](#)

2.2 Technical Options

The Technical Options category consists of a collection of information related to technological advancements that can reduce the impacts related to human activities. The goal of Technical Options is to evaluate all technological alternatives that may be considered to increase environmental sustainability, including an innovative set of options that have not yet been integrated into the framework of ICZM as environmentally **sustainable technologies** (i.e. renewable energies, bio-remediation,) or new methodologies (i.e. low-impact coastal defense).

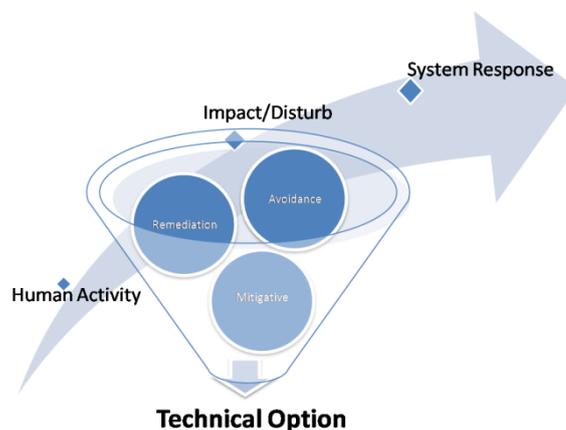


Fig.2 The technical options act by stopping and/or mitigate the impacts of human activities influencing positively the system response to increase the overall sustainability for the coastal areas.

The objective of Technical Options category is to test these sets of alternatives on some of the SPICOSA's pilot sites because very often the available technologies are still in the prototype stage and not applied in an integrated manner under any ICZM issues. The evaluation of alternative management scenarios through technical options, and adverse effects on coastal marine system in the implementation of the methodology proposed by an ICZM project.

See Technical option database tool. (Hyperlink @ <http://www.spicosa.eu/dataportal/index.htm>)

Downloadable Readings ()

- Ahmet Baban, “Mitigation of impacts to achieve ICZM via promising technologies”
- Vincent Mazeiraud and Nicolas Garcia , “The use of sand by-passing systems in the management of an urban beach. The case of Cape Breton, France.”
- Yvon Mensencal , “Marine Energy”
- Yvon Mensencal, “ Use of TELEMAC software system as a technical modelling tool for coastal zone development studies”
- Régis Walther, “Restoration master plan for improving hydro-sedimentological processes in the Loire Estuary: the actions and the three-dimensional hydro-sedimentological modelling tool”.

2.3 Intelligent Monitoring

The Intelligent Monitoring category consists of the methods for monitoring and data acquisition relative to Coastal Zone Issues and Impacts in the context of the SAF methodology and ICZM. The importance of this category became obvious during the SAF applications when existing data was insufficient or inadequate to support reasonably good simulation models. Hence, it is strongly recommended that a minimum data requirement be met before conducting an application, which includes input data, process validation data, and calibration data for the complete model simulation (hind-cast run).

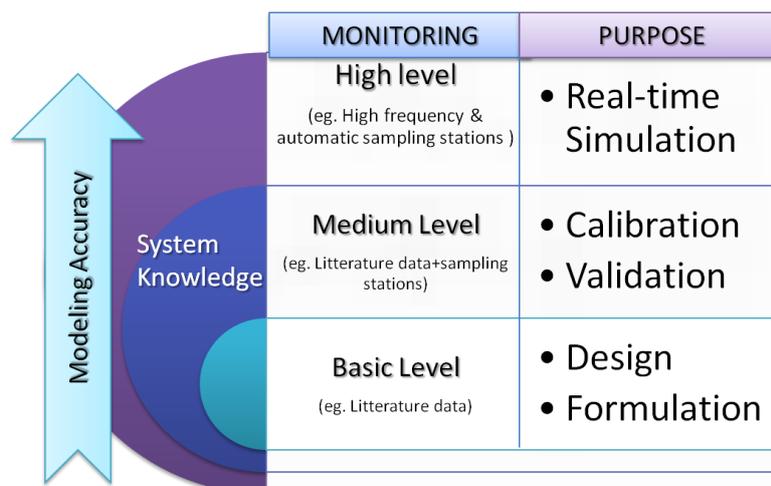


Fig.3 Intelligent monitoring is strongly aimed to raising the strategies to data acquisition in coastal marine systems in the context of the SAF application. It also takes account of the balance between modeling accuracy and system knowledge in the investigation of the coastal zone at different levels.

For this category, a library on the state of the art techniques for monitoring the coastal zone was created and is available under Spicosa data portal. Moreover the intelligent monitoring produced also the implementation of appropriate monitoring packages, for in-situ and remote sensing monitoring, tailored to the needs of the pilot sites compared to SAF phases, namely design patterns, formulation, calibration and validation results.

Web-resources

See **Intelligent Monitoring database tool**. ([Hyperlink @ http://www.spicosa.eu/dataportal/index.htm](http://www.spicosa.eu/dataportal/index.htm))

Downloadable Readings ()

- Decembrini Franco and Bergamasco Alessandro , “Monitoring plan for ICZM”
- Dror Angel and Noa Nakar, “System monitoring in the Coastal Zone”

3. Practical Applications of Alternative Strategies Tools

Alternative Strategies support researchers, technicians, politicians and practitioners in the development of complementary methods dedicated to models creation and scenarios management following a logical process that starts from the problem, provides monitoring solutions to enhance models performance, and suggests technological innovation that can be included into simulation to evaluate and predict, for example, costs and benefits.

The methodology includes the use of Alternative Strategies software tools ([relational database](#) with graphical user interfaces) after having evaluated all the information about the coastal system studied (i.e. identification of the ICZM problem). The first step to access to Alternative strategies is to frame the studied site in a multidisciplinary context. This includes Conceptual Diagrams of the Coastal Zone System and the Virtual System specified for the simulation, which includes the key functionalities and dependencies in the ecological component through the so-called "Cause-Effect-Chain" that links the Human Activities (cause) to the Impact (effect). This is coupled through the Impact to another such chain "Impact-Response-Chain" that links the Impact to the Responses in the socio-economic sectors of the VS. This type of qualitative analysis allows a clear and indicative of interactions at the systemic level and eventually sub-systems, both on bio-physical and socio-economic aspects highlighting the factors that play a key-role in issue management.



Fig 4 Example of "Cause-Effect-Chain" in the case of nutrient loads increase due to Human Activities (cause) and aquaculture job loss as System Response.

A practical example of Alternative Strategies application to aquaculture management could be:

Step-A. Interrogating the policy options (formulation of a query to PO-DB) on sustainable environmental management issues including details on management and classification of the coastal system studied (eg, **aquaculture, coastal erosion, coastal protection, eco- tourism**) at local, national and European level ;

Step-B. Interrogating the database on technical options (formulation of a query) by inserting details of impact on human activities considered (eg metal industry, extraction of inert materials, shipping);

Step-C. Interrogating the Monitoring database based on the results of the "Cause-Effect Analysis-Chain-" as to extract the information to identify the monitoring techniques (i.e. monitoring with CTD, ADCP, remote sensing, lidar, etc.) to detect parameters of interest.

The joint application and a database query in relation to a case study generates a set of outputs that will support both the modeling and operational support to help creating a possible management planning as in the following example in the case of the management of aquaculture activities:

Step A.1 Policy Option: references to legislation concerning the evaluation of scenarios for the sustainable management of fisheries and aquaculture (i.e. reduction of farming areas, reduction of pollutant loads, change of management structure).

Step B.1 Technical Option: Introduction of wastewater cleaners that can be natural (eg wetlands) or traditional to assess costs and benefits of reducing the pollutants load that reach the coastal system responsible for a decrease in quality of the product 'aquaculture, as well as the general reduction of environmental quality. In this case, the database also provides the end user of the technical useful for the design a

"virtual" option in the SAF-modeling technique selected for the mitigation / reducing environmental impact.

Step C.1 Monitoring Option: technological alternatives (direct and indirect methods) to monitor important parameters and processes of water quality and major environmental forcing affecting aquaculture and who are able to influence the biological productivity (eg, waves and currents , winds, nutrient, an estimate of TSM, chlorophyll, etc.). In this case a monitoring package can be carried out ad-hoc (eg, inclusive of alternative technologies to be adopted and the suggestion of a sampling space-time) for the assessment of the basic parameters that a validation of a SAF-model or for its application in real-time.

4. Links to external web-resources

<http://www.spicosa.eu>

<http://www.spicosa.eu/saf-handbook/index.html>

<http://www.spicosa.eu/dataportal/index.htm>

5. References

Please see Spicosa portal page publications sub-menu at:

<http://spicosa.databases.eucc-d.de/plugins/documents/>