Client: European Commission – DG Environment

Subject: Option for coastal information systems

Doc. title: Final Report

Document no.: 21807-REL-T006.2

Distribution list: DG Environment, file 21807

rev.    date       issued for  pages      prepared  checked  approved
0       01.07.2011  Comments     91 + 6Ann.   ER        ME      MB
1       29.07.2011  Approval     116 + 6Ann.  ER        ME      MB
2       31.08.2011  Information  124 + 6Ann.  ER        MB      MB
3

Thetis S.p.A.
Castello 2737/f, 30122 Venezia
Tel. +39 041 240 6111
Fax +39 041 521 0292
www.thetis.it
Table of contents

1 Non-technical summary ................................................................. 4
2 Introduction .................................................................................. 10
   2.1 Study objective and expected results ......................................... 10
   2.2 Study structure ....................................................................... 11
   2.3 Objective and structure of the final report ............................... 12
3 Study Methodology ....................................................................... 14
   3.1 General overview of existing coastal information systems .......... 14
   3.2 In-depth description of selected coastal information systems ....... 20
   3.3 Development of key structuring policy requirements for CISs ..... 22
   3.4 Impact assessment of policy requirements and options ............. 23
   3.5 Stakeholder identification and involvement ............................. 25
   3.6 Stakeholder participation ...................................................... 26
4 Analysis of CIS illustrative cases .................................................... 29
   4.1 Overview analysis ................................................................. 29
   4.2 In-depth analysis of selected CIS ............................................ 37
   4.3 Results interpretation ........................................................... 40
5 Policy requirements ...................................................................... 49
   5.1 Approach for the policy requirements identification ............... 49
   5.2 Policy requirements description ............................................ 53
6 Policy options definition ............................................................... 59
   6.1 Problem identification and objective definition ......................... 59
   6.2 Baseline scenario and policy options definition ..................... 65
7 Impact assessment of policy options ............................................. 77
   7.1 Impacts definition ................................................................. 77
   7.2 Assessment of direct impacts of policy options ......................... 81
      7.2.1 Direct impacts: expected benefits ................................. 84
      7.2.2 Direct impacts: cost implications ................................. 93
   7.3 Assessment of indirect impacts of policy options ...................... 106
   7.4 Policy options comparison .................................................. 115
8 Conclusions .................................................................................. 121
Annexes

Annex 1 – Overview analysis: analytical tables of European CIS cases
Annex 2 – Overview analysis: analytical tables of extra-European CIS cases
Annex 3 – Results of the in-depth analysis
Annex 4 – Information source for the in-depth analysis
Annex 5 – List of identified stakeholders
Annex 6 – Workshop report
1 **Non-technical summary**

The European Commission has recently launched a review of the EU ICZM Recommendation, with a view to a follow-up proposal by the end of 2011\(^1\). An impact assessment is conducted to explore the need and options for future EU action and to assess potential social, economic and environmental consequences that new initiatives proposed by the European Commission may have. This important activities imply a wide variety of initiatives aiming to provide input to the Recommendation review, including: an on-line public consultation, a public hearing event held on the 30\(^{th}\) of May in Brussels, Member State reports on progress in ICZM implementation, the OURCOAST project\(^2\) gathering and disseminating case studies and practical examples of coastal management practice in Europe, specific studies to inform the impact assessment. The present study is part of these latest initiatives, together with other three parallel studies: (i) a study to examine the Member States reports on progress on ICZM up to 2010, (ii) a study to assess the impacts of the policy options for a follow-up proposal to the EU ICZM Recommendation, (iii) a study to model land-use changes in the European coasts. The diffusion, further development (including innovation) and actual use of information tools (coastal information systems - CISs) can therefore concretely improve the implementation of ICZM in Europe; indeed this is one of the strategic objective of EU ICZM related policies. This study aims to contribute to this overall goal, in particular by the identification of the key structuring requirements and related policy options for coastal information systems that may significantly improve the support to ICZM implementation through scientifically-based data, functions, tools and mechanisms.

One of the main challenges in the implementation of ICZM is the one related to the integration of different sources of knowledge and different types of information in order to better understand coastal processes and dynamics and in order to develop scenarios for better evaluate, and manage properly, the possible impacts deriving from different coastal uses. Within this framework, gathering and proper structuring of relevant data, transparent and ready available information to decision makers and stakeholders, adequate communication to citizens, information sharing, effective and concrete use of data and information in policy and decision making are all key elements to support and implement integrated planning and management of coastal zones. 

To respond to this goal, the study is organised in three main technical activities. The first one dealt with the overview and in-depth analysis of CIS illustrative cases to depict main characteristics of existing operative systems, related strengths, weaknesses and gaps in supporting ICZM. The second activity represents the core of the study; based on the Task 1 results, and other significant input, this activity aimed to identify policy requirements and related policy options to improve CIS support to the diffusion and implementation of ICZM processes at various scales. The same activity assessed policy options in terms of expected (direct and indirect) benefits and costs or negative effects. Task 1 and Task 2 activities implied stakeholder involvement and participation (Task 3) in relation to various steps of the study. This task in particular included the organisation of a stakeholder workshop that was held in Marseille on the 6\(^{th}\) of May 2011.

---

\(^1\) [http://ec.europa.eu/environment/iczm/home.htm](http://ec.europa.eu/environment/iczm/home.htm)

The overview analysis considered forty CIS illustrative cases, representing different levels of application (local, sub-national, national, transnational and regional sea one), regional seas and CIS’ typologies. Based on the obtained results, twelve cases were further in-depth analysed through direct interviews of main involved actors. Task 1 analysis highlighted the following main issues related to CIS support to ICZM:

- For the great majority of considered illustrative cases (28 – 70%) the CIS geographical area of interest is mainly defined by administrative boundaries (in particular for the national and sub-national levels). For the 30% of the cases (in particular local level ones) the area of interest has been mainly defined according to an ecosystem-based approach;
- Territory and environmental data and information are properly considered in CISs, while social and in particular economic and governance data are properly included in a relatively limited number of CISs;
- Other data gaps or weaknesses are related to: (i) historical series, generally limited to a small number of specific issues, (ii) climate change related data, (iii) 3D data (e.g. DEM)
- Almost half of the considered CIS cases provides basic ICZM knowledge and process related functionalities: availability of geo-spatial data, operation at different spatial scale, multi-time data and information (although limited only to specific issues), support to problem understanding and structuring, support to identification and assessment of planning and management alternatives;
- More advanced ICZM functions are much less available, such as: ICZM indicators and indexes, climate change related functions (i.e. on-line tools enabling users to interactively visualise and analyse climate change and sea level related data), stakeholder involvement and participation, vision building and scenario development, support to monitoring and evaluation, support to adaptive planning and management;
- Tools enabling an appropriate e-participation in ICZM (i.e. e-forum, geo-tagging, video sharing, etc.) are still not much diffused (20% of the cases).

The overview and in-depth analysis highlighted significant strengths of existing CISs, which however are not always properly exploited to fully support the ICZM processes at various scales. The same analysis enabled to identify main current CIS’s weakness and gaps; i.e. key issues to be dealt with in terms of new, and often innovative, requirements. The main problem to be addressed is therefore a twofold problem that can be summarised as follows:

- Underuse or improper use of existing coastal information systems within the ICZM process at various scales.
- Existence weakness and gaps to be addressed through the development of new CIS’ features to further improve their use within the ICZM process at various scales.

In relation to the above twofold problem, it is important to act on all the CIS’ component including in particular: contents (data, information and related structuring), on-line functions and tools related to different target users (expert and non-expert), CIS’ scope in relation to different users (decision and policy making, coast management and planning, stakeholder participation, etc.), and management and operation mechanisms. Contents and function related requirements can mainly act on the design and development of new CISs features thus principally
addressing the second aspect of the problem, while mechanisms can also determine significant improvement in the use of already existing features, thus strengthening their positive effects on the ICZM process (first aspect of the problem).

Policy options formulated by the study aim to address the above problem; their general objective is therefore to improve the concrete support of coastal information systems to the ICZM process, enhancing CISs diffusion and strengthening their use in strict connection to integrated coastal planning and management. In relation to this general objective, the following specific objectives have been identified:

- Increase the use of coastal information system in providing full support to implement the key ICZM principles, in particular as defined by the Recommendation 2002/413/EC, such as: broad overall perspective (thematic and geographic), long term perspective, adaptive management and sound scientific basis, local specificities and diversity of European coasts, working with natural processes, involving all parties concerned in the management process, support and involvement of all relevant administrative bodies (at national, regional and local level), use a combination of instruments to facilitate coherence between sectoral policies objectives and between planning and management.

- Provide support (through data, functions and management mechanisms) to the ongoing integration process between ICZM and MSP, and more in general between ICZM and close related policies (including in particular the EU policy on climate change adaptation).

- Simplify the use of coastal information systems in order to make easier and more immediate their support to the ICZM decision making.

Within the above framework, the study subsequently focused on the formulation of the policy options for coastal information systems, i.e. integrated and homogenous sets of the key structuring policy requirements. Firstly a “baseline scenario” was defined, to set a reference benchmark for the impact assessment of the policy options. In the specific context of the study, the baseline scenario is defined as the scenario not including the implementation of new policy requirements for coastal information systems and implying the fulfilment of already set legislative requirements, in particular related to implementation of the INSPIRE Directive.

In relation to the identified problems and objective, the study formulated the following three policy options:

- **P1 – Improving data and information base;** P1 option deals with the principal identified data and information gaps, specifically related to: socio-economic and governance data, integrated information (i.e. indicators, indexes or maps generated through the integrated analysis of different data typologies), multi-time data (i.e. historical series) and climate change data. The final goal is therefore the creation of a wider database able to address the various sectors and integrated aspects of the ICZM holistic approach as well as its long-term perspective, thus improving the current main contents gaps characterising the baseline scenario. The implementation of the P1 policy option mainly relies on the integration within CISs of already existing data and information, still not included in the system, rather than on the acquisition of new data or the realisation of new study.
P2 – Improving and innovating functions and tools; P2 option mainly aims to improve the availability of functionalities and tools directly supporting ICZM decision makers and coastal planners and managers, as well as to increase stakeholders’ involvement and participation in the ICZM process. This policy option is therefore characterised by two main objectives. The first goal is to provide users with on-line functions and tools enabling them to interactively analyse and elaborate CIS’s data, thus supporting ICZM decision making through new information produced by these tools. In this perspective P2 policy option can be strictly related to P1 one; a wider and more complete data and information base can better support data analysis and elaboration through the newly available tools. The second goal is to further develop on-line tools to involve stakeholders in the generation and use of coastal information and more in general in the ICZM process. The implementation of this option will significantly evolve the current state of the art (baseline scenario) in relation to interactive tools (for ICZM decision making and stakeholder involvement) available on-line.

P3 – Enhancing cooperation; P3 policy option mainly aims to enhance cooperation among different subjects involved in the CISs implementation and management and more in general in ICZM process, thus improving the CISs support to this latter. Specifically, increased horizontal and vertical cooperation is desirable among: structures of the same authority involved in ICZM and/or the CIS’ management and operation, different public authorities involved in the ICZM process, different coastal data providers and managers, managers of different CISs related to the same area of interest. The P3 policy option is implemented through the following principal specific issues:

- Progressively move towards the adoption of an ecosystem-based approach in the definition of the CIS’s context and geographic area of application;
- Establish strict link and cooperation between the structure responsible for the CIS management and operation and the structure responsible for the implementation of the ICZM process;
- Improve the use of protocols facilitating geo-spatial data sharing, implying cooperation among different data producers and managers.

P3 focus is therefore on the reinforcement (respect to the baseline scenario) of coordination mechanisms that can enhance the CIS usefulness in promoting and implementing ICZM principle. It does not only refer to changes and modification to be brought to the coastal information systems themselves, but it also implies a great effort in cooperation among different subjects directly or indirectly related to CISs and more in general to the ICZM process.

The conceptual framework of the three policy options and the baseline scenario is illustrated in Figure 6-3. Policy options were then assessed in terms of direct (or primary) and indirect (or derived) impacts. Direct impacts are those related to effects directly determined by a CIS policy option on key issues of ICZM diffusion and implementation in Europe or to the use and the operation of the coastal information systems. Indirect impacts are those directly or indirectly deriving from the direct ones. Evaluation of direct and indirect impacts attempt to assess both expected benefits and negative effects. Expected benefits express how the policy options would contribute to the achievement of the identified general and sector objectives and to provide solutions to the main depicted problem. Negative impacts can be mainly due to increase
in costs or in general effort needed for the policy implementation, and increase in difficulties related to the use of the system.

All the three options represent a significant step forward compared to the baseline scenario, since they include new requirements to be implemented in the CISs, contributing to further increase the support to the ICZM process. The impact assessment showed that the three policy options can be conceptually distributed along a gradient. P3 represents the most ambitious policy option, in terms of economic and human resources likely required for its implementation, but also in terms of expected direct and indirect benefits. P2 is in a relative medium position, while P1 is characterised by a relative lower level of ambition.

Cost related to the implementation of the three policy options in the European Union are summarised by the following general figures (all estimations represent additional costs to the baseline scenario):

- **P1 policy option**: 13.3 – 20.0 million € for the development cost and 26.0 – 38.9 million € for yearly management costs;
- **P2 policy option**: 18.4 – 27.6 million € for the development cost and 30.7 – 46.1 million € for yearly management costs;
- **P3 policy option**: 43.1 – 64.7 million € for the development cost and 53.5 – 80.2 million € for yearly management costs;

Any use of these estimations should acknowledge the important simplification and assumption that the study necessarily had to include dealing with the heterogeneous nature of existing coastal information systems and the main gaps in the input data needed for the analysis (see chapter 7.2.2 for methodological details).

The full implementation of the P3 option would require an effort (to upgrade about the 64% of existing CISs) that is 1.6 greater than the one required by the full implementation of the P1 option (corresponding to 41% of CISs to be upgraded); P3 expected effort is also greater than P2 one (56% of CISs to be upgraded). The following rough schematisation of policy ambition and implementation challenge can be therefore defined: P3 > P2 > P1. However, the implementation of all the three policy options still requires relevant efforts.

In terms of likely affected categories the following considerations are possible: P3 option is expected to mainly affect international institutions and bodies (e.g. Regional Sea Commissions) and the public administrations involved in ICZM in terms of decision making and coastal planning and management. Also the other two policies will likely generate significant positive effects for decision makers and coastal planners/managers of the public administrations. P2 will significantly affect research institution and the civil society, too, while P1 expected benefits will be probably related again to research institutions and private companies, as well.

Significant differences exist among the various European regions in relation to the current implementation level of the three policy options and the related expected benefits and effort needed for their further improvement. The analysis showed the greatest challenges in general are related to: (i) the P3 option implementation in all the regions with relatively minor relevance for the North Sea and (ii) the Black Sea region for all the three policy options, where however there are significant on-going initiatives that will probably improve the current situation. Compared to P3, P2 option is better represented in the current CISs, although a relevant effort is still required, in particular for the Baltic Sea, the Celtic Sea and the Bay of Biscay and Atlantic Iberian Coast, at least according to the analysis performed in this study. Finally main chal-
Challenges related to P1 implementation are expected to be in general lower than P3 and P2 ones, being slightly more consistent for the Mediterranean and the North Sea.

In terms of policy instruments for the implementation of the different option the following main considerations are provided by the study:

- P1 policy option includes essential requirements to improve the CISs’ capacity in supporting the ICZM process and can be therefore considered as a necessary (or basic) step to improve CIS’ support to ICZM. In this perspective, this policy option can be incorporated in an EU binding legislative framework (i.e. EU Directive) defining obligations for the ICZM implementation, also in relation to the CISs further improvement. A strict link with the INSPIRE Directive is also essential for the P1 policy option implementation.

- An EU binding legislative framework could also fit with the second policy option (P2), which also includes some essential requirements for the improvement of the CISs support to the ICZM process (i.e. the development of new tools to better support ICZM decision making and stakeholders’ participation). However, this could be more efficiently implemented through the Recommendation policy instrument that enables a higher level of flexibility.

- The implementations of the P3 policy option (focusing on enhanced cooperation) can be likely more efficiently supported through incentives, e.g. a policy programme providing a common framework for and financial support to projects and studies dealing with P3 key issues. The higher costs related to the P3 policy option also suggest to avoid the adoption of a strictly binding approach for the implementation of this policy and to prefer a more flexible and progressive mechanism.

As a final conclusion, the study suggests to adopt a two phase approach. The first four-five years phase would focus on P1 and P2 policy options (to be implemented through an EU Directive and/or an EU Recommendation). Different effort could be given to each of the two policy option according to the differences highlighted in the current implementation level among the various European Regions; i.e.: greater attention to P2 for the Baltic Sea, the Celtic Sea and the Bay of Biscay and Atlantic Iberian Coast; equal attention to P1 and P2 for the North Sea and the Mediterranean Sea for which however almost half of the analysed systems are currently characterised by a good level of P1 and P2 implementation; great attention to CIS strengthen and CIS-ICZM link reinforcement in general for the Black Sea.

The first phase should not totally neglect the P3 option; whenever opportunities arise this should be promoted through a dedicated policy programme, even if the major focus would be on P1 and P2, and its implementation monitored to correctly depict the occurring progresses. An interim and final evaluation of the first phase results will be useful to prepare the second phase that will specifically focus on the implementation of the P3 option. This evaluation will be also useful to fine-tune the policy instrument to be used to successfully implement the P3 option in the second phase, i.e. the continuation of an incentives-based policy programme and/or the development of another policy instrument (e.g. a specific EU Recommendation).
2 Introduction

2.1 Study objective and expected results

Gathering and proper structuring of relevant data, transparent and ready available information to decision makers and stakeholders, adequate communication to citizens, information sharing, effective and concrete use of data and information in policy and decision making are all key elements to support and implement integrated planning and management of coastal zones. In relation to ICZM, EC Communication COM(2007)308 highlights that “While the methodology to assess the spatial impacts of EU policies has progressed, the gaps in data and the lack of effective information-sharing systems are still a barrier to its more widespread and pro-active use in decision making processes”.

In this perspective the study generally aims to contribute to the implementation of the above issues within the development and use of coastal information systems, thus contributing to the diffusion of tools resulting in being actually useful and concretely used in integrated coastal zone planning and management. To pursue this overall goal, the study foresees the identification and assessment of policy requirements for coastal information systems that will likely contribute to the follow-up proposal to the EU-ICZM Recommendation (2002/413/EC). Indeed, the study focuses on the role that coastal information systems can play in concretely supporting the implementation of ICZM processes at various scales (local, sub-national, national and international). Therefore the study concern is mainly on operational systems rather than on research initiatives. It may also include systems that are at an advanced stage of development (pilot or pre-operational systems) or other ones that are particularly relevant for innovation for examples in terms of functionalities, technological platforms or contents. The above overall aim can be detailed in the following specific study objectives:

- Provide an overview of illustrative examples of existing coastal information systems in order to depict a general understanding of the main characteristics and level of use of existing systems with the ICZM processes. This overview also aims to identify the more interesting systems to be in-depth analysed;
- Analyse in details the selected coastal information systems. The in-depth analysis enables to clearly understand the strength and weakness of existing systems and identify the elements to be further improved;
- Develop key structuring policy requirements for ICZM supporting information systems, on the basis of the results obtained by pursuing the previous described goals. Identified requirements shall be: (i) relevant at the EU level, (ii) the most remarkable ones in supporting the development of coastal information systems related to ICZM, (iii) concrete and operational in order to result in being really useful, (iv) ambitious and innovative to introduce new steps in the development of coastal information systems and in their use in the ICZM process;
• Assess the positive and negative impacts of the policy requirements and related policy options (i.e. integrated sets of policy requirements) to identify the conditions that can contribute to the improvement of coastal information system and those than can impede the process;

• Organise the involvement and participation of different typologies of key stakeholders in various steps of the study, in order to benefit from their expertise and experience.

The main expected result is a key set of properly identified, assessed and validated policy options (and related policy requirements) for coastal information systems. These requirements will likely support the further extension, improvement and innovation of ICZM related information systems with the aim to concretely support the ICZM implementation at the EU level and in the EU member states. The study expected results also include:

• A general overview of existing coastal information system around Europe;

• An understating of the key factors supporting or limiting ICZM-related information systems;

• A full understanding of the role of coastal information system in the concrete support to the implementation of the various ICZM steps.

2.2 Study structure

The study is organised in four principal tasks, including three technical ones and one task dealing with project management, technical coordination and final reporting. Each task is structured in sub-tasks as briefly described below. Figure 2-1 illustrates the conceptual scheme of the study activities, as well as the mutual interrelations among the same. Sub-tasks belonging to the same task are identified by a specific colour: Task 1 – orange, Task 2 – yellow, Task 3 – light blue, and Task 4 – grey.

The first task of the study is dedicated to the analysis of the illustrative cases of existing coastal information systems. As highlighted in the previous section, the focus is on operational systems, in case including some innovative, pre-operational or pilot systems, whose analysis can provide remarkable information for the other study activities. Task 1 is divided in two sub-tasks. The first one (1.1) aims to depict a general overview of the existing information systems supporting ICZM and has enabled to select the most representative ones to be in-depth analysed by the second sub-task (1.2).

The results of Task 1 constitute one of the bases for the implementation of Task 2 “Definition of the policy requirements/options and assessment”. This task is divided in three sub-tasks. The first one (2.1) is dedicated to develop key structuring policy requirements for ICZM supporting information systems. The same policy requirements are assessed in sub-task 2.3 in terms of impact evaluation of policy options (i.e. integrated set of policy requirements), according to the methodology optimised in sub-task 2.2.

Task 3 is dedicated to the stakeholder involvement and participation, and is structured in three sub-tasks: stakeholder identification and involvement (3.1), stakeholder participation (3.2), analysis of stakeholder feedbacks (3.3). Stakeholder participation has been in particular relevant for the optimisation and validation of policy requirement, and related policy options, identified and assessed in Task 2. Stakeholders can bring a very important contribution to the study,
concurring to generate concretely useful results. The study therefore has foreseen their involvement also in other activities, including specifically feedbacks on illustrative cases of coastal information system for the overview and the in-depth analysis (sub-task 2.1) as well as the same development of policy requirements (sub-task 2.1).

Technical tasks are continuously supported by project management and coordination (Task 4). Task 4 also includes a specific sub-task dedicated to the elaboration of the draft and conclusive version of this final report.

![Conceptual scheme of the study activities](image)

2.3 **Objective and structure of the final report**

This document constitutes the final report of the study “Options for coastal information systems” and aims to illustrate findings and results of the performed activities. Table 2-1 summarises all the deliverables issues during the study, including this final report.

The final report is structured in eight chapters. The first chapter includes the executive summary. Chapter 2 illustrates introduction contents, i.e. the study’s objective and expected results as well as the study structure, which is organised in three tasks including different sub-tasks. Chapter 3 deals with methodological aspects for each of the three technical tasks making the study. The fourth chapter illustrates Task 1 results, related to the overview and in-
depth analysis of the considered illustrative cases of existing CISs. The same chapter summarizes the main issues arising from the interpretation of these results. Detailed data gathered by Task 1 activities are reported in the following annexes:

- Annex 1 contains the analytical tables of the analysed European CIS cases;
- Annex 2 contains the analytical table of the analysed extra-European CIS cases;
- Annex 3 contains the results of the in-depth analysis, i.e. information gathered through direct interviews on selected CIS cases;
- Annex 4 contains details on information sources used for the in-depth analysis.

Chapter 5 describes the approach used in the identification of policy requirements aiming to improve CIS support to ICZM, including stakeholder contribution, and the developed policy requirements. Based on the results of previous activities, chapter 6 focuses on the identification of the core problem and objectives of the analysis and develop the related policy options, i.e. integrated sets of policy requirements. Chapter 7 deals with the impact assessment of the defined policy options, including identification of direct and indirect impacts to be used in the assessment, their evaluation and policy options comparison. Finally, chapter 8 attempts to draw some conclusions in relation to the follow-up of the EU-ICZM Recommendation (2002/413/EC). The report is completed by Annex 5 including the list of stakeholders invited to support the study and Annex 6, the Report of the stakeholder workshop held in Marseille on the 6th of May 2011.

Table 2-1 Study deliverables.

<table>
<thead>
<tr>
<th>Table</th>
<th>Reference code</th>
<th>Issuing date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inception Report</td>
<td>21807-REL-T001.1</td>
<td>01.03.2011</td>
</tr>
<tr>
<td>Progress Report</td>
<td>21807-REL-T002.1</td>
<td>27.05.2011</td>
</tr>
<tr>
<td>Workshop Report – Stakeholder Workshop 6th May 2011 Marseille</td>
<td>21807-REL-T004.0</td>
<td>20.05.2011</td>
</tr>
<tr>
<td>Policy options – Progress results</td>
<td>21807-REL-T005.0</td>
<td>14.06.2011</td>
</tr>
<tr>
<td>Final Report</td>
<td>21807-REL-T006.0</td>
<td>30.06.2011</td>
</tr>
</tbody>
</table>
3 Study Methodology

3.1 General overview of existing coastal information systems

Sub-task 1.1 aims to depict a general overview of the characteristics of existing coastal information systems, through the analysis of a wide set of illustrative cases. The study gives much relevance on the concrete and practical effects of the use of information system within the ICZM process. Therefore, the focus is on operational system, i.e. information systems that are already used to support coastal planning and management. However, the overview may also include some pre-operational, pilot or innovative systems, whenever these can provide particularly relevant information for the following tasks of the study and in particular for the definition of policy requirements. This is for example the case of not-yet operational systems that can make available some innovative functionalities or procedures resulting in being particularly useful in relation to CIS/ICZM key issues.

The term coastal information system (CIS) refers to a wide variety of system typologies, including among the others: web-site, web-portal, web-GIS or web-atlas, off-line GIS, indicators web viewers, spatial data infrastructure, map and data service, mixed systems.

The methodological approach has included scan of various types of information sources, i.e.:

- EU funded and co-funded projects related to ICZM and/or coastal information systems, in particular considering INTERREG projects or other EC programmes aiming to the development of operative tools and procedures (Table 3-1);
- Main research projects co-financed by EU (FP6 and FP7 principally) related to ICZM and/or coastal information system (Table 3-1);
- Other projects directly commissioned by the European Commission such as EUROSION and in particular OURCOAST, dealing with an overview and analysis of ICZM best practices in Europe;
- Relevant non-EU initiatives, i.e. illustrative examples from United States and other countries such as Australia;
- Scientific literature;
- Other information available on Internet about implemented and used coastal information system; particular attention has been given to available on-line CIS and to international networks (ICAN – International Coastal Atlas Network, EUCC – Coastal and Marine Union, PAP/RAC, BALTIC LAGOON network, ANCORIM – Atlantic Network for Coastal Risk Management, etc.);
- Other internet sources, including among the others web-sites of: Regional Sea Commissions (HELCOM, OSPAR Commission, Black Sea Commission and UNEP-MAP), other International Organisations (such as the European Environmental Agency), and national and sub-national administrative authorities.
### Table 3-1 Main consulted information sources related to EU funded projects.

<table>
<thead>
<tr>
<th>Project</th>
<th>Short description</th>
<th>Years</th>
<th>Funding programme</th>
<th>Web-site</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANCORIM</td>
<td>Atlantic Network for Coastal Risk Erosion</td>
<td>2009-2012</td>
<td>Interreg IV B</td>
<td><a href="http://ancorim.aquitaine.fr/">http://ancorim.aquitaine.fr/</a></td>
</tr>
<tr>
<td>BAR</td>
<td>Beaches at Risk</td>
<td>2003 - 2008</td>
<td>Interreg III A</td>
<td><a href="http://www.geog.sussex.ac.uk/BAR/">http://www.geog.sussex.ac.uk/BAR/</a></td>
</tr>
<tr>
<td>BEACHMED-3</td>
<td>Strategic resources for the adaptations of Mediterranean littorals to climate change</td>
<td>2010 - 2020</td>
<td>Interreg III C</td>
<td><a href="http://www.beachmed.it/Beachmed3/tabid/130/Default.aspx">http://www.beachmed.it/Beachmed3/tabid/130/Default.aspx</a></td>
</tr>
<tr>
<td>BLAST</td>
<td>Bringing Land and Sea Together</td>
<td>2009 - 2012</td>
<td>Interreg IV B</td>
<td><a href="http://www.blast-project.eu/">http://www.blast-project.eu/</a></td>
</tr>
<tr>
<td>BOTHNIAN BAY LIFE</td>
<td>System for cooperation and information exchange regarding best available techniques (BAT) between countries, industries and municipalities around the Bothnian Bay</td>
<td>2001 - 2005</td>
<td>LIFE Project</td>
<td><a href="http://www.ymparisto.fi/default.asp?contentid=244465&amp;lang=en">http://www.ymparisto.fi/default.asp?contentid=244465&amp;lang=en</a></td>
</tr>
<tr>
<td>COASTMAN</td>
<td>Coastal Zone Management in the Baltic Sea region</td>
<td>2004 - 2007</td>
<td></td>
<td><a href="http://www.coastman.se/">http://www.coastman.se/</a></td>
</tr>
<tr>
<td>COMRISKS</td>
<td>Common Strategies to reduce the risk of storm floods in coastal lowlands</td>
<td>2002 - 2005</td>
<td>Interreg III B</td>
<td><a href="http://comrisk.hosted-by-ifki.baw.de/">http://comrisk.hosted-by-ifki.baw.de/</a></td>
</tr>
<tr>
<td>DITTYPROJECT</td>
<td>Development of an Information Technology Tool for the Management of European Southern Lagoons under the influence of river basin runoff</td>
<td>2003 - 2005</td>
<td>FP5</td>
<td></td>
</tr>
<tr>
<td>ECOMANAGE</td>
<td>Integrated ecological coastal zone management system</td>
<td>2004 - 2008</td>
<td>FP6</td>
<td><a href="http://www.ecomanage.info/">http://www.ecomanage.info/</a></td>
</tr>
<tr>
<td>ENVIFACILITATE</td>
<td>Project aiming to demonstrate accessible, technologically sustainable and user-friendly tools for the sharing of environmental spatial information</td>
<td>2004 - 2006</td>
<td>LIFE Project</td>
<td><a href="http://envifacilitate.utw.tu.de">http://envifacilitate.utw.tu.de</a></td>
</tr>
<tr>
<td>Project</td>
<td>Short description</td>
<td>Years</td>
<td>Funding programme</td>
<td>Web-site</td>
</tr>
<tr>
<td>-------------</td>
<td>------------------------------------------------------------------------------------</td>
<td>-----------</td>
<td>-------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>LITUSGO</td>
<td>LitusGo: Training Mediterranean local authorities and civil organizations on ICZM and reaction to the impacts of climate changes</td>
<td>2009 - 2012</td>
<td>Leonardo da Vinci Project</td>
<td><a href="http://www.litusgo.com/?index">http://www.litusgo.com/?index</a></td>
</tr>
<tr>
<td>MESMA</td>
<td>Monitoring and Evaluation of Spatially Managed Areas</td>
<td>2009 - 2013</td>
<td>FP7</td>
<td><a href="http://www.mesma.org/">http://www.mesma.org/</a></td>
</tr>
<tr>
<td>MICORE</td>
<td>Morphological impacts and coastal risks induced by extreme storm events</td>
<td>2008 - 2011</td>
<td>FP7</td>
<td><a href="https://www.micore.eu/">https://www.micore.eu/</a></td>
</tr>
<tr>
<td>PEGASO</td>
<td>ICZM project for the Mediterranean and the Black Sea</td>
<td>2010 - 2014</td>
<td>FP7</td>
<td><a href="http://www.pegasoproject.eu/">http://www.pegasoproject.eu/</a></td>
</tr>
<tr>
<td>RESPONSE</td>
<td>Responding to the risks from climate change</td>
<td>2006 - 2009</td>
<td>EU life program</td>
<td><a href="http://www.coastalwight.gov.uk/response.html">http://www.coastalwight.gov.uk/response.html</a></td>
</tr>
<tr>
<td>SUSCOD</td>
<td>SUStainable COastal Development</td>
<td>2009 - 2013</td>
<td>Interreg IV B</td>
<td><a href="http://www.noord-holland.nl/web/Projecten/Suscod.htm">http://www.noord-holland.nl/web/Projecten/Suscod.htm</a></td>
</tr>
<tr>
<td>SUSTAIN</td>
<td>Assessing sustainability and strengthening operational policy</td>
<td>2010 - 2012</td>
<td>Interreg IV C</td>
<td><a href="http://www.sustain-eu.net/">http://www.sustain-eu.net/</a></td>
</tr>
<tr>
<td>SDI4SEB</td>
<td>SUSTAINABLE DEVELOPMENT INDICATORS FOR ICZM IN THE SOUTH-EST BALTIC</td>
<td>2007 - 2008</td>
<td></td>
<td><a href="http://corpi.ku.lt/~SDI-4-SEB/index.html">http://corpi.ku.lt/~SDI-4-SEB/index.html</a></td>
</tr>
<tr>
<td>THESEUS</td>
<td>Innovative technologies for safer European coasts in a changing climate</td>
<td>2009 -2013</td>
<td>FP7</td>
<td><a href="http://www.theseusproject.eu/">http://www.theseusproject.eu/</a></td>
</tr>
<tr>
<td>TIDE</td>
<td>TIDE makes integrated management and planning a reality in the Elbe, Weser, Schelde and Humber estuaries</td>
<td>2009 -2010</td>
<td>Interreg IV B</td>
<td><a href="http://www.tide-projet.eu/">http://www.tide-projet.eu/</a></td>
</tr>
</tbody>
</table>
The overview analysis therefore describes a number of illustrative examples of coastal information systems in order to depict their main characteristics, in particular in relation to their use within the ICZM process. The analysis has attempted to consider a set of illustrative examples representative of the various: EU coastal states, different geographical coverage (regional, national, sub-national, local), different coastal systems (e.g. coastal lagoon, estuary, highly urbanised coastal areas, high-value natural coastal areas, regional sea, etc.) and different typologies of CISs. Each coastal information system was described by means of an analytical table (see structure and contents in Table 3-2).

### Table 3-2 Structure and contents of the analytical table used in the overview analysis of CISs illustrative cases.

<table>
<thead>
<tr>
<th></th>
<th>General Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Name Name and/or acronym of the analysed CIS</td>
</tr>
<tr>
<td>1a</td>
<td>Description Short description of the CIS</td>
</tr>
<tr>
<td>1b</td>
<td>Operating entity Name of the entity (institution, public authority, private entity, or any other typology) that is responsible for the operation of the CIS</td>
</tr>
<tr>
<td>1c</td>
<td>Management structure Structure, within the operating entity, that is responsible for the management of the CIS</td>
</tr>
<tr>
<td>1d</td>
<td>Contacts Web-site, e-mail and/or address</td>
</tr>
<tr>
<td>1e</td>
<td>Typology Operational (used or ready to be used), pre-operational (tested to be developed in a ready to be used-system) or pilot system (partly developed and tested)</td>
</tr>
<tr>
<td>1f</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Operational context and information content</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>ICZM dimensions Does the information included in the CIS address one or more ICZM dimension: territory, environment, economy, society, governance?</td>
</tr>
<tr>
<td>2a</td>
<td>ICZM sectors List of considered information sectors, including for example: drivers of coastal processes (e.g. hydrodynamic, tides, geomorphology, climate change, etc.), human activities (fishery, tourism, energy production, industry, agriculture, port activity, transportation, urbanisation, nature protection, recreational use, etc.), impacts on the coastal system, coastal vulnerability, measures for coastal adaptation, etc.</td>
</tr>
<tr>
<td>2b</td>
<td>Integration Does the CIS provide any integration among the identified sectors/dimensions, e.g. by means of integrated indicators or maps?</td>
</tr>
<tr>
<td>2d</td>
<td>Spatial scale</td>
</tr>
<tr>
<td>2e</td>
<td>Flexibility</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3</th>
<th>ICZM functionalities</th>
</tr>
</thead>
</table>
| 3a | Knowledge related functionalities | Does the CIS provide knowledge functionalities supporting the ICZM process? i.e.:
- Integration among information dimensions and/or sectors supporting integrated assessment;
- Availability of spatial information, i.e. not only maps but proper GIS data on the coastal system (dynamic mapping vs. static mapping);
- Operation at different spatial scales;
- Multi-time data and information;
- Inclusion of relevant ICZM indicators;
- Inclusion of functionalities or maps related to assessment of coastal vulnerability to climate change;
- Inclusion of ICZM best-practices database;
- Others |
| 3b | Process related functionalities | Does the CIS provide process functionalities supporting the ICZM process? i.e.:
- Problem understanding (e.g. definition of impacts, risk and vulnerability) and structuring (i.e. conceptual modelling of problems);
- Stakeholder involvement and participation;
- Vision building and scenario development;
- Assessment of alternatives in planning and/or management;
- Monitoring and evaluation;
- Adaptive planning and management;
- Others. |

---

3 Considered ICZM indicators are the 27 ones defined by the Deduce project (http://www.deduce.eu/index.html) and the work performed by the Working Group on Indicators and Data.
## Users

| 4a | User typology | List of target users, including the following possible ones: Policy-makers, Decision-makers, Coastal planners and/or managers, Specialised and expert users, Representative of private sectors (e.g. industrial or energy companies); Civil society (i.e. general users, NGOs or any other representative of the civil society that are interested in being informed on and/or participating in ICZM) |

## Use of the system

| 5a | Accessibility | Access to the CIS:  
- Free access on-line (access allowed to all users with or without password) to the complete CIS;  
- Free access on line (access allowed to all users with or without password) to part of the CIS;  
- Restricted access on-line (e.g. access allowed only to restricted users such as researchers);  
- Only off-line access. |
| 5b | User-friendliness | Expert judgment on the user-friendliness of the system: low, medium, high. The expert judgment of user-friendliness will be evaluated through the analysis of available interface in case of on-line access or available documentations in case of off-line access to the CIS. |
| 5c | Interactiveness | Availability of Web 2.0 tools or other e-participation tools (e.g. on-line forum, blogs, video-sharing, chat, interactive web-GIS) enabling a high level of interaction between external users and the CIS. |
| 5d | Data access | Availability of functionalities enabling direct access to data, in particular:  
- Availability of downloadable data;  
- Availability of downloadable maps;  
- Availability of downloadable spatial data (GIS layer);  
- Meta-data provision. |

## Technological characteristics

| 6a | Used technology | Typology of the used technological platform: (i) open source, (ii) licensed software, (iii) mixed solution, (iv) other (non-IT). |
| 6b | Integration with other tools | Is the CIS integrated with tools providing specific functionalities managed/operated by the same or other entities? Including the following possible ones: models (e.g. morphological, environmental or hydrological models), relational database, Decision Support System, others. |
6c Integration with other CIS

Is the analysed CIS connected/integrated with other CISs? A specific CIS may be part of a network of coastal information systems sharing the same general structure and enabling mutual interchange of data.

6d Interoperability

Expert judgment on the basis of above information or specific information provided on this issue: low, medium, high. Interoperability is intended as the possibility for spatial data sets to be combined, and for services to interact, without repetitive manual intervention, in such a way that the result is coherent and the added value of the data sets and services is enhanced.

7 Cost/resources

7a Resources

If possible, investment cost (where available); costs and human resources to operate the systems (estimates, where available)

Available information varies significantly; most advanced and well-known coastal information systems are described in details while information on less popular ones (that however may be relevant for the implementation of the ICZM process, in particular at the local level) may be less available. Some systems are totally accessible on line, while others only partially or not at all. The description of coastal information systems considered in the overview analysis varies consequently. Contents of analytical tables actually depends on information availability; for some illustrative cases available information have been not sufficient to describe some of the characteristics addressed by the analytical tables. In such case these specific fields (rather few) have remained blank.

3.2 In-depth description of selected coastal information systems

Out of the overview analysis a subset of coastal information systems was selected for an in-depth description. Selection was based on the qualitative analysis of all CISs’ characteristics highlighted by the general overview (except those related to the general description of the CIS), in particular focusing on those information of the analytical table strictly related to the ICZM implementation, as described in section 4.2 that illustrates the rationale of the selection procedure. Selection based on the qualitative judgement of the main CISs’ characteristics was than reviewed in order to include illustrative cases representing various European sea basins, spatial levels of application, system typologies.

Selected systems were then described in details. The analysis investigated the following topics and sub-topics. Some of them represent further specification of issues addressed in the overview analysis, while others are new ones:

- General Information
  - Name and acronym of the CIS;
  - Description;
✓ Operating entity;
✓ Contacts;
✓ Typology.

- Operational context and information content
  ✓ Further description of the CIS information content (i.e. addressed ICZM dimensions and sectors) and the integration among different information typologies;
  ✓ Metadata management and availability;
  ✓ Data and information providers (e.g. universities, other research institution, statistics institutions, environmental agencies, cartographic institutions or agencies, etc.);
  ✓ Scalability and flexibility of the system.

- Technological characteristics
  ✓ Used technology;
  ✓ Integration with other tools (e.g. models, relational database, decision support systems, etc.);
  ✓ Integration with other coastal information systems;
  ✓ Interoperability.

- ICZM related functionalities
  ✓ Detailed description of ICZM knowledge related functionalities identified by the overview analysis, including: integration among dimensions and/or sectors supporting integrated assessment; availability of spatial information, i.e. not only maps but proper GIS data on the coastal system (dynamic mapping vs. static mapping); operation at different spatial scales; multi-time data and information; inclusion of relevant ICZM indicators; inclusion of functionalities or maps related to assessment of coastal vulnerability to climate change; inclusion of ICZM best-practices database; others;
  ✓ Detailed description of ICZM process related functionalities identified by the overview analysis: problem understanding (e.g. definition of impacts, risk and vulnerability) and structuring (i.e. conceptual modelling of problems); stakeholder involvement and participation; vision building and scenario development; assessment of alternatives in planning and/or management; monitoring and evaluation; adaptive planning and management; others;
  ✓ Availability of summary information that can directly support the ICZM process, including: indicators (specifically ICZM ones), integrated maps (e.g. composite impact on the coastal system, coastal risk, coastal vulnerability, integrated coastal zone planning, marine spatial planning), graphs, summary reports, fact sheets, etc.

- System development and management
  ✓ CIS developer;
  ✓ Description of difficulties encountered in developing the system, such as for example: obstacles related to data acquisition and integration (e.g. heterogeneity of data format, lack of metadata, etc.), obstacles in institutional cooperation, budget limitation, technological problems, etc.;


- Costs related to the system development;
- Description of management modalities, including: (i) structure and roles (e.g. system management, data management, data check and validation, data publication, interaction with external users, etc.) of the specific entities (e.g. a specific department of the public administration) responsible for the CIS management, (ii) data and software updating;
- Cost related to system management, human resources;
- Users’ description, including: multiple/single users, user levels and relative privileges, user typologies, access modalities, management of user access.

- Experience with the implementation
  - Description of the actual use of the CIS, such as for example management of coastal data, data sharing, communication, coastal monitoring, coastal planning and management, etc.;
  - Effective support to ICZM; the analysis will indicate whether the CIS is actually used within an on-going ICZM process and in case will describe the directly supported steps: investigation, analysis, assessment, issue prioritisation, planning, management, monitoring and reviewing.

- Conclusive remarks
  - Conclusive remark on the actual or potential efficacy of the system in supporting the implementation of the ICZM process; i.e. Does the system provide appropriate information and/or functionalities to support the implementation of ICZM in an adaptive management framework?
  - Benefits and usefulness of the system.

Information for the in-depth analysis was acquired by means of desk and “field” research. Field research consisted in remote interviews (e-mail, telephone and/or skype interview) and/or meetings for direct interview with representative of the CIS operating entity (see Annex 4 - Information sources for the in-depth analysis).

### 3.3 Development of key structuring policy requirements for CISs

Within the context of the “Options for coastal information system” study, a policy requirement is defined as a requisite that can be concretely implemented in coastal information systems in order to improve their use in supporting the diffusion and implementation of the ICZM process at various scales (regional sea, national, sub-national and local). Policy requirements have been defined according to the following criteria:

- Relevant at the **EU and/or regional level** (i.e. regional seas); they should be applied to different geographical contexts and to various coastal typologies;
- **Multi-phase oriented**; they should be related to CIS’s support to different phases of the ICZM process (i.e.: assessment, scoping, planning, management, monitoring, reviewing);
- **Limited in number**: identified requirements should be the most relevant ones, i.e. those likely to determine most significant positive effects in improving the support to ICZM;

- **Realistic and operationally oriented**: defined requirements should be concretely useful for the ICZM process and therefore be really implementable rather than representing very good but not applicable options;

- **Ambitious and innovative**: although key requirements will be operationally oriented and realistic, they might include ambitious scope and innovative elements.

Furthermore, definition of policy requirements considered the following specific input:

- Results of the overview and in-depth analysis of illustrative cases of CISs (Task 1);
- Analysis of the thematic literature;
- Results of a first stakeholder consultation involving the invited speakers to the workshop held in Marseille on the 6th of May, who have provided their precious contribution to the preliminary identification of policy requirements and direct impacts to be considered in the impact assessment (see section 3.6);
- Contributions and feedbacks provided by the participants to the stakeholder workshops held in Marseille on the 6th of May;
- Overview analysis of main policy documents related to the implementation of ICZM in Europe. Policy requirements for ICZM supporting information systems attempts to focus on main issues highlighted by this analysis;
- Preliminary assessment of direct impacts of policy requirements; this assessment enabled to verify the usefulness of previously identified policy requirements and optimise their definition and full description.

### 3.4 Impact assessment of policy requirements and options

Subsequently to their definition, key structuring policy requirements and the related policy options (i.e. integrated sets of policy requirements) were assessed in terms of direct (or primary) and indirect (or derived) impacts determined by their implementation throughout the EU, in particular in relation to the support provided to the diffusion and implementation of ICZM policies. The assessment methodology was structured according to framework and the key analytical steps identified by the EC Impact Assessment Guidelines\(^4\); in particular the following steps were considered:

1. Problem identification;
2. Objectives definition;
3. Baseline scenario definition;
4. Policy options development;
5. Identification of direct (or primary) impacts;

6. Identification of indirect (or derived) impacts;
7. Impact assessment;
8. Options comparison.

As further described below, direct and indirect impacts were distinguished to properly take in consideration specificities of the study’s impact assessment, i.e. evaluation of policy options contribution to further improve CISs’ support to the ICZM process.

The first step describes the nature and extent of main problems to be addressed by the impact assessment. These problems were defined on the basis of the results generated by Task 1 (overview and in-depth analysis of illustrative case of existing CISs), including in particular: the state of implementation and use of coastal information systems, as well as gaps, limits and obstacles identified. The second step of the methodology set the objectives related to the previously defined problems. Third step dealt with the definition of the baseline scenario to be used as benchmark for the policy options evaluation. Policy options were then defined (step 4) and closely linked to problems previously identified. Policy options are represented by integrated sets of the key structuring policy requirements defined by sub-task 2.1.

The following methodological step (5 and 6) aimed to identify direct (or primary) and indirect (or derived) impacts. Direct impacts are those related to effects directly determined by a CIS policy option on key issues of ICZM diffusion and implementation in Europe or to the use and the operation of the coastal information systems. Expected positive direct impacts express how the policy options would contribute to the achievement of the identified general and sector objectives and to provide solution to the problem to be addressed. Direct impacts assessment also includes the evaluation of possible negative effects and cost implications. Indirect impacts are those directly or indirectly deriving from the direct ones. Indirect impacts identification was based on the list provided in the EC Impact Assessment Guidelines and grouped in three categories: economic, social and environmental ones.

Afterward (step 7) the magnitude of the direct and indirect impacts was assessed and estimated for each policy option in relation to the baseline scenario. The methodological approach for the evaluation of the impact magnitude implied the definition of qualitative scores expressed by the following possibilities: ---; --; -; 0; +; ++; ++++. Negative values express a negative interpretation of the expected effect (e.g. decreased involvement and participation of stakeholders in the ICZM process) in comparison to the baseline scenario, whereas positive values express an expected positive impact (e.g. increased involvement and participation of stakeholders in the ICZM process).

Impact assessment included the evaluation of cost implications. This analysis was in particular structured in the following three steps:
- Qualitative evaluation of costs;
- Quantitative evaluation of the effort required for the policy implementation;
- Quantitative evaluation of costs.

The qualitative evaluation of costs was based on the definition of qualitative scores according to the same methodology used to evaluate the other (direct and indirect) impacts, thus ensuring consistency and homogeneity of the applied approach. In order to be coherent with the evaluation of these other impacts, in this case negative values still represent a negative interpretation of the expected effect (i.e. increase in costs, for example related to the development
of maintenance of the CIS requirements included in the policy option), while positive values indicate expected positive effects (i.e. decrease in costs).

The quantitative evaluation of the effort (in terms of human and/or economic resources) required for the policy implementation was based on the appraisal of the level of implementation of the three policy options in the CIS illustrative cases considered in the study, according to a 0-3 range; a 3 score represents the proper implementation of the policy option for the considered CIS, 0 is the condition of no implementation of any aspect of the policy option, 1 and 2 represent an intermediate situation being 2 a condition closer to the proper policy option implementation. The used methodology is further described in section 7.2.2. This evaluation enabled to understand the current level of implementation of each policy option, to assess what regions are further off from the proper policy option implementation and to estimate the effort still needed for the policy option implementation at the European and regional sea levels.

Finally, cost quantification was based on the analysis of cost data gathered by Task 1 and the results of the previous two steps, i.e. qualitative evaluation of cost and quantitative evaluation of the required effort. The specific adopted methodology is described section 7.2.2.

Results of the evaluation process were used to compare options among each other (step 8). In particular, final comparison highlighted for each policy option: expected main positive (direct and indirect) effects (benefits), expected main implications in terms of costs and effort required for the policy options implementation, who’s mainly affected, what regions are further off from a proper policy option implementation.

3.5 Stakeholder identification and involvement

The study implied the involvement of a group of stakeholders in order to gain from their experience on ICZM and receive feedbacks on various steps.

Stakeholders are all those who need to be considered in achieving project or programme goals and whose participation and support are crucial to its success. In the context of the present study, particular attention was therefore given to their identification, not only including coastal GIS end-users (e.g. decision-makers, planners, coastal managers) and more specialised users or providers of coastal information (e.g. coastal GIS specialists), but also more in general representatives of the ICZM context. The selection of the relevant stakeholders was made taking into account the specificities of the ICZM implementation process in Europe; the ICZM multi-level governance framework was therefore considered. This consists of:

- International level (e.g. EC-DG, the European Environmental Agency and related European Topic Centres, Regional Seas Commissions);
- National level (mainly Member States relevant Ministries or National Environmental Agencies and National Coastal Agencies; also including Member State representatives participating to the EU ICZM Expert Group);
- Sub-national levels (such as governmental institution acting at the sub-national level and their European associations or sub-national agencies dealing with aspects related to ICZM);
- Local (e.g. municipalities).
In order to gather feedbacks on more technical aspects addressed by the project, CIS and ICZM experts (from main European research institutions) were invited, too. Furthermore, taking into consideration the need for the ICZM implementation of involving all segments of the civil society, and in order to pursue the aim of integration among different perspectives and stakes, representatives of the private sectors (such as representative of main sector associations, dealing for example with fishing, tourism, port management, aquaculture, etc.) and of the civil society (such as members of coastal forum and coastal partnerships of representatives of NGOs and other association) were considered as well.

Stakeholders’ selection was done performing a stakeholder analysis which identified primary and secondary stakeholders who have a vested interest in the issues with which the study is concerned. The goal of stakeholder analysis was to develop a strategic view of the human and institutional landscape, and the relationships between the different stakeholders and the issues concerned. The stakeholder analysis consisted in the following phases:

1. Identifying the key stakeholders and their interests;
2. Assessing the interest, power, and relation to other stakeholders;
3. Identifying how best to engage stakeholders.

In order to identify stakeholders an initial brainstorming (involving the study team) on all possible stakeholders was performed, taking into consideration: who possesses claims, who are the people or groups most knowledgeable about coastal resources and coastal GIS, who are the actors at different governance levels responsible for ICZM implementation in EU Member Countries. A preliminary stakeholders list served as input for the development of the definitive stakeholders list. The snowball technique was employed. The snowball samples begin from a core of known elements that are then increased by adding new elements given by members of the original sample. Afterwards a definitive list of potential parties was identified.

This final list is included in Annex 5. All these stakeholders were contacted and a formal invitation to participate to the study was then sent to them by e-mail. Those who responded positively to the invitation were involved in the concrete activities described in the next section.

### 3.6 Stakeholder participation

In order to motivate the identified stakeholders to actively participate in the study, their involvement was considered throughout the whole duration of the same, rather than only at the end of the activities. Stakeholder participation in particular implied three steps, which were implemented through different modalities as described in this section. The three participatory steps related to:

1. Support to activities of Task 1, in particular dealing with the overview analysis of existing coastal information systems and the selection of illustrative CISs to be in-depth analysed;
2. Support to the initial identification and description of policy requirements, as well as to the definition of direct and indirect impacts to be considered by the impact assessment of the same policy requirements;
3. Validation of policy requirements for coastal information systems and feedbacks for the definition of related policy options, in particular through the organisation of a stakeholder workshop that was held in Marseille on the 6th of May.

All the stakeholders that responded positively to the invitation were involved in the first activity. Progress results of Task 1 of the study were made available (by e-mail) to participating stakeholders; in particular: the list of CISs analysed by the general overview and the list of CISs selected for the in-depth analysis including a short description of the reasons (rationale) supporting the selection. Each participating stakeholder was invited to provide its feedbacks (by e-mail) on two specific issues:

- Identification of further CISs to be analysed by the general overview;
- Validation on the preliminary selected CISs to be in-depth analysis, and in case identification of other cases to be considered.

First feedbacks were used to finalised the list of forty illustrative cases considered in the overview analysis (see section 4.1), while the second sub-activity validated the CISs identified for the in-depth analysis and agreed on the used selection method (see section 4.2).

The second activity involved a restricted number of stakeholders: i.e. seven invited speakers at the stakeholder workshop who provided their precious contribution to the preliminary identification of policy requirements and direct impacts to be considered in the impact assessment. Stakeholders were in particular involved in a two-step consultation. Firstly, they were invited to respond to a short questionnaire sent by e-mail asking their opinion on major CIS’s strengths and weaknesses and most relevant policy requirements for CIS in order to enhance the support to the ICZM. The following specific questions were included in the questionnaire:

- In your opinion what are the current strengths of CIS?
- What are the current weaknesses of CIS?
- Based on the given answers to the previous questions, what are on your opinion the most relevant policy requirements for CIS in order to enhance the support to the ICZM process?

All the involved stakeholders provided their answers to the questionnaire. These were used to structure and orientate a skype-call (second step) aiming to further discuss and fine-tune policy requirements and direct impacts previously identified. Feedbacks were used to define a preliminary list of policy requirements.

The third activity represented the core of the stakeholder involvement and focused on the organisation of a 1-day stakeholder workshop held in Marseille on the 6th of May. The workshop was structured in two sessions (see the Workshop agenda included in Annex 6). Morning session aimed to:

- Illustrate preliminary results of the study also in order to structure and support the afternoon discussion;
- Illustrate some examples of concrete uses of coastal information system in supporting the ICZM process and related future expectations and development.
Stakeholders were invited to participate to the workshop and contribute to the project through two interlinked steps. Firstly, they were asked to fill a short questionnaire (see Annex 6) to provide their support in:

- Validation and priority definition of the preliminary identified policy requirements;
- Impact assessment of preliminary identified policy requirements.

Through the questionnaire, stakeholders were firstly asked to express their evaluation of the policy requirement importance according to a 1 to 10 scale; afterwards, they were invited to provide an assessment of direct impacts of policy requirements, through qualitative scores. More detailed on the used procedures and the relative results are illustrated in section 5.1 of the present report and in the Annex 6 – Workshop report.

Results of the questionnaires were then used to structure the afternoon discussion session that focused on:

- Discussion on and validation of policy requirements;
- Discussion on policy options, i.e. integrated set policy requirements.

Annex 6 (Workshop Report) describes the main issues discussed during the workshop and the most relevant feedbacks that emerged from this discussion. As illustrated in the following chapters (from 5 to 7), these feedbacks were used to: (i) fine-tuned policy requirements and their organisation in groups, (ii) optimise the definition and the structure of direct impacts to be considered in the policy assessment, (iii) to define policy options. This latter aspect was also discussed during the XI meeting of the EU ICZM Expert Group held on the 20th of June in Brussels. Related feedbacks were used to finalise the identified policy options.
4 Analysis of CIS illustrative cases

The current chapter illustrates the activities performed under Task 1, the obtained information and the related interpretation. In particular:

- Section 4.1 describes the CIS illustrative cases addressed by the overview analysis, including both European and extra-European cases. Detailed results of the overview analysis (i.e. CIS analytical tables) are reported in Annex 1 and Annex 2;
- Section 4.2 refers to the in-depth analysis of specific cases, including in particular the description of the criteria used in the selection of those cases. Results of this analysis (i.e. reports of the direct and remote interviews) are included in Annex 3, while Annex 4 describes the details of the used information sources;
- Finally, section 4.3 summarises the main elements arising from the interpretation of results produced by the overview and in-depth analysis of European illustrative cases, depicting a general picture of the current state of implementation and use of coastal information systems, as well identifying main strengthens, weaknesses and existing gaps.

4.1 Overview analysis

The overview analysis considered forty European illustrative cases of CISs. During the analysis a wider initial number of CISs was identified; however some cases were not finally considered since they resulted in addressing too specific sectors, totally not-connected to any ICZM process, or still in a very initial development phase or because only very few specific information is available, thus not enabling a proper description. Table 4-1 and Figure 4-2 respectively show the principal descriptive characteristics (short name, extended name, geographic coverage, spatial level, European sea basins of reference, country) and distribution of analysed CISs. Considered European Sea Basins are those included in the European Atlas of the Sea (Figure 4-1), i.e.:

- Baltic Sea (8 cases);
- North Sea (11 cases);
- Norwegian Sea (1 case);
- Celtic Sea (7 cases);
- Bay of Biscay and Atlantic Iberian Coast (6 cases);
- Mediterranean Sea (13 cases);
- Black Sea (3 cases).

Nine cases are related to two (such as Geoseportal, Nokis or Rediam) or even three European Sea Basins (i.e. Geoidd-Litto); this has been accounted in the above distribution. Detailed results of the overview analysis (i.e. analytical tables) of European illustrative cases are report in Annex 1.
Figure 4-1 European Sea Basins, according to the European Atlas of the Sea sub-division (source: http://ec.europa.eu/maritimeaffairs/atlas/maritime_atlas/#extent=-22.9_15.7_74.3_74&theme=themeGeography.subthemeIMPSeaBasins , last visit on 24.06.2011 at 14.00).
<table>
<thead>
<tr>
<th>Short name</th>
<th>Name</th>
<th>Geographic coverage</th>
<th>Spatial level</th>
<th>European Sea Basin</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>HELCOM MDS</td>
<td>HELCOM Map and Data Service</td>
<td>Baltic Sea</td>
<td>Regional</td>
<td>Baltic Sea</td>
<td>-</td>
</tr>
<tr>
<td>LMS</td>
<td>Lounaispaikka Map Service - LMS</td>
<td>Varsinais Suomi</td>
<td>Sub-National</td>
<td>Baltic Sea</td>
<td>Finland</td>
</tr>
<tr>
<td>South East Baltic Coastal Zone Database</td>
<td>Integrated Atlas of the State of the Coast in the South-Eastern Baltic</td>
<td>South East Baltic Sea</td>
<td>Transnational</td>
<td>Baltic Sea</td>
<td>Poland Russia Lithuania</td>
</tr>
<tr>
<td>REWAL CIS</td>
<td>Coastal Information System of the municipality of Rewal</td>
<td>Rewal coast in Baltic Sea</td>
<td>Local</td>
<td>Baltic Sea</td>
<td>Poland</td>
</tr>
<tr>
<td>Oder Estuary – GIS ICZM</td>
<td>Coastal Information System of the Oder Estuary</td>
<td>Oder Estuary and Mecklenburg-Vorpommern Coastal Area</td>
<td>Sub-National</td>
<td>Baltic Sea</td>
<td>Germany</td>
</tr>
<tr>
<td>GeoSeaPortal</td>
<td>Geographical Sea Portal for the German coast</td>
<td>German coast</td>
<td>National</td>
<td>Baltic Sea and North Sea</td>
<td>Germany</td>
</tr>
<tr>
<td>CIS-FFD</td>
<td>Coastal Information System supporting Fish Farming in Denmark (CIS-FFD)</td>
<td>Denmark</td>
<td>National</td>
<td>Baltic Sea and North Sea</td>
<td>Denmark</td>
</tr>
<tr>
<td>NOKIS</td>
<td>North Sea and Baltic Sea Coastal Information System</td>
<td>North Sea and Baltic Sea</td>
<td>National</td>
<td>Baltic Sea and North Sea</td>
<td>Germany</td>
</tr>
<tr>
<td>Short name</td>
<td>Name</td>
<td>Geographic coverage</td>
<td>Spatial level</td>
<td>European Sea Basin</td>
<td>State</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>----------------------------------------------------------------------</td>
<td>--------------------------------------</td>
<td>--------------</td>
<td>-------------------------------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>LIMFJORDEN CIS</td>
<td>Limfjorden Coastal Information System</td>
<td>Limfjorden</td>
<td>Local</td>
<td>North Sea</td>
<td>Denmark</td>
</tr>
<tr>
<td>The Trilateral Wadden Sea Cooperation web-site</td>
<td>The Trilateral Wadden Sea Cooperation web-site</td>
<td>Wadden Sea (The Netherlands, Denmark and Germany)</td>
<td>Transnational</td>
<td>North Sea</td>
<td>Netherlands, Denmark and Germany</td>
</tr>
<tr>
<td>ScheldeMonitor web portal</td>
<td>ScheldeMonitor web portal</td>
<td>Dutch and Belgian</td>
<td>Transnational</td>
<td>North Sea</td>
<td>Belgium-Netherlands</td>
</tr>
<tr>
<td>WATLAS</td>
<td>WATLAS (Wadden Sea Atlas) and the Wadden Sea Portal</td>
<td>Dutch Wadden Sea</td>
<td>Sub-National</td>
<td>North Sea</td>
<td>Netherlands</td>
</tr>
<tr>
<td>KUSTATLAS</td>
<td>KustAtlas - Belgian Coastal Atlas</td>
<td>Belgium coast</td>
<td>National</td>
<td>North Sea</td>
<td>Belgium</td>
</tr>
<tr>
<td>MAREANO</td>
<td>Marine Area Database for Norwegian coastal and marine regions</td>
<td>Norwegian coast</td>
<td>National</td>
<td>North Sea and Norwegian Sea</td>
<td>Norway</td>
</tr>
<tr>
<td>CAMRA</td>
<td>UK Coastal and Marine Resource Atlas (CAMRA).</td>
<td>United Kingdom</td>
<td>National</td>
<td>North Sea and Celtic Sea</td>
<td>Great Britain</td>
</tr>
<tr>
<td>MIDA</td>
<td>The Marine Irish Digital Atlas</td>
<td>Ireland coast</td>
<td>National</td>
<td>Celtic Sea</td>
<td>Ireland</td>
</tr>
<tr>
<td>Short name</td>
<td>Name</td>
<td>Geographic coverage</td>
<td>Spatial level</td>
<td>European Sea Basin</td>
<td>State</td>
</tr>
<tr>
<td>----------------</td>
<td>----------------------------------------------------------------------</td>
<td>----------------------------------------------------------</td>
<td>---------------</td>
<td>-------------------------------------------------------------------------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>CCO-CIS</td>
<td>Channel Coast Observatory Coastal Information System</td>
<td>Southern England Coast (English Channel)</td>
<td>Sub-National</td>
<td>Celtic Sea</td>
<td>Great Britain</td>
</tr>
<tr>
<td>DORSET EXPLORER</td>
<td>Dorset Explorer and Dorset Coastal Explorer</td>
<td>Dorset coast</td>
<td>Sub-National</td>
<td>Celtic Sea</td>
<td>Great Britain</td>
</tr>
<tr>
<td>CORK HARBOUR GIS</td>
<td>Cork Harbour Geographic Information System</td>
<td>Cork harbour</td>
<td>Local</td>
<td>Celtic Sea</td>
<td>Ireland</td>
</tr>
<tr>
<td>GEOIDD-LITTO</td>
<td>Geography and indicators related to coastal sustainable development</td>
<td>French Coastal Area</td>
<td>National</td>
<td>Celtic Sea, Bay of Biscay and Atlantic Iberian Coast and Mediterranean Sea</td>
<td>France</td>
</tr>
<tr>
<td>GÉOBretagne</td>
<td>GÉOBretagne</td>
<td>Bretagne coast</td>
<td>Sub-National</td>
<td>Celtic Sea and Bay of Biscay and Atlantic Iberian Coast</td>
<td>France</td>
</tr>
<tr>
<td>OCA-CIS</td>
<td>Aquitaine Coast Observatory Coastal Information System</td>
<td>Aquitania coast</td>
<td>Sub-National</td>
<td>Bay of Biscay and Atlantic Iberian Coast</td>
<td>France</td>
</tr>
<tr>
<td>RIA FORMOSA CIS</td>
<td>Ria Formosa Coastal Information System</td>
<td>Ria Formosa</td>
<td>Local</td>
<td>Bay of Biscay and Atlantic Iberian Coast</td>
<td>Portugal</td>
</tr>
<tr>
<td>MEGASIG</td>
<td>Monitoring and Environmental management of the Guadiana Estuary Salt Marshes</td>
<td>Guadiana Estuary</td>
<td>Local</td>
<td>Bay of Biscay and Atlantic Iberian Coast</td>
<td>Portugal and Spain</td>
</tr>
<tr>
<td>Short name</td>
<td>Name</td>
<td>Geographic coverage</td>
<td>Spatial level</td>
<td>European Sea Basin</td>
<td>State</td>
</tr>
<tr>
<td>---------------</td>
<td>--------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------</td>
<td>---------------</td>
<td>----------------------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>REDIAM</td>
<td>Environmental Information Network of Andalusia</td>
<td>Andalucía Atlantic and Mediterranean Coast</td>
<td>Sub-National</td>
<td>Bay of Biscay and Atlantic Iberian Coast and Mediterranean Sea</td>
<td>Spain</td>
</tr>
<tr>
<td>IDEIB</td>
<td>Spatial Data Infrastructure of Balearic Islands</td>
<td>Balearic Islands</td>
<td>Local</td>
<td>Mediterranean Sea</td>
<td>Spain</td>
</tr>
<tr>
<td>IDEC-LITORAL</td>
<td>IDEC-LITORAL</td>
<td>Catalonian coast</td>
<td>Sub-National</td>
<td>Mediterranean Sea</td>
<td>Spain</td>
</tr>
<tr>
<td>THAU LAGOON CIS</td>
<td>Coastal Information System of the Thau Lagoon</td>
<td>Thau Lagoon</td>
<td>Local</td>
<td>Mediterranean Sea</td>
<td>France</td>
</tr>
<tr>
<td>CRIGE-PACA SDI</td>
<td>CRIGE-PACA Spatial Data Infrastructure</td>
<td>Provence and Cote d'Azur</td>
<td>Sub-National</td>
<td>Mediterranean Sea</td>
<td>France</td>
</tr>
<tr>
<td>SICoast</td>
<td>SICoast Information System</td>
<td>Liguria region - Tyrrenian Sea coast</td>
<td>Sub-National</td>
<td>Mediterranean Sea</td>
<td>Italy</td>
</tr>
<tr>
<td>CMGIZC Web-GIS</td>
<td>Web-GIS of the Monitoring Centre for Integrated Coastal Zone Management of the Lazio Region</td>
<td>Lazio region - Tyrrenian Sea coast</td>
<td>Sub-National</td>
<td>Mediterranean Sea</td>
<td>Italy</td>
</tr>
<tr>
<td>Web GIS Coast of the Campania Region</td>
<td>Web GIS Coast of the Campania Region</td>
<td>Campania coastal Area</td>
<td>Sub-national</td>
<td>Mediterranean Sea</td>
<td>Italy</td>
</tr>
<tr>
<td>CIS of Emilia Romagna Region</td>
<td>Coastal and marine information system of Emilia Romagna Region</td>
<td>Emilia Romagna Region - Adriatic Sea coast</td>
<td>Sub-National</td>
<td>Mediterranean Sea</td>
<td>Italy</td>
</tr>
<tr>
<td>Short name</td>
<td>Name</td>
<td>Geographic coverage</td>
<td>Spatial level</td>
<td>European Sea Basin</td>
<td>State</td>
</tr>
<tr>
<td>---------------</td>
<td>----------------------------------------------------------------------</td>
<td>------------------------------</td>
<td>---------------</td>
<td>-------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>SINFO CIS</td>
<td>GIS tools of the Information Service of the Venice Water Authority</td>
<td>Venice Lagoon</td>
<td>Local</td>
<td>Mediterranean Sea</td>
<td>Italy</td>
</tr>
<tr>
<td>SIL VENICE</td>
<td>The Atlas of the Venice Lagoon</td>
<td>Venice Lagoon</td>
<td>Local</td>
<td>Mediterranean Sea</td>
<td>Italy</td>
</tr>
<tr>
<td>GULF OF GERA CIS</td>
<td>Gulf of Gera Coastal Information System</td>
<td>Gulf of Gera (Aegean archipelago)</td>
<td>Local</td>
<td>Mediterranean Sea</td>
<td>Greece</td>
</tr>
<tr>
<td>BCA</td>
<td>Bulgarian Black Sea Coastal Atlas</td>
<td>Bulgarian coast</td>
<td>National</td>
<td>Black Sea</td>
<td>Bulgaria</td>
</tr>
<tr>
<td>AKCAKOCA CIS</td>
<td>Akçakoca Coastal Information System</td>
<td>Akçakoca</td>
<td>Local</td>
<td>Black Sea</td>
<td>Turkey</td>
</tr>
<tr>
<td>Odessa CIS</td>
<td>Odessa Coastal Information System</td>
<td>Odessa Coastal area</td>
<td>Local</td>
<td>Black Sea</td>
<td>Ukraine</td>
</tr>
</tbody>
</table>
Figure 4-2 Distribution of European illustrative cases considered by the overview analysis.
The overview analysis of European illustrative cases was integrated with some extra-European cases. Table 4-2 summarises the five considered cases; four are related to the US experience (and in most case to the ICAN – International Coastal Atlas Network initiative) and a fifth one to the Australian experience. The analysis of extra-European cases attempted to focus on some illustrative cases providing good examples of innovative and original CIS features (i.e. tools, functionalities, contents, etc.), being particularly user-friendly and/or providing a wide coverage of data and information typologies supporting integrated coastal zone planning and management. Some cases (i.e. MARCO-MPP and the Australian On-line Coastal Information – OzCoast) were also selected to describe their climate change related functions. Detailed results of the overview analysis of CISs extra-European cases are reported in Annex 2.

Table 4-2 Extra-European illustrative cases considered in the overview analysis.

<table>
<thead>
<tr>
<th>Name</th>
<th>Geographic coverage</th>
<th>Spatial level</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mid-Atlantic Regional Council on the Ocean Mapping and Planning Portal (MARCO-MPP)</td>
<td>Mid-Atlantic Ocean coastal area, including coastal areas of five states (New York, New Jersey, Delaware, Maryland and Virginia)</td>
<td>Regional</td>
<td>States of New York, New Jersey, Delaware, Maryland and Virginia (USA)</td>
</tr>
<tr>
<td>Virginia Coastal Geospatial and Educational Mapping System</td>
<td>Atlantic coast of Virginia</td>
<td>Sub-National</td>
<td>State of Virginia (USA)</td>
</tr>
<tr>
<td>Massachusetts Ocean Resource Information System (MORIS)</td>
<td>Atlantic coast of Massachusetts</td>
<td>Sub-National</td>
<td>State of Massachusetts (USA)</td>
</tr>
<tr>
<td>Oregon Coastal Atlas</td>
<td>Pacific coast of Oregon</td>
<td>Sub-National</td>
<td>State of Oregon (USA)</td>
</tr>
<tr>
<td>Australian On-line Coastal Information</td>
<td>Australian coast</td>
<td>National</td>
<td>Australia</td>
</tr>
</tbody>
</table>

4.2 In-depth analysis of selected CIS

Out of the overview analysis a subset of coastal information systems was selected for an in-depth description. Selection was based on the qualitative assessment of main CISs characteristics highlighted by the general overview analysis. In particular identified CISs were selected since they:

- Cover a wide range of ICZM information dimensions (information dimensions considered in the analysis are: territory, environment, economy, society, governance) and sectors; thus providing a comprehensive knowledge base to support ICZM implementation.
- Provide good illustrative examples of integration among data and information related to different ICZM sectors and dimensions, thus supporting the integrated analysis of
complex coastal systems in particular by means of summary information (e.g. indicators or integrated maps, such as for example maps of coastal vulnerability to single or multi risks) concretely useful for decision and policy making.

- Provide good illustrative examples of ICZM knowledge related functionalities, in particular: integrated analysis of different information (see previous point); operation at different spatial scale supporting multi-scale and/or cross-border analysis; multi-time data set enabling the analysis of past trends of key coastal processes and supporting the definition of possible future evolution; use of ICZM indicators; inclusion of maps on coastal vulnerability to climate changes and other risks.

- Are directly related to an ICZM process, that in some cases have also acted as key driver for the development and implementation of the coastal information system.

- Provide good examples of ICZM process related functionalities, such as those supporting: problem understanding (e.g. assessment of impacts, vulnerability and risk) and structuring (i.e. conceptual modelling of identified problems); stakeholder involvement and participation (i.e. through Web-GIS and/or other e-participation tools), vision building and scenario development; assessment of alternatives in planning and/or management; monitoring and evaluation.

- Are integrated with other tools (e.g. models, relational database, decision support systems, web viewers for indicators and/or statistics, etc.) and/or other coastal information systems (also through international networks such as ICAN) that can significantly improve the functionalities of the specific CIS, its capacity in providing data and information useful for the ICZM process and enhance opportunities for the exchange of experiences and best practices.

Above criteria were used to select cases to be in-depth described. The identified subset as a whole widely covers these criteria; this actually means that each specific coastal information system included in the subset positively responds to more than one single criteria, although generally not to all of them. Selection based on criteria judgement was than reviewed in order to include illustrative cases representing various:

- European Sea Basins (ref. Figure 4-1); selected cases are related to: Baltic Sea (2 cases), North Sea (2 cases), Celtic Sea (4 cases), Bay of Biscay and Atlantic Iberian Coast (2 cases), and Mediterranean Sea (5 cases). Two cases are related to more than one sea basins (i.e. REDIAM and GEOID-Litto). The overview analysis did not enable to identify a good illustrative case for the Black Sea;

- Spatial levels of application, including regional (i.e. Regional Sea; 1 case), national (4 cases), sub-national (5 cases) and local (2 cases) ones. ICZM concrete processes are mainly occurring at the national and sub-nationals levels; these are therefore more widely covered in the in-depth analysis;

- System typologies, including examples of: web-portal, web-GIS, web-atlas, off-line GIS, indicators web viewers, spatial data infrastructure, map and data service, mixed systems.

Table 4-3 summarises the twelve illustrative cases that have been selected and in-depth described. These must not be considered as the best available CIS in Europe; they rather represent a heterogeneous set of good illustrative cases, whose analysis provided proper information about strengths and weakness of currently available system, in particular in relation to
their use in concretely supporting the ICZM process. Detailed contents of the analysis (i.e. reports of the direct and remote interviews) are reported in Annex 3, while the relative information sources are summarised in Annex 4.

Table 4-3 Illustrative cases considered in the in-depth analysis.

<table>
<thead>
<tr>
<th>Name</th>
<th>Geographic coverage</th>
<th>Spatial level</th>
<th>European Sea Basin</th>
</tr>
</thead>
<tbody>
<tr>
<td>HELCOM Map and Data Service</td>
<td>Baltic Sea</td>
<td>Regional</td>
<td>Baltic Sea</td>
</tr>
<tr>
<td>Coastal Information System of the Oder Estuary</td>
<td>Oder Estuary and Mecklenburg-Vorpommern Coastal Area</td>
<td>Sub-National</td>
<td>Baltic Sea</td>
</tr>
<tr>
<td>North Sea Atlas (Noord Zee Atlas)</td>
<td>North Sea Dutch coastal area</td>
<td>National</td>
<td>North Sea</td>
</tr>
<tr>
<td>KustAtlas - Belgian Coastal Atlas</td>
<td>Belgium coast</td>
<td>National</td>
<td>North Sea</td>
</tr>
<tr>
<td>The Marine Irish Digital Atlas</td>
<td>Ireland coast</td>
<td>National</td>
<td>Celtic Sea</td>
</tr>
<tr>
<td>Dorset Coastal Explorer</td>
<td>Dorset coast</td>
<td>Sub-National</td>
<td>Celtic Sea</td>
</tr>
<tr>
<td>Cork Harbour Geographic Information System</td>
<td>Cork harbour</td>
<td>Local</td>
<td>Celtic Sea, Bay of Biscay and Atlantic Iberian Coast and Mediterranean Sea</td>
</tr>
<tr>
<td>Geography and indicators related to coastal sustainable development</td>
<td>French Coastal Area</td>
<td>National</td>
<td>Celtic Sea, Bay of Biscay and Atlantic Iberian Coast and Mediterranean Sea</td>
</tr>
<tr>
<td>Environmental Information Network of Andalusia</td>
<td>Andalucía Atlantic and Mediterranean Coast</td>
<td>Sub-National</td>
<td>Bay of Biscay and Atlantic Iberian Coast and Mediterranean Sea</td>
</tr>
<tr>
<td>CRI GE-PACA Spatial Data Infrastructure</td>
<td>Provence and Cote d'Azur</td>
<td>Sub-National</td>
<td>Mediterranean Sea</td>
</tr>
<tr>
<td>Coastal and marine information system of Emilia Romagna Region</td>
<td>Emilia Romagna Region - Adriatic Sea coast</td>
<td>Sub-National</td>
<td>Mediterranean Sea</td>
</tr>
<tr>
<td>GIS tools of the Information Service of the Venice Water Authority</td>
<td>Venice Lagoon</td>
<td>Local</td>
<td>Mediterranean Sea</td>
</tr>
</tbody>
</table>
4.3 Results interpretation

The composition of the set of analysed European illustrative cases (40 in total) can be characterised by the following general figures:

- Addressed European sea basins: Baltic Sea (8 cases; 20%), North Sea (11 cases, 28%), Norwegian Sea (1 case, 3%), Celtic Sea (7 cases, 18%), Bay of Biscay and Atlantic Iberian Coast (6 cases, 15%), Mediterranean Sea (13 cases, 33%), Black Sea (3 cases, 8%). Since some of the illustrative cases refer to more than one sea basin, the sum of the percentage distribution is greater than 100% (see Figure 4-3);

![Figure 4-3 CISs percentage distribution in relation to addressed European Sea Basins.](image)

- Scale of application: Regional Sea (1 case; 2.5%), Transnational (i.e. involving coastal areas of different states; 3 cases; 7.5%), National (10 cases; 25%), Sub-national (14 cases; 35%), local (12 cases, 30%) (Figure 4-4). Due to relevance given by the project to operational systems actually supporting ICZM, a higher number of illustrative cases actually refers to the local and the sub-national scale, where ICZM processes are mainly concretely implemented;
CIS typologies: Web-GIS - Web Atlas (42.5%), Off-line GIS (20%), Spatial Data Infrastructure including a Web-GIS component (15%), Web-portal including a relevant Web-GIS component (12.5%), Web-site (10%) (Figure 4-5);
The great majority of analysed illustrative cases are multi-sector (87.5%) thus attempting to deal with the holistic and integrated nature of the ICZM perspective. The selection of illustrative cases was actually based on this specific requirement, too. Some cases are mainly related to specific sectors (oil spill – 2.5%, erosion and coastal dynamics – 5%, fish farming and aquaculture – 5%), however providing data and information useful in general for the ICZM process.

The analysis of the information acquired through the overview and in-depth analysis enabled to draw the following specific considerations related to CIS state of implementation and use in relation to ICZM.

**Operational context and information content**

- For the great majority of considered illustrative cases (28 – 70%) the CIS geographical area of interest is mainly defined by administrative boundaries (in particular for the national and sub-national levels). For the 30% of the cases (in particular local level ones) the area of interest has been mainly defined according to an ecosystem-based approach, specifically referring to: coastal lagoon (4 cases), estuary (3 cases), bay (2 cases), fjord (1 case), marine area (1 case – English Channel), regional sea (1 case – Baltic Sea). Almost all analysed CISs include geo-spatial data related both to the land and marine components of the coastal systems; 4 cases “only” contains marine data and one case appears to mainly include land information;

- The overview analysis investigated the typologies of ICZM information dimensions addressed by the considered CISs cases. All of them include data related to the territory and the great majority properly deals with environmental information (90%). The other information dimensions are properly considered only by some CISs, in particular: 63% case for the economy dimension, 45% for the society dimension, and 40% for the governance one (Figure 4-6).

![Figure 4-6 Percentage of CISs addressing the five ICZM dimensions.](image)
• Integrated information (e.g. integrated maps and indicators) resulting from the joint analysis of different data typologies related to various ICZM sectors and dimensions is properly provided by the 32.5% of analysed cases. Another 32.5% of cases support the integrated assessment with a rather limited number of value-added products, while the 27.5% cases does not directly included examples of integrated assessment (for 3 cases, 7.5%, information on this issue is not available).

ICZM functionalities

• Results concerning the investigation of ICZM knowledge related functionalities are summarised by the following figures. About the 55% of the analysed CIS provides the following specific functionalities:
  o Availability of geo-spatial data; proper geographic information are made available to user that can use them for specific analysis supporting integrated coastal planning and management;
  o Operation at different spatial scale; some of the available spatial data can be rescaled according to the considered spatial extent, thus enabling to visualize more details at a higher scales. This possibility can support multi-scale assessment of main coastal process and dynamics;
  o Multi-time data and information, that however is often limited to a small number of specific issues, in particular: shoreline position, satellite images and orthophotos, population and population density, land uses, environmental monitoring data. Multi-time information is essential for the assessment of coastal process past trends and therefore the evaluation of future evolution and related uncertainty.

  More advance knowledge related functionalities are much less frequently included in the analysed CISs: ICZM indicators and indexes (20%), climate change related functions (12.5%), ICZM best-practices database (7.5%), others (12.5%) (including: other indicators such as for example sustainability indicators, coastal encyclopaedia, coastal barometer web-tool, etc.).

• Results concerning the investigation of ICZM process related functionalities can be summarised by the following figures:
  o More than the 50% of cases resulted in providing direct supports (in terms of functionalities) to problem understanding and structuring (60%) and identification and assessment of planning and management alternatives (52.5%);
  o Other functions are much less diffuse: stakeholder involvement and participation (35%), vision building and scenario development (18%), monitoring and evaluation (15%), adaptive planning and management (2.5%);
  o Some CISs (23%) provides other ICZM process related functionalities, such as support to international cooperation approached by 5 cases.
Use of the system

- 77.5% of the illustrative cases are totally or in great part accessible on-line, while the 22.5% are currently only off-line accessible;

- About 52.5% provides direct access to and download of geo-spatial data. The analysis showed that 33% of analysed CISs (included in the above 52.5%) enables users to access and directly visualise geo-spatial data through WMS (Web Map Service). 25% of cases currently do not enable geo-spatial data downloading even if CISs are accessible on-line, while the remaining 22.5% of CISs is only off-line accessible;

- Metadata are on-line provided by the 68% of analysed CISs (48% of cases clearly appears to meet INSPIRE DIRECTIVE related metadata protocols – ISO 19115/ISO19139) while 4 cases related to on-line CISs currently do not include proper metadata description. 23% is related to off-line system that may include metadata, that however are not on-line visible;

- Tools enabling an appropriate e-participation in ICZM (i.e. e-forum, geo-tagging, video sharing, etc.) are still not much diffused (20%). Some CISs (25%) provide tools enabling partial e-participation and interactiveness (e.g. feedback tools, data exchange platform, etc.). Great majority of CISs do not include specific e-participation tools (Figure 4-7).

![Figure 4-7 Percentage of CISs including e-participation tools.](image)

- 21 cases are available in one language, while 14 cases are available in more than one language (10 in two, 3 in three and 1 in four languages). No information is available for 5 off-line cases. 23 CISs are available in English, including all the 14 multi-languages CISs.
Technological characteristics

- 42.5% of analysed CISs have been developed mainly with licensed software, while 35% are based on open-source software (no information is available for 9 cases – 22.5%);
- According to the overview analysis 12 cases (30%) are related to CISs included in international networks (i.e. ICAN, European Atlas of the Sea, Beachmed network);
- 60% of analysed CIS are characterised by a high level of interoperability, while for the 3% and the 8% interoperability was respectively considered medium or low. For a significant number of cases (12 – 30%) it was possible to define a qualitative evaluation of interoperability (in particular for the off-line systems). Indeed a full and proper assessment of interoperability is really complex and would have required direct and detailed access to all the components of the analysed CISs. Interoperability results are therefore rather indicative.

Cost and resources

- Figure 4-8 and Figure 4-9 illustrate the distribution of main funding sources supporting the CIS development and/or management. The first histogram graph shows funding sources of the forty analysed CISs: 7.5% international organisation, 30% national public organisations and 7.5% national public organisations plus EC funding, 20% regional (i.e. sub-national) (or local, for 2 cases) public organisations and 15% regional public organisation plus EC funding, 15% mainly EC funding. Figure 4-9 illustrates the percentage of CIS’s funded by each funding source; the sum is greater than 100% since some CISs are related to more than a single financial source. EC funding contributed to the development of about the 37.5% of analysed systems.
- Table 4-4 summarise the information on costs and resources related to the CIS development and management that has been possible to acquire through the overview and in particular the in-depth analysis. This kind of information can be reserved and critical, in particular as far as costs are concerned, and therefore is not easy to be found. However, some information is available for almost half of the analysed illustrative cases (47.5%), mainly in terms of resources involved in the CIS development and/or management.

Number of resources involved in the system management depends very much on the application scope, the spatial level of application and geographic coverage, the provided functionalities and in general the level of development of the system. Multi-scope and wide system including various and complex functions as well as a high number of data can involve a relevant number of resources, such as REDIAM and IDEC (both not only focusing on the costs) or CRIGE-PACA SDI and the Emilia Romagna CIS. Smaller systems tend to involve a lower number of resources. However, it is rather difficult to identify a general picture and a clear direct relation among maintenance cost/resources and completeness/complexity of the system, as also showed by some of the data included in Table 4-4. This would have actually required the detailed knowledge of specific aspects that was not possible to fully investigate in the project.
Figure 4-8 Funding sources (in percentage) for the analysed CISs.

Figure 4-9 Percentage number of CIS’s funded by each funding source.
**Table 4-4 Information on costs/resources related to CIS development and management.**

<table>
<thead>
<tr>
<th>CIS</th>
<th>Development costs/resources</th>
<th>Management costs/resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Helcom MDS</td>
<td>Development of current application (2007-2009) involved: 1 part-time persons (map services) and 2-3 person full-time (data preparation)</td>
<td>4 persons in total: 1 dealing with data administration and 2-3 persons with layer preparation</td>
</tr>
<tr>
<td>Lounaispaikka Map Service</td>
<td>A full time project planner for 2 years and two software developers for 2 months each</td>
<td>1 person full time; need for another full time person</td>
</tr>
<tr>
<td>CIS Oder Estuary</td>
<td>The whole project ICZM Oder was started in 2004 with a total budget of 2 million € Between 2004 and 2008: 425,000 € for the Web Portal development, including 365,000 € for the Web-GIS development</td>
<td>4 persons</td>
</tr>
<tr>
<td>North Sea Atlas</td>
<td>First web version of the Atlas involved 2 full time developers for about one year</td>
<td>Management (in particular updating) cost is about 15,000 €/y, involving 8 persons</td>
</tr>
<tr>
<td>Watlas</td>
<td>Initial development (9 years ago): 35,000 €</td>
<td>Management costs for the whole CIS (Wadden Sea Portal) is 375,000 € per year (including resources for 3.3 full time equivalent per year – fte/year). Management costs for Watlas (web atlas) include in the Wadden Sea Portal: resources for 0.2 fte/year and 10,000 €/y of external technical costs.</td>
</tr>
<tr>
<td>KustAtlas</td>
<td>46,381 € for the development of the printed version of the Atlas 25,073 € for the development of the on-line version, plus 5,855 for multi-language translation</td>
<td></td>
</tr>
<tr>
<td>MIDA</td>
<td></td>
<td>1 full time staff and 4 part-time resources</td>
</tr>
<tr>
<td>Dorset Explorer</td>
<td>One person (Dorset Coast Forum) for data management and 5 persons (County Council GIS team) for the tool development and maintenance</td>
<td></td>
</tr>
<tr>
<td>Cork Harbour GIS</td>
<td>System development and management is in charge of 4-5 (part-time) persons at CMRC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Development costs/resources</td>
<td>Management costs/resources</td>
</tr>
<tr>
<td>----------------</td>
<td>-------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>CIS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GEOIDD-Litto</td>
<td>45,000 € or the development of the first GEOIDD-Litto version (2007); about additional 50,000 € for the tool currently o-line (2009)</td>
<td>1 person</td>
</tr>
<tr>
<td>GÉOBretagne</td>
<td>The whole GÉOBretagne project received a total funding of about 3 M € for 2007-2013, in part used for the Internet platform development</td>
<td></td>
</tr>
<tr>
<td>Ria Formosa CIS</td>
<td>247,000 €, involving 10 researchers working in the development and management of the tools over a three years period</td>
<td></td>
</tr>
<tr>
<td>REDIAM</td>
<td></td>
<td>The whole REDIAM management involves about 50 persons from Egmasa (a public environmental company if the regional government) and about 10 persons from Ministry of the Environment of Andalusia</td>
</tr>
<tr>
<td>IDEC-Litoral</td>
<td></td>
<td>For the whole IDEC (including IDEC-Litoral, the specific section on the coastal zone) 13 persons are involved in the management of the GIS unit and further 3 persons for the SDI</td>
</tr>
<tr>
<td>CRIGE-PACA SDI</td>
<td>CRIGE PACA is responsible for the management of the CRIGE-PACA SDI and involved 8 full-time persons. SDI management budget for 2009-2011 is about 620,000 €/year. Data acquisition is budgeted as a separate expenditure and its cost can significantly vary.</td>
<td></td>
</tr>
<tr>
<td>CMGIZC Web-GIS</td>
<td></td>
<td>1 full-time and 2 part-time persons</td>
</tr>
<tr>
<td>Coastal and marine information system of Emilia Romagna Region</td>
<td></td>
<td>10 persons: 5 dedicated to CIS operation and 5 to technological support (likely serving also other services)</td>
</tr>
<tr>
<td>GIS tools SINFO-CIS</td>
<td></td>
<td>12 full-time persons involved in the management, updating and progressive development</td>
</tr>
<tr>
<td>Atlas of Venice Lagoon</td>
<td></td>
<td>2 part-time persons from the Observatory of the Venice Lagoon and 2 consultants (for 20% of their time)</td>
</tr>
</tbody>
</table>
5 Policy requirements

The current chapter illustrates the approach used for the identification of policy requirements that was based on various input, including the results of the overview and in-depth analysis of illustrative cases of coastal information systems (Task 1 – see chapter 4). Much relevance was also given to the precious input and feedbacks provided by the involved stakeholders, previously and during the 6th of May workshop. Finally, the chapter describes the selected policy requirements.

5.1 Approach for the policy requirements identification

Within the context of the “Options for coastal information system” study, a policy requirement is intended as a requisite that can be concretely implemented in coastal information systems in order to improve the use of the same CISs in supporting the diffusion and implementation of the ICZM process at various scales (international, national, sub-national – regional and local). Identified policy requirements are related to the following four categories: scope, contents, functions of and mechanisms of coastal information systems. Afterwards, policy requirements have been grouped to the derive policy options (described in section 6) that have been evaluated in terms of expected direct and indirect impacts. Results of this latter activity are described and discussed in chapter 7.

The identification of policy requirements followed a three steps approach. In the first step policy requirements identification was based on:

- Results of the overview and in-depth analysis of illustrative cases of CISs that enabled to understand the present state of CISs’ development and use, as well as to identify main current gaps and weakness. In particular, policy requirements definition focused on the main problem, and the related objectives, depicted on the basis of the analysis of Task 1 results; problem and objectives identification are the first step of the impact assessment activity and is specifically described in section 6.1;
- Analysis of the thematic literature, in particular related to the comparative analysis of coastal information system and/or to the evaluation of their support to coastal and marine planning;
- Overview analysis of main policy documents related to the implementation of ICZM in Europe. Policy requirements for ICZM supporting information systems attempts to focus on main issues highlighted by this analysis;
- Results of a first stakeholder consultation on policy requirements definition involving the invited speakers (see agenda and list of invited speakers in Annex 6 – Workshop Report) to the workshop held in Marseille on the 6th of May, who had provided their

---

precious contribution to the preliminary identification of policy requirements and direct impacts to be considered in the impact assessment. Stakeholders were in particular involved in a two-steps consultation. Firstly, they responded to a questionnaire sent by e-mail asking their opinion on major CIS’s strengths and weaknesses and most relevant policy requirements for CIS in order to enhance the support to the ICZM. Secondly, they participated to a skype-call to further discuss and fine-tune policy requirements and direct impacts to be assessed.

The above activities enabled to identify an initial set of policy requirements. Subsequently to their initial definition, policy requirements were than assessed by the study team in terms of expected direct impacts (benefits, negative impacts and costs) according to the methodology illustrated in section 3.4 (step 2). As expressed in section 6.1 (see in particular Figure 6-2) benefits included in the identified direct impacts express how policy requirements (and the related policy options) would contribute to address main problems arising from the analysis of the current state of the art and to fulfil the related objectives, dealing with the improvement and strengthen of CIS support to the ICZM process.

The list of direct impacts used for the policy requirements evaluation was defined again with the support of the stakeholders involved in the above mentioned consultation (held before the stakeholder workshop). The impact evaluation exercise specifically aimed to verify the validity and usefulness of the preliminarily identified policy requirements and direct impacts, thus contributing to the definition of relevant requirements in terms of positive effects for the ICZM policy implementation. Direct impacts were identified on the basis of the:

- Results of the already mentioned preliminary stakeholder consultation (included in the above described step 1) involving the workshop invited speakers, in particular through the skype-call discussion;
- Overview analysis of main policy documents related to the implementation of ICZM in Europe (also included in the previously described step 1).

Identified direct impacts for policy requirements evaluation are:

- Integrated knowledge on the coastal system;
- Bridged gap between scientific information and policy/decision making in the ICZM process;
- Involvement of stakeholders in the ICZM process, also aiming to improve awareness on sustainable coastal planning and management;
- Support and facilitation in climate change adaptation of coastal zones within the wider context of ICZM;
- Periodical evaluation process of ICZM planning and management; support an ICZM adaptive process;
- Cooperation among different institutions and institutional levels;
- Implementation of ICZM in a regional sea context;
- Adoption of a long-term perspective for ICZM;
- Support to the integration of ICZM with other closely related policies (in particular IMP-MSP and climate change policies);
• Costs related to maintenance and updating of the CIS;
• Simplification of the use of the coastal information system.

Evaluation of the direct impacts of the identified policy requirements was done through the definition of qualitative scores expressed by the following possibilities: ---; --; -; 0; +; ++; +++.

Negative values express a negative interpretation of the expected effect (for example decrease in civil society participation in ICZM or increase in costs related to maintenance and updating of the CIS), whereas positive values express an expected positive impact (e.g. increase in civil society participation in ICZM or decrease in costs). Table 5-1 reports the results of the direct impacts evaluation.

Finally (third step) policy requirements were presented and discussed at the stakeholder workshop held in Marseille on the 6th of May. Initially, workshop participants were asked to fill a short questionnaire to provide their support in the:

• validation of the preliminary identified policy requirements, as resulting from steps 1 and 2 of the identification approach;
• impact assessment of preliminary identified policy requirements, to contribute to verify their actual validity and usefulness.

Questionnaire results are described in the workshop report (Annex 6), that also summarised the main feedbacks provided during the open discussion. Workshop participants agreed on the presented and discussed policy requirements and on the used categorisation in four groups (scope, contents, functions, mechanisms). Thus the workshop enables to validate the identified policy requirements and the related specific feedbacks were used to optimise their description, illustrated in section 5.2. Results of the policy requirements impact assessment are consistent with the evaluation summarised in Table 5-1 for some of the considered direct impacts (e.g. integrated knowledge on the coastal system or involvement of stakeholders in the ICZM process) while are different for others (e.g. simplification of the use of the coastal information system). These differences confirm the difficulty to define homogeneous values, as also highlighted by the high variability of responses provided by workshop participants for some of the impacts. Variability and heterogeneity are expected to be less significant for the policy impact evaluation, since policy options aggregate various requirements in depicting a more general aim.

From a methodological perspective, it is finally important to stress that the whole study refers to a wide variety of coastal information systems, related to different operating scales (local, sub-national, national and regional sea one), geographic areas and system typologies. Policy requirements refer to the same variability of systems and conditions; in this context they attempt to be:

• enough general to properly deal with this variability;
• enough flexible to permit the implementation of specific solutions able to address specific ICZM problems;
• at the same time, enough specific to determine their possible concrete realisation with the CIS development and implementation.
Table 5-1 Example of evaluation of direct impacts of preliminary identified policy requirements.

<table>
<thead>
<tr>
<th>Integrated knowledge on the coastal system</th>
<th>Bridging gap between scientific information and decision making in the ICZM process</th>
<th>Involvement of stakeholders in the ICZM process</th>
<th>Support and facilitation in climate change adaptation of coastal zones within the wider context of ICZM</th>
<th>Periodical evaluation and management; support an ICZM adaptive process</th>
<th>Cooperation among different institutional levels</th>
<th>Implementation of ICZM in a regional sea context</th>
<th>Adoption of a long-term perspective for ICZM</th>
<th>Support to the integration of related policies</th>
<th>Costs related to maintenance and updating of the CIS</th>
<th>Simplification of the use of the coastal information system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Include end-user in the system design</td>
<td>++</td>
<td>++</td>
<td>*</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Address different user expectations and needs</td>
<td>***</td>
<td>++</td>
<td>*</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Adopt an ecosystem-based approach in the definition of the CIS' context and geographic area of application</td>
<td>++</td>
<td>++</td>
<td>*</td>
<td>++</td>
<td>***</td>
<td>++</td>
<td>***</td>
<td>++</td>
<td>***</td>
<td>--</td>
</tr>
<tr>
<td>Continue and strengthen the effort in matching the INSPIRE Directive</td>
<td>+++</td>
<td>++</td>
<td>*</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Improve economic and in particular social and governance information within CISs</td>
<td>+++</td>
<td>++</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>--</td>
</tr>
<tr>
<td>Improve availability of information resulting from the integrated analysis of data related to different topics</td>
<td>+++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
<td>*</td>
<td>+</td>
<td>++</td>
<td>***</td>
<td>--</td>
<td>++</td>
</tr>
<tr>
<td>Improve availability of multi-time data</td>
<td>+++</td>
<td>++</td>
<td>++</td>
<td>***</td>
<td>**</td>
<td>+++</td>
<td>***</td>
<td>+</td>
<td>--</td>
<td>++</td>
</tr>
<tr>
<td>Develop and implement a common ontology for coastal and marine information</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Improve functionalities directly supporting ICZM decision making in a short and long term perspective</td>
<td>+++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>---</td>
</tr>
<tr>
<td>Improve diffusion and innovation of e-participation tools</td>
<td>+++</td>
<td>++</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>---</td>
<td>+++</td>
</tr>
<tr>
<td>Integrate 3D data and develop 3D tools</td>
<td>+++</td>
<td>++</td>
<td>++</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Ensure data and metadata availability</td>
<td>++</td>
<td>++</td>
<td>***</td>
<td>+++</td>
<td>+++</td>
<td>***</td>
<td>+++</td>
<td>++</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Improve availability of geospatial data and CIS functions related to climate change</td>
<td>++</td>
<td>++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>***</td>
<td>+++</td>
<td>**</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Establish strict link and cooperation between the structure responsible for the CIS management and operation and the structure responsible for the implementation of the ICZM process</td>
<td>++</td>
<td>++</td>
<td>***</td>
<td>+++</td>
<td>***</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Improve the use of protocols facilitating geo-spatial data sharing</td>
<td>++</td>
<td>++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>***</td>
<td>+++</td>
<td>**</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Develop on-line tools to measure the real use of CIS</td>
<td>*</td>
<td>++</td>
<td>***</td>
<td>+</td>
<td>+</td>
<td>+++</td>
<td>++</td>
<td>--</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Participate to CIS and/or ICZM networks</td>
<td>+</td>
<td>++</td>
<td>***</td>
<td>++</td>
<td>++</td>
<td>+++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
</tr>
</tbody>
</table>
5.2 Policy requirements description

The three steps procedure described in the previous chapter allowed identifying 17 policy requirements, below grouped in the four already mentioned categories.

Scope

A1. Include end-user in the system design

Consultation of the user community throughout the CIS design phase is essential to ensure to match users' needs and develop a really useful and concretely used system. This firstly requires the identification of the user community and their active participation in the definition of the specific system requirements, as actually done by some of the analysed CIS illustrative cases.

A2. Address different user expectations and needs

A CIS may aim to provide data and functionalities to different users, such as policy and decision makers, coastal planners and managers, researchers, representative of the economic sectors, citizens, students, CIS experts etc. These can have different expertise and skills, and different requirements and expectation. Multiple-users CISs are required to deal with diverse user typologies, providing them with different knowledge levels, data, functionalities and interfaces. The development of multi-user systems requires a proper evaluation of users’ needs, thus being strictly related to policy requirement (a1).

A3. Progressively move towards the adoption of an ecosystem-based approach in the definition of the CIS’ context and geographic area of application

The adoption of an ecosystem-based approach is one of the key pillars of the ICZM policy. In relation to CISs this would imply the inclusion in the CIS’s geographical area of application of the drainage basin, the land component of the coastal area, and the marine area, thus promoting integration across the land-sea boundary. The adoption of an ecosystem-based approach can also require the definition of the CIS’ area of application beyond administrative (sub-national and national) boundaries, thus implying a cross-border cooperative effort in creating common CIS platforms, also at the international level (some examples have been analysed in this study, such as: Integrated Atlas of the state of the coast in the South-Eastern Baltic, Trilateral Wadden Sea cooperation web-site, Schelde Monitor, Oder Estuary coastal information system, MEGASIG).

A4. Continue and strengthen the effort in matching the INSPIRE Directive

Continue and strengthen the effort in matching the INSPIRE Directive, specifically in relation to metadata standards, geo-spatial data availability and interoperability in general. It is in particular important to ensure the high-quality and standards-compatible metadata are continued to be provided; this can be rather challenging in particular for historical geo-spatial data. Use of various-levels structure to organise and describe metadata (e.g. abstract, discovery, full metadata) can be very useful in approaching different target users.
B1. Improve economic and in particular social and governance information within CISs

The great majority of coastal information system widely covers territory and environmental information. Economic information is considered by a good number of CISs, however only for limited data typologies (such as for examples location of main economic activities). Social and governance information is rarely properly addressed. Indeed, there is a need to improve economic and in particular social and governance geospatial data within CISs. In relation to the governance dimension, it would be very important to include in the CIS the progress results of the ICZM process, i.e. information (data, spatial layers, documents, etc.) on ICZM related plans and policies. These should be made available to all users thus improving awareness and participation of all possibly involved stakeholders on the ongoing ICZM process.

This policy requirement is strictly related to the holistic nature of ICZM and the related ecosystem-based management approach, aiming to determine progress towards good environmental status of coastal ecosystems that is directly relevant to socio-economic benefits and human well-being.

B2. Improve availability of information resulting from the integrated analysis of data related to different topics (and possibly to different ICZM information dimensions: territory, environment, society, economy and governance).

Integrated information (i.e. information directly related to integrated management, such as in particular integrated maps, indicators and indexes) can result really useful in supporting ICZM decision making and communication, in particular in relation to cross-sector analysis and assessment, for example related to: coastal sensitivity, vulnerability and risk, overall pressure on the coastal system, coastal evolution, adaptation, etc. These added value products are also particularly important in dealing with multi-uses zoning (of both land and marine components of the coastal systems) and resolution of conflicts induced by multiple human uses. A specific CIS section on integrated data and geo-spatial data related to ICZM could be developed to properly structure this kind of information.

B3. Improve availability of multi-time data

Historical series of data and geospatial information are essential for the assessment of coastal process trends and the evaluation of their future evolution. Currently, availability of multi-time data is limited to some specific issues, such as in particular: shoreline position, satellite images and orthophotos, population and population density, land uses, some environmental monitoring data. Multi-timing should be expanded to other spatial information, also addressing the economic, social, and governance dimensions.

B4. Develop and implement a common ontology for coastal and marine information

Terminology used to describe same or similar information sectors and data typologies is not uniform; there are differences among various information systems (e.g. shoreline vs. coastline). These differences can obstacle data search, sharing and integration. The adoption of a common ontology could reduce this limitation.
**Functions**

**C1. Improve functionalities and tools directly supporting ICZM decision making in a short and long term perspective**

Coastal information systems only partly provide functionalities specifically supporting the ICZM decision making process, in particular for the public administrations. These kinds of functionalities are particularly required and useful for: vision building and scenario development, assessment of planning and management alternatives, monitoring and evaluation of the ICZM process. Their complexity and completeness can widely vary, including data driven functions (such as integrated maps, scenario maps or ICZM indicator), customised functions and more ambitious Decision Support Tools (DST). DST should be in case designed and developed on the basis of real end-users expectation, thus avoiding too general and no-useful tools.

**C2. Improve diffusion and innovation of e-participation tools**

There is a clear need to evolve from information/communication to real participation in the generation and use of coastal information and more in general in the ICZM process. However few CISs provide proper e-participation tools and functionalities; such tools therefore need to be further developed and innovated. Some examples are: blog, e-forum, social networks, platform for participated GIS (for example to analyse conflicts among coastal uses), wiki-like tools focusing on ICZM or specific related topics, functionality enabling users to provide georeferred naturalistic or environmental observations (geo-tagging functions), etc.. Also database containing information on coastal stakeholders can be very useful in supporting mutual cooperation and full participation within the ICZM process.

Effort shall also be dedicated to develop specific interactive education tools aiming to increase civil society awareness. Analysed CIS cases showed very few tools or sections specifically dedicated to education that is a fundamental step towards awareness rising.

**C3. Integrate 3D data and develop 3D tools**

3D data and tools can be useful in the analysis of some relevant coastal management issues, such as flooding vulnerability and risk, coastal erosion and definition of related interventions, topographic and bathymetry evolution, habitat conservation and requalification, etc. These data and tools are mainly addressed to specialised users, but can also result in being useful for the decision making process for example for 3D visualisation; their development can be therefore linked to the c1 policy requirement.

**C4. Ensure data and metadata availability**

CISs should provide the possibility to download the majority of data and geospatial data they contain, thus supporting the use of coastal information for a wide spectrum of ICZM related initiatives. Downloadable data must be accompanied by a detailed metadata description, also including clear and transparent link to the original data producers.

**C5. Improve availability of geospatial data and CIS functions related to climate change**

Climate change and sea level rise will likely improve significantly coastal vulnerability in the next decades. However, these issues appear to be rarely considered in the analysed illustrative cases of coastal information systems. There is an evident need to improve the availability of geo-spatial data and functionalities (such as for example coastal vulnerability maps to sea level rise, coastal evolution scenarios, visualisation tools, etc.) related to cli-
mate change impacts, vulnerability and adaptation. This would actually support main-
streaming of climate change vulnerability and adaption in coastal and marine plans and
polices.

Mechanism

D1. Establish strict link and cooperation between the structure (department, office, division,
etc.) responsible for the CIS management and operation and the structure (often a differ-
etent one) responsible for the implementation of the ICZM process.

Modalities to develop or reinforce this cooperation can be different and depend on the
specific ICZM case and in particular on the involved subjects. One example could be the
creation of a working group (or a coordination board) for the definition of guidelines for the
implementation, management and use of the CIS. The working group should primarily fa-
cilitate the embedding of the CIS in the policy making and planning/management process,
therefore leading to a concrete use of the CIS for ICZM implementation.

The working group should involve representatives (with different roles: policy makers,
coastal planners, coastal managers, CIS experts, etc.) of all the public (at the all relevant
governance levels) and private bodies/structures involved in the concrete implementation
of the ICZM process, including those operating the CIS.

D2. Improve the use of protocols facilitating geo-spatial data sharing

Open Geospatial Consortium standards (such as Web Map Service – WMS, Web Feature
Services – WFS, and Web Coverage Services – WCS, etc.) offer a high potential for data
and metadata sharing, implying the following advantages: data and metadata are updated
by data producers, responsibility of data and metadata quality check is shared among dif-
ferent subjects (again the data producers), reduction of management costs in particular re-
lated to the previous two issues, reduction of limitation to data accessibility related to re-
strictive data policies and Intellectual Property Rights (IPS).

D3. Develop on-line tools to measure the real use of CIS

These tools should aim to assess the real use of CISs within an ICZM process and there-
fore by the ICZM community. Generally available web statistic tools can provide part of the
needed information, however innovative tools are required.

D4. Participate to CIS and/or ICZM networks

Participation to CIS ad/or ICZM networks (such as ICAN – International Coastal Atlas
Network) can be particularly useful for the exchange of best practices on CIS manage-
ment and use within a ICZM process. These networks can also be very important to
share knowledge related to more technical aspects, including data contents, interoperabil-
ity, metadata, functions and tools, etc., as well as to connect initiatives at different levels
(sub-national, national and international).

Participants to the Marseille stakeholder workshop were invited to evaluate the relative im-
portance of above policy requirements through a questionnaire that was distributed to them
before the same workshop (as mentioned in section 5.1). In particular, they were asked to ex-
press a score ranging from 1 to 10 for each of the policy requirement (where 1 stands for “not
relevant at all” and 10 stands for “extremely important), to evaluate their relative importance.
Figure 5-1 shows the mean score of the policy requirement evaluation based on 21 filled ques-
tionnaires.
All policy requirements got a mean score greater than 6, thus resulting in being all relevant although with relatively significant differences. Policy requirements getting scores higher than 8 were:

- C4 - Ensure data and metadata availability (score = 8.5);
- D1 - Establish strict link and cooperation between the structure responsible for the CIS management and operation and the structure responsible for the implementation of the ICZM process (score = 8.4);
- A2 - Address different user expectations and needs (score = 8.3);
- B1 - Improve economic and in particular social and governance information within CISs (score = 8.2);
- A4 - Continue and strengthen the effort in matching the INSPIRE Directive (score = 8.1);
- A1 - Include end-user in the system design (score = 8.1).
Figure 5-1 Mean scores of policy requirements evaluation (based on 0-10 range) expressed by the participants to the stakeholder workshop.
6 Policy options definition

Following the impact assessment methodology, this chapter describes results of the first four steps:

1. Problem identification;
2. Objectives definition;
3. Baseline scenario definition;
4. Policy options development.

Policy options are intended as integrated sets of the policy requirements described in chapter 5. Conceptually, steps 1 “Problem identification” also oriented the definition of the same policy requirements, as previously described, that were just used to formulate the policy options.

6.1 Problem identification and objective definition

The overview and in-depth analysis highlighted significant strengths of existing CISs, which however are not always properly exploited to fully support the ICZM processes at various scales. The same analysis enabled to identify main current CIS’s weakness and gaps; i.e. key issues to be dealt with in terms of new, and often innovative, requirements. The main problem to be addressed is therefore a twofold problem that can be summarised as follows:

- Underuse or improper use of existing coastal information systems within the ICZM process at various scales.

- Existence of weaknesses and gaps to be addressed through the development of new CIS’ features to further improve their use within the ICZM process at various scales.

Available coastal information systems already include relevant information, functions and tools that can be used to support the ICZM process. However, in some cases these are not fully exploited to properly underpin integrated coastal zone planning and management. Indeed, Task 1 results showed that more than 50% of the analysed CISs provides a good “basic” support to ICZM knowledge (i.e. availability of geo-spatial data, operation at different spatial scale, multi-time data) and process related aspects (i.e. problem understanding and structuring and, even if less frequently, identification and assessment of planning and management alternatives). However support to “more advanced” ICZM aspects (e.g. integrated analysis, stakeholder involvement and participation, vision building and scenario development, adaptive planning management, international cooperation) is much less frequently addressed.

The above described situation is not only related to existing gaps and limits in the CISs’ development (in terms of availability of data or of specific functions and tools, such as those directly supporting decision making or e-participation in ICZM), but is also determined by the underuse of existing CIS potentialities to concretely support the ICZM process. In this perspective, the key issue to be addressed is the reinforcement, or in some cases the establishment, of strict link and cooperation among CIS managers and ICZM actors in order to embed the development and use of the same CISs in the policy making and coastal planning/management process. CIS cases considered in the in-depth analysis provide good examples of direct link to
on-going ICZM processes; however the same, at least in some cases, still highlight the opportunity to reinforce relations between CISs and coastal plans and policies and to support CIS evolvement in tools more accepted and valuable for coastal decision making.

Results of the Public Consultation “Possible way forward for maritime spatial planning and integrated coastal management in the EU”\(^6\), taking place from 23 March to 20 May 2011, highlighted this aspect, too. Although information on the coastal and marine systems are generally available, stakeholders participating to the consultation stressed the great importance (85% of responses expressed a 5 or 4 score on a 1-5 range) of having “Information systems that facilitate the sharing and use of data between competent authorities, stakeholders and the public”.

The second aspect of the defined problem is specifically related to existing gaps and weakness of CISs in relation to their use in proper supporting ICZM, which would require the further development or even the innovation of some CISs elements (contents and functions). The overview and in-depth analysis of CIS illustrative cases (see section 4.3) enabled to identify the following main “weak” elements:

- The CIS context and geographical area of application are not generally defined according to an ecosystem-based approach;
- Economic and in particular social and governance geo-spatial data are often not adequately covered in CISs contents;
- Availability of multi-time data is limited to some specific issues and in general does not cover aspects that are particularly relevant for integrated coastal planning and management;
- Integrated information (e.g. integrated maps and indicators) resulting from the joint analysis of different data typologies related to various ICZM sectors and dimensions is properly provided by few systems;
- Climate change appears to be rarely covered, both in terms of data availability and functions to on-line interactively visualise and analysis these data;
- As previously stressed, coastal information systems only partly provide integrated information and functionalities specifically supporting the ICZM decision making process, in particular for the public administrations. This is particular evident for more complex ICZM aspects, such as vision building and scenario development, adaptive planning management, international cooperation;
- Tools enabling an appropriate e-participation in ICZM (i.e. e-forum, geo-tagging, video sharing, etc.) are still poorly diffused.

Other features appear to be already adequate to provide support to the ICZM process, thus requiring minor or even no new development. These include:

- Multi-sector approach; the great majority of analysed CIS cases considers all the key sectors of the coastal systems, thus attempting to deal with the holistic and integrated nature of the ICZM perspective;

---
- Environmental and territory data and information are in general properly covered;
- A good portion of coastal information systems (more than 50%) provides “basic” support to knowledge and processes related aspects of ICZM, as previously pointed out;
- Great part of the systems is accessible on-line and there is a great effort in making geo-spatial data and metadata directly accessible and freely available to users; however use of Open Geospatial Consortium standards and protocols is still limited;
- Interoperability appears to be one of the main goal of CIS developers and managers and the majority of analysed cases are significantly progressing on this issue;
- Use-friendliness generally is adequate to support the CIS use in coastal planning and management. This aspect can constitute a real limit only for specific CIS cases.

As already stressed in the policy requirements definition, it is important to act on all the CIS’ component including in particular: contents (data, information and related structuring), functions related to different target users (expert and non-expert) and scope (decision and policy making, coast management and planning, stakeholder participation, etc.), and management and operation mechanisms. Contents and function related requirements can mainly act on the design and development of new CISs features, while mechanisms can also determine significant improvement in the use of already existing features, thus strengthening their positive effects on the ICZM process.

The second step of the methodology sets the objectives related to the identified problem. The general objective of the policy options and related impact assessment is to improve the concrete support of coastal information systems to the ICZM process at various scales, enhancing CISs diffusion and strengthening their use in strict connection to integrated coastal planning and management. In relation to this general objective, the following specific objectives have been identified:

- Increase the use of coastal information system in providing full support to implement the key ICZM principles, in particular as defined by the Recommendation 2002/413/EC;
- Provide support (through data, functions and management mechanisms) to the ongoing integration process between ICZM and MSP, and more in general between ICZM and close related policies;
- Simplify the use of coastal information systems in order to make easier and more immediate their support to the ICZM decision making.

Figure 6-1 shows the main links among the specific and general objectives and the two aspects of the identified problem. The same conceptual scheme includes two important criteria considered for the comparison among options:

- Limit and possibly reduce costs related to the development, maintenance and updating of coastal information system;
- Provide benefits on relevant key economic, social and environmental issues that can be indirectly affected by the improvement of CIS use within the ICZM process.
General and specific objectives are then linked to expected benefits considered in the identified direct impacts (see sections 5.1 and 7.1). These express how the policy requirements and options would contribute to the implementation of the same objectives. Figure 6-2 illustrates the main links between the specific objectives and the direct impacts used in the assessment.

The first specific objective contributes to the general one through an improved support of CISs to the implementation of the specific ICZM aspects related to the eight key principles identified by the Recommendation 2002/413/EC. Figure 6-2 shows main links of each key principle to the identified direct impacts. In this perspective, this objective deals with both aspects characterising the considered problem, i.e.: (i) underuse or improper use of already existing CISs strengths and (ii) weakness and gaps limiting the CISs support to ICZM.

The second specific objective focuses on a key issue of the on-going debate of ICZM implementation, i.e. the harmonisation between the ICZM and MSP policies and more in general the integration between ICZM and other closely related policies, including IMP and the climate change adaptation policy. An improved integration among these closely related policies can also reinforce other essential aspects of the ICZM process (referring to the eight key principles), including: the adoption of an ecosystem-based approach, the implementation of ICZM in a regional sea context, the cooperation among different sectors and institutional levels. Figure 6-2 highlights the direct links of this specific objective with the ICZM principle 8 “use of a combination of instruments designed to facilitate coherence between sectoral policy objectives and coherence between planning and management” and to the related direct impact. This objective is mainly related to the first aspect of the identified problem; however actions related to the development of new functions (dashed line in Figure 6-1) might also contribute to this specific objective, too.

Finally, the third specific objective contributes to the general one by pursuing a simplified and immediate use of the coastal information system in supporting ICZM decision making. This objective is not much related to the CIS use-friendliness; indeed Task 1 analysis highlighted that this aspect does not currently constitute a strong limit in the CISs use. The objective is much more related to the development (and innovation) of information and functions that can be directly used in feeding the decision making process on coastal planning and management. In this perspective, this objective is specifically related to the second aspect of the identified problem.
Figure 6-1 Conceptual links among identified problem, general and specific objectives.
Increase use of CISs in supporting the implementation of key ICZM principles

Provide support to the integration between ICZM and MSP and between ICZM and other closely related policies

Simplify use of CISs to better support ICZM

Figure 6-2 Conceptual links among specific objectives and positive direct impacts (benefits) considered in the assessment process.
6.2 Baseline scenario and policy options definition

Policy options are intended as integrated and homogenous sets of the key structuring policy requirements. These are grouped together to define a strategy (i.e. the policy option) generally aiming to improve CIS's support to ICZM implementation, through specific objectives and modalities. Policy options have been clearly defined on the basis of the previous study activities and in particular the results of the analysis of CISs illustrative case and the step-by-step definition of policy requirements (see chapter 5). A further very relevant input to the definition of policy options came from the stakeholder workshop held in Marseille on the 6th of May; main related feedbacks can be summarised in the following points:

- Provide a clear definition of the baseline scenario, that should also include those policy requirements that are related to the fulfilment of already set legislative demands;
- Use all the identified policy requirements for the formulation of the policy options;
- Clearly differentiate the identified policy options; categorizations used to group the policy requirements (four groups: scope, contents, functions and mechanism) can be very useful in supporting the formulation of properly differentiated policy options.

Feedbacks on the policy options formulation were also provided by the EC ICZM expert group, in particular at the XI group meeting.

The first conceptual step of this part of the study dealt with the definition of the "baseline scenario", i.e. the reference scenario to relatively assess direct and indirect impacts of policy options, as described in chapter 7. In the specific context of this study, the baseline scenario is defined as the scenario not including the implementation of new policy requirements for coastal information systems and implying the fulfilment of already set legislative requirements, in particular related to implementation of the INSPIRE Directive. As agreed with participants to the stakeholder workshop, the baseline scenario includes the two identified policy requirements strictly and directly related to the INSPIRE Directive:

- Continue and strengthen the effort in matching the INSPIRE Directive (A4);
- Ensure data and metadata availability (C4), policy requirement strictly related to the previous one.

Afterwards, three policy options were developed, as formed by different policy requirements and being characterised by a different level of ambition (low, medium, high) in terms of expected benefits on the ICZM process, but also in terms of likely costs or burdens linked to the policy option implementation, as further illustrated in the following parts of this chapter.

The following four policy requirements were considered as common to all the three policy options:

- Include end-user in the system design (A1);
- Address different user expectation and needs (A2);
- Develop on line-tools to measure the real use of CIS (D3) in particular in concreting support ICZM;
- Participate to CIS and/or ICZM networks (D4).
These were included in all the three policy options since can provide an evident benefit to all of them with relatively limited use of economic resources and human skills. Ready involvement of final users in the system design and a multi-users oriented system can improve the real use and usefulness of CISs, specifically in the ICZM process, with relatively limited costs. Indeed, users can help to rightly orientate the CIS design and development (in terms of objectives, contents, functions and technological platform) since its real beginning. The further development of on-line tools to measure the real CIS’s use can provide relevant feedbacks to orientate the development and management of the system, as well. Similarly, participation to CIS and/or ICZM networks can require limited economic and human resources and result in being particularly advantageous for the ICZM implementation, enabling to share worldwide experiences and best practices, as well as knowledge related to more technical aspects.

Task 1 highlighted that most of the analysed coastal information systems lack data and functions supporting the assessment of climate change impacts, vulnerability and adaptation on the coasts. However, provisional results of the Public Consultation ”Possible way forward for maritime spatial planning and integrated coastal management in the EU”7, taking place from 23 March to 20 May 2011, showed that “stakeholders” are well informed about the risk that may affect the coast in a specific country/region also due to the impacts of climate change. It is likely that a wide variety of studies, projects and/or plans related to climate change effects on the coastal systems have been produced and related data and information are available, but they have not been included in most the CISs. Thus the “C5 policy requirement” has been split in two:

- Improve availability of geospatial data related to climate change (C5.I); this policy requirement is considered less ambitious and was therefore included in the first policy option. It should mainly imply the integration in coastal information systems of already existing data and information related to the climate change issues;
- Improve availability of functions related to climate change (C5.II), i.e. functions and tools enabling to interactively visualise or even analyse climate change drivers (including sea level rise) and their effect on the coastal systems in terms of impacts, vulnerability and risk. This policy requirement is considered more ambitious since it implies the design and development of new functions. It was therefore included in the second policy option.

The three developed policy options are described below.

**P1 – Improving data and information base (low ambition)**

This policy option mainly aims to improve the data and information base of CISs in particular to increase: the role of the scientifically-based approach, multi-sector and integrated (holistic) knowledge and long-term evaluation in supporting the ICZM planning and management process. The policy option deals with the principal identified data and information gaps, i.e.: socioeconomic and governance data, integrated information, multi-time data (i.e. historical series) and climate change data. In relation to these identified gaps, the policy option in particular aims to improve the availability of geo-spatial data, i.e. georeferred data than can be visual-

---

ised as maps or elaborated to derived other thematic maps, thus providing spatial information useful for integrated coastal planning and management.

The implementation of the P1 policy option mainly relies on the integration within CISs of already existing data and information, still not included in the system, rather than on the acquisition of new data or the realisation of new study. The final goal is therefore the creation of a wider database able to address the various sectors and integrated aspects (i.e. not only environmental and territorial issues) of the ICZM holistic approach as well as its long-term perspective (through multi-time data). The policy option includes the eight policy requirements (4 common and 4 specific ones; these latter mainly related to the “Content” category). The four specific ones are further detailed below:

- Improve economic and in particular social and governance information within CISs (B1);

The great majority of coastal information system widely covers territory and environmental information. Economic information is considered by a good number of CISs, however only for limited data typologies (such as for examples location of main economic activities). Social and governance information is rarely properly addressed. Indeed, there is a clear need to properly cover all the aspects that are essential in dealing with the sustainable planning and management of the coastal and marine systems and the sustainable use of coastal and marine resources.

The overview and in-depth analysis showed that some socio-economic and governance information are included at least in some of the analysed CISs. The main challenges (i.e. priority) compared to the baseline situation are related to the improvement of the following information within CIS:

- Economic information; this type of information is generally covered in terms of spatial location of main marine economic activities (e.g. location of fishing, marine traffic, energy production, energy transportation, mining, harbours). Similar geo-spatial data are required for economic activities (e.g. location of tourism facilities, coastal industry, terrestrial traffic also in relation to marine traffic, commercial activities, etc.) occurring on the land component of the coastal system. Furthermore, location information need to be integrated with quantitative data on the economic activities, that are generally totally lacking, such as tourist fluxes, fishing production, energy production, quantitative data on marine and terrestrial traffic, and related economic values.

- Social information; more frequently available data are related to the demographic sectors. Other data are generally lacking, these mainly refers to data useful to understand the quality of life of coastal population, such as: location of main social services (e.g. schools, hospitals, cultural services, recreational services), employment and labour market, housing market, emergency services. Geo-spatial data on the location of tourist services and attractions need to be further improved, too.

- Governance information; task 1 overview analysis showed how this specific information typology is particularly poorly considered in current CISs. Main priorities are related to: (i) detailed land use to support integrated coastal zoning, (ii) detailed marine use to support maritime spatial planning, (iii) maps on competence on the coastal and marine system, (iv) spatial plans addressing
the coastal system, (iv) sector plans addressing the coastal system, (v) in case available scenarios on the evolution of the coastal physical, natural and socio-economic system.

- Improve availability of information resulting from the integrated analysis of data related to different topics (B2);

Integrated analysis and elaboration of different data typologies can generate and provide summary and integrated information very useful to underpin the ICZM decision making process. This specific aspect of the P1 option aims to improve the availability of integrated information within CISs. B2 requirement differs from the C1 requirement (included in the P2 option) since it does not aim to design and develop on-line tools to enable users to interactively generate this type of information. P1 “simply” deals with the publication on-line of “static” integrated information; in this perspective B2 requirement can be seen as a preliminary step of C1 one. Two main types of integrated information are identified: indicators and/or indexes and integrated maps.

According to Task 1 analysis, indicators and indexes resulted in being included only in the 20% of the analysed cases; ICZM indicators identified by the Deduce project can represent a good reference to further diffuse this type of integrated information. Standardised indicators can enable to relatively compare different coastal areas and the same system in different time steps, thus tracking its evolution. Integrated maps that could be included in CISs strictly depend on the specific characteristics of the considered coastal system and the goals of the on-going ICZM process. Some examples are maps on: (i) multi-use of the coastal and marine system, (ii) coastal vulnerability to single and multi-drivers, (iii) coastal natural and/or technological (single and multi) risk (e.g. oil spill, fire, industrial accident, flooding, coastal erosion, desertification, hydraulic risk, etc.), (iv) level of protection of high-value areas and ecosystems, (v) specific indexes (e.g. the Baltic Sea Pressure Index and the Baltic Sea Impact Index contained in Helcom MSD or the Ecological Sensitivity Index provided by the Odessa CIS). Important integrated maps are related to governance aspects mentioned for the B1 requirement, i.e. the development and on-line availability of integrate coastal zone and maritime spatial planning maps.

- Improve availability of multi-time data (B3);

Historical series of data and geospatial information are essential for the assessment of coastal process trends and the evaluation of their future evolution. Currently, availability of multi-time data is limited to some specific issues (indeed provided by about 55% of the analysed CISs), as highlighted in Task 1 analysis (such as in particular: shoreline position, satellite images and orthophotos, population and population density, land uses, some environmental monitoring data). Multi-timing should be expanded to other spatial information, considering the following possible priorities:

- Include other relevant territorial and environmental issues, such as for example morphological evolution, environmental quality of various matrixes or physical data (e.g. waves, storminess, etc.). Specific typologies of multi-time data to be further expanded depends on the considered coastal system and related CIS;
- Provide multi-time data on main coastal impact and risk, including for example coastal erosion, coastal and river flooding, oil spill, saltwater intrusion, major pollution events, etc.;
- Expand multi-timing to economic, social and governance information, currently addressed in some cases only in terms of land use and demographic data (see B1 policy requirement);
- Include historical series of key data related to climate change and sea level rise impact and vulnerability (see C5.I requirement);
- Provide values of ICZM indicators at different time steps to illustrate the evolution of key coastal process and aspects.

- Improve availability of geospatial data related to climate change (C5.I);

Climate change and sea level rise will likely improve significantly coastal vulnerability in the next decades. However, these issues appear to be rarely considered in the analysed illustrative cases of coastal information systems. There is an evident need to improve the availability of geo-spatial data and functionalities (this aspect is considered in the P2 policy option).

As previously described, provisional results of the Public Consultation "Possible way forward for maritime spatial planning and integrated coastal management in the EU", taking place from 23 March to 20 May 2011, showed that "stakeholders" are well informed about the risk that may affect the coast in a specific country/region also due to the impacts of climate change. It is therefore likely that a wide variety of studies, projects and/or plans related to climate change effects on the coastal systems have been produced and related data and information are available, but they have not been included in most the CISs. This specific policy requirement therefore mainly deals with the collection and inclusion within the CIS of already available climate change related information, with particular focus on geo-spatial data that can be mapped on the territory. Main data relevant for the ICZM process can summarised as follows:

- Past trends of main climate change drivers (e.g. air and water temperature, precipitation, storminess), relative sea level rise (therefore including eustacy, subsidence and isostacy contribution) and storm surges;
- Future projection of main climate change drivers, relative sea level rise and storm surges;
- Thematic maps on coastal vulnerability and risk related to main climate change and sea level rise impacts on the coastal systems; e.g. permanent inundation due to sea level rise, storm surges and flooding, coastal erosion, change in sedimentation patterns, impacts on wetlands and other high-value natural systems, saltwater intrusion in freshwater system, combined river and marine flooding;
- Thematic maps on current, planned and envisaged (scenarios) adaptation measures (i.e. coastal defences, beach nourishment, coastal planning, zoning, natural system migration, etc.). Adaptation information is essential since adaptation can strongly influence coastal vulnerability.
This policy requirement is connected to the previous one, since a greater availability of multi-time data is essential to the development of great part of the above information. In this perspective important historical data include obviously those related to climate change and sea level rise and the physical characteristic of the system (such as the coastline evolution or the location of important ecological systems), but even refers to socio-economic data (e.g. demography, infrastructure distribution, GDP, economic values, etc.) that are essential to evaluate coastal vulnerability.

P2 – Improving and innovating functions and tools (medium ambition)

This policy option mainly aims to improve the availability of functionalities and tools directly supporting ICZM decision makers and coastal planners and managers, as well as to increase stakeholders’ involvement and participation in the ICZM process. This policy option is therefore characterised by two main objectives. The first goal is to provide users with on-line functions and tools enabling them to interactively analyse and elaborate CIS’s data, with particular relevance for geo-spatial information, thus supporting ICZM decision making through customised information (e.g. thematic and integrated maps) produced by these new tools and functions. In this perspective P2 policy option can be strictly related to P1 one; a wider and more complete data and information base can better support data analysis and elaboration through the newly available tools, in particular in relation to the integration of different information typologies. Task 1 analysis highlighted that, although there is a clear need to evolve from information/communication to real participation in the generation and use of coastal information and more in general in the ICZM process, few CISs provide proper e-participation tools and functionalities; P2 option therefore aims to further develop these tools.

The policy option includes eight policy requirements (4 common and 4 specific ones, these latter related to the “Function” category). The four specific ones are further detailed below:

- Improve functions directly supporting ICZM decision making in a short and long term perspective (C1);

This requirement is conceptually linked to the B2 one (see policy option P1), actually representing a further and more demanding step in providing direct support to ICZM decision making. It specifically aims to design and develop on-line tools to enable users to interactively generate information useful for coastal planning and management. The main difference between B1 and C1 is therefore related to the possibility of customisation of final products offered by the latter. Again, the specific function/tools to be realised depend on the particular CIS’s goals and application contexts; the following four levels of implementation can be identified:

  o Dynamic visualisation of spatial layers; i.e. the function enabling to select and overlay more than one layer in a single view to produced customised maps. This function is provided by the great majority of analysed CISs including a Web-GIS component, together with other basic tools (e.g. zooming in and out, panning, legend customisation, etc.). However some of them are still limited to a static visualisation, i.e. visualisation of pre-define maps;

  o Improved Web-GIS functions; these refer to functions that are normally available in off-line GIS but are currently very limited or totally lacking in on-line CISs, such as: buffering, spatial layer classification according to customised legend, distance calculation from a specific target and related mapping, transparency visualisation of a specific layer to show simultaneously two different
layers (i.e. flooded areas on orthophotos or infrastructure), visualisation of attribute data (i.e. numeric data associated to geo-spatial features), possibility to create graphs and/or statistics on attribute data associated to a specific geo-spatial layer, spatial query, etc. These functions can significantly improve the possibility to generate customised maps, thus resulting in being very useful for coastal planning and management.

- Functions for the on-line generation of integrated maps, such as those described in the B2 requirement, part of the P1 policy option. While B2 is “limited” to the on-line publication of pre-defined integrated maps, C1 enables users to generate own customised analysis and maps, mainly in two ways: (i) selecting, or even providing, the specific geo-spatial dataset to be analysed to derive the integrated maps, and/or (ii) selecting the method (e.g. a specific method for the calculation of the Coastal Vulnerability Index) to be used to aggregate the different dataset.

- Tools for the creation of scenarios on coastal evolution; these represent the more advanced level of CIS development, aiming to provide scenarios on key coastal process and issues (i.e. urbanisation, tourism development, population development, coastal vulnerability to climate change, etc.). Such scenarios can be very useful in assessing possible alternatives and contribute to envisage and plan the future. Scenarios tools are normally based on models and require great initial investment.

Task 1 analysis showed that the great majority of the on-line available CISs just satisfy the first level. The priority is therefore on the complete implementation of the first level and the greater diffusion, currently very limited, of the second type of on-line functions.

- Improve diffusion and innovation of e-participation tools (C2);

Task 1 showed that tools enabling an appropriate e-participation in ICZM are still not much diffused (20%). Some other CISs (25%) provide tools enabling partial e-participation and interactivity. Although e-participation is not a specific objective of all CIS typologies (for example it is not strictly relevant for Spatial Data Infrastructure), it should be further strengthened due to the relevant role that stakeholder involvement and participation play in the ICZM process. Some examples are: blog, e-forum, e-room (virtual space to share data, documents, maps, etc.), social networks, platform for participated GIS (for example to analyse conflicts among coastal uses), wiki-like tools focusing on ICZM or specific related topics, functionality enabling users to provide georeferred naturalistic or environmental observations (geo-tagging functions), e-learning platform to freely provide training material, etc.. Also database containing information on coastal stakeholders can be very useful in supporting mutual cooperation and full participation within the ICZM process.

- Integrate 3D data and develop 3D tools (C3);

3D data resulted in being very poorly considered in the analysed CISs. The main priority is therefore to visualise and make available “basic” 3D data, i.e. data describing the three dimensional variation of the coastal and marine systems, respectively Digital Elevation Model or Digital Terrain Model and bathymetric data. 3D digital models can be very useful for various application, related for example to: coastal morphology evolution, analysis of sedimentation/erosion patterns, evaluation of coastal flooding impact.
and risk, planning of coastal defences and other coastal interventions (such as beach nourishment), habitat re-construction or re-qualification (for example for dune systems), etc. 3D data can be used to feed on-line 3D tools. However due to the current situation, the focus is on data availability rather than on tools development.

- Improve availability of CIS functions related to climate change (C5.II);

The conceptual link of this requirement to C5.1 (see policy option P1) is very similar to the one characterising B2-C1 relation. This requirement specifically aims to design and develop on-line tools to enable users to interactively visualise and analyse climate change and sea level related data and generate customised thematic maps on coastal vulnerability and risk to the most relevant impacts (e.g. coastal and river flooding, permanent inundation, coastal erosion, wetland loss or migration, etc.).

An interesting example is the Sea Level Rise and Coastal Flooding Impacts Viewer from the US National Oceanic and Atmospheric Administration (NOAA; available at [http://www.csc.noaa.gov/slr](http://www.csc.noaa.gov/slr)). The purpose of this data viewer is to provide coastal managers and scientists with a preliminary look at sea level rise and coastal flooding impacts. The viewer is a tool that uses nationally consistent data sets and analyses to advise the user of the impacts (in terms of submersions and coastal flooding) of a range of different scenarios of sea level rise. Considered vulnerability targets include: the coastal physical system, the socio-economic system and main wetland areas. Another example is represented by MARCO Portal from the US Mid-Atlantic Regional Council on the Ocean (available at [http://maps.tnc.org/MARCO/index.html](http://maps.tnc.org/MARCO/index.html)) and further described in the relative analytical table included in Annex II. Besides being useful for coastal planners and managers, these tools are very powerful for communication purposes.

P2 focus is on functions provided to ICZM users. C1 and C2 are the core policy requirements of this policy option; indeed C3 and C5 address some specific aspects that are particularly important for the previous C1 and C2 policy requirements. C3 and C5 can be seen as sort of sub-policy requirements of the two previous ones.

**P3 – Enhancing cooperation (high ambition)**

This policy option mainly aims to enhance cooperation among different subjects involved in the CISs implementation and management and more in general in ICZM process, thus improving the CISs support to this latter. Specifically, increased horizontal and vertical cooperation is desirable among: structures of the same authority involved in ICZM and/or the CIS' management and operation, different public authorities involved in the ICZM process, different coastal data providers and managers, managers of different CISs related to the same area of interest. The policy option includes eight policy requirements (4 common and 4 specific ones). The four specific ones are further detailed below:

- Progressively move towards the adoption of an ecosystem-based approach in the definition of the CIS’s context and geographic area of application (A3);

The adoption of an ecosystem-based approach is one of the key pillars of the ICZM policy. However, the CIS’s area and context of application are normally identified according to administrative boundaries; only some cases (about 30%) attempted to apply the ecosystem-based criteria (in particular at the local level). The progressive adoption of this approach can result in being very useful in supporting the ICZM pro-
cess since enables to correctly look at any process (e.g. sediment budget, pollutant load generation and transfer, saltwater intrusion, coastal-river flooding, etc.) linking the drainage basin, the coastal system and the marine area, and to consequently address the definition of planning and management strategies and intervention in a unique and integrated framework, thus promoting integration across the land-sea boundary. The ecosystem approach is also a fundamental step in synergistically merging the implementation of different EU policies and directives dealing with the coastal system, including ICZM, the Integrated Maritime Policy (and the related Marine Spatial Planning – MSP), the Water Framework Directive, the Marine Strategy Framework Directive, the climate change adaptation policy in coastal areas, etc.

Although very promising, the adoption of an ecosystem-based approach is also very challenging and resource demanding for various aspects. Technically, it requires the acquisition and organisation within the CIS of a great set of, often heterogeneous, geo-spatial data not only related to the coastal system itself, but also to the drainage basin and the marine system. Furthermore, it needs a great effort in cooperation at the horizontal and vertical level among the various administrations having competences on the different part of the system. Cooperation can be also required at the international level, when the ecosystem extends beyond national boundaries, as approached by some illustrative CIS cases analysed in Task 1 (e.g. Integrated Atlas of the state of the coast in the South-Eastern Baltic, Three later Wadden Sea cooperation web-site, Schelde Monitor, Oder Estuary coastal information system, MEGASIG). Actually, the development of a cross-border coastal information system, for example through an EU-funded project, can act as a catalyser for longer international cooperation in the ICZM implementation.

- Establish strict link and cooperation between the structure responsible for the CIS management and operation and the structure responsible for the implementation of the ICZM process (D1);

The goal of this specific requirement is to reinforce or even totally establish a strict cooperation between CIS managers and operators and experts in charge to implement the ICZM process. This would avoid that information systems are created just because money and data are available and would bring to really embed the CIS development and use with the ICZM process. This does not only imply that CIS data and functions are used to support coastal planning and management, but even that the ICZM process act as a driver in specifically defying CIS objectives and features.

Modalities to develop or reinforce this cooperation can be different and depend on the specific ICZM case and in particular on the involved subjects. One example could be the creation of a working group (or a coordination board) for the definition of guidelines for the development, management and use of the CIS. The working group should involve representatives (with different roles: policy makers, coastal planners, coastal managers, CIS experts, etc.) of all the public (at the all relevant governance levels) and private bodies/structures involved in the concrete implementation of the ICZM process, including those operating the CIS.

Similarly to A3, this requirement may result in being very useful since would enable to focus CIS development and use to the specific ICZM needs, but would also require a significant collaborative effort among different subjects. Specific resources and time should be therefore dedicated to this cooperation, although these are expected to be
less that those required for the progressive adoption of an ecosystem-based approach.

- Improve the use of protocols facilitating geo-spatial data sharing (D2), implying cooperation among different data producers and managers;

This requirement is included in the P3 policy option since, like the previous two, significantly depends on an enhanced cooperation. In this specific case cooperation is needed among different data providers and managers to share geo-spatial information through an improved use of Open Geospatial Consortium standards (such as Web Map Service – WMS, Web Feature Services – WFS, and Web Coverage Services – WCS, etc.). The technical solution does not represent a relevant limit to data and metadata sharing, while the establishment of a collaborative approach may result in being onerous, at least in the initial phase.

The required effort can be however balanced by the following main advantages: data sharing leads any subject to have access to a wider dataset; responsibility and effort related to data (and metadata) management, updating and quality check are shared among the different data providers; management costs are consequently reduced; limitation to data accessibility related to restrictive data policies and Intellectual Property Rights can also significantly reduced or totally eliminated.

- Develop and implement a common ontology for coastal and marine information (B4);

Finally, the implementation of this requirement needs a collaborative effort in defining a common ontology for coastal and marine information, taking advantage of the already on-going initiatives, such as for example the work promoted by ICAN – the International Coastal Atlas Network. A common ontology can eliminate some of the obstacles currently limiting data search, sharing and integration.

P3 focus is on the coordination mechanism that can enhance the CIS usefulness in promoting and implementing ICZM principle. It is highly ambitions since it does not only refer to changes and modification to be brought to the coastal information systems, but it also implies a great effort in cooperation among different subjects directly or indirectly related to CISs.

Figure 6-3 illustrates the main conceptual links among the different identified policy options. P1, P2 and P3 can be considered progressive scenarios in terms of likely required resources and effort (human and economic) for their implementation and expected benefits in concrete support to the ICZM process. All the three represent a step forward compared to the baseline scenario, since they include new requirements to be implemented in the CISs, aiming to increase the support to the ICZM process, and requires additional resources. In this perspective P1 depicts a relatively low ambitious policy option; P2 a medium ambitious policy option and P3 a high ambitious policy option.

P1 and P2 policy options mainly act on the design and development of new CISs features to improve support to ICZM, respectively related to data/information (contents) and functions/tools. P1 deals with the principal identified data and information gaps, i.e.: socio-economic and governance data, integrated information, multi-timing and climate change data. Its focus is mainly on the integration within CISs of already existing data and information, still not included in the system, rather than on the acquisition of new data or the realisation of new study. The final goal is therefore the creation of a wider database able to address the various sectors and integrated aspects (i.e. not only environmental and territorial issues) of the ICZM
holistic approach as well as its long-term perspective (through multi-time data). P1 policy option, at least for some of its components, and the related creation of a more complete CIS database are often a pre-requisite for the full implementation of the P2 policy option, which focuses on the design and development of new on-line available tools enabling users to interactively visualise, analyses and/or summarise data and information, thus supporting ICZM decision making. P2 policy option also stresses the importance to further improve e-participation tools. Both aspects (decision making and participation oriented functions/tools) require investment to support design and development of new on-line functions and tools. Related costs and efforts are expected to be higher than those characterising P1 option (see impact assessment in chapter 7), in particular due to the required initial costs of development. At the same time, P2 option aims to provide tools (and the related data) that can be directly used by decision makers, coastal planners and coastal managers in their contribution to ICZM, as well as to directly support one of the key principle of the process: the stakeholders’ involvement and participation. Benefits on the ICZM process are therefore expected to be higher than those related to P1. In this perspective (expected higher costs, effort and benefits) P2 option is considered more ambitious to be implemented and in terms of likely positive results.

P3 policy option focuses on increased cooperation, not only in relation to specific CIS aspects (such as data sharing, CIS management or common ontology definition) but also, and in particular, in relation to the real use of the same CIS within the ICZM process and the progressive adoption of an ecosystem-based approach, requiring collaborative effort of the different (public and private) subjects involved in integrated coastal planning and management of a specific territory. Enhancing cooperation can result in being greatly effective in promoting the use of CIS within the ICZM process, also having important effects on various fundamental ICZM aspects, such as: involvement of and cooperation among all relevant administrative levels and bodies, international cooperation including the ICZM implementation within a regional sea context, working with natural processes, or implementation of instruments to facilitate coherence between sectoral policies and between planning and management. P3 option is therefore expected to be particularly ambitious in terms of likely benefits for the use of CIS within the ICZM process. At the same time costs related to its implementation are expected to be higher than those characterising the other two policy options. Significant investments of economic and in particular human resources are necessary to both initiate and maintain alive the collaborative processes; these are not only strictly related to the specific CIS context but even imply the engagement of other ICZM actors, in particular for the adoption of the ecosystem-based approach. P3 can be therefore considered the most ambition option, requiring more effort to be implemented but also likely generating greater benefits. P3 and P1-P2 options are mutually interrelated. Some aspects of the latter can represent steps towards the realisation of P3 requirements, such as in the case of integrated information (P1) and decision support functions (P2) that can underpin the enhancement of cooperation among CIS and ICZM; improved scientifically-based information can also contribute to the progressive adoption of an ecosystem-based approach. On the contrary P3 implementation can reinforce some of the P1 and P2 elements; for example the improvement of the use of protocols facilitating geo-spatial data sharing can contribute, even significantly, to cover the gap on availability of social, economic and governance geo-spatial data.

The impact assessment illustrated in chapter 7 enabled to clearly understand policy options implications in terms of benefits, negative impacts and costs, thus also providing further information to confirm the level of ambition characterising the three options.
Figure 6-3 Conceptual scheme of policy options.
7 Impact assessment of policy options

Following the impact assessment methodology, this chapter describes results last four steps:

5. Identification of direct impacts;
6. Identification of indirect impacts;
7. Impact assessment;
8. Options comparison.

7.1 Impacts definition

Policy options were assessed in terms of direct (or primary) and indirect (or derived) impacts. Direct impacts are those related to effects directly determined by a CIS policy option on key issues of ICZM diffusion and implementation in Europe or to the use and the operation of the coastal information systems. Indirect impacts are those directly or indirectly deriving from the direct ones. Evaluation of direct and indirect impacts attempt to assess both expected benefits and negative effects. Expected benefits are those related to the improvement of the CIS’s support to key ICZM issues (such as for example cooperation among different institutions and institutional levels or involvement of stakeholders in the ICZM process), i.e. they express how the policy options would contribute to the achievement of the identified general and sector objectives (step 2) and to provide solutions to the main depicted problem (step 1). Figure 6-2 illustrates the main link between specific objectives and considered positive impacts (benefits). Other types of benefits may be related to the reduction of costs or use of human resources, for example in relation to maintenance and operation of the system. Negative impacts can be mainly due to increase in costs or in general effort needed for the policy implementation, and increase in difficulties related to the use of the system.

Direct impacts for the policy options assessment include the same direct impacts used to for the policy requirements validation (see section 5.1, step 2 of the policy requirements definition); their definition was therefore based on:

- the results of the already mentioned preliminary stakeholder consultation involving the workshop invited speakers, in particular through the skype-call discussion;
- overview analysis of main policy documents related to the implementation of ICZM in Europe.

This preliminary list of direct impacts was than discussed during the stakeholder workshop held in Marseille on the 6th of May. Main related feedbacks are summarised as follows; workshop participants:

- agreed on the proposed direct impacts (those already mentioned in section 5.1 and used to preliminarily assess policy requirements);
- suggested that policy impacts assessment should be based on an integrated evaluation of expected benefits and costs;
• suggested to include some other “costs or expected negative impacts” in the list of direct impacts to better support the understanding of negative implications of policy options;
• suggested to structure direct impacts by grouping them in homogenous categories;

The final list of direct impacts used to assess the three policy options was therefore defined also on the basis of the above workshop feedbacks. Direct impacts are conceptually organised as follows.

Aspects related to ICZM principles (as identified by the Recommendation 2002/413/EC)
• Integrated knowledge on the coastal system;
• Bridged gap between scientific information and policy/decision making in the ICZM process;
• Involvement of stakeholders in the ICZM process, also aiming to improve awareness on sustainable coastal planning and management;
• Support and facilitation in climate change adaptation of coastal zones within the wider context of ICZM;
• Periodical evaluation process of ICZM planning and management; support an ICZM adaptive process;
• Cooperation among different institutions and institutional levels;
• Adoption of a long-term perspective for ICZM.

Links with a broader policy context
• Implementation of ICZM in a regional sea context;
• Support to the integration of ICZM with other closely related policies (in particular IMP-MSP and climate change policy).

Use of the system
• Simplification of the use of the coastal information system.

Costs and use of resources
• Development or initial costs;
• Costs related to maintenance and updating of the CIS;
• Learning (or training) costs.

The selection of indirect or derived impacts depended on the policy options and the direct impacts individuated. The analysis was based on the EC Impact Assessment Guidelines (in particular Table 1, p. 33). According to the EC Guidelines, the study considered the division of indirect impacts in three groups: economic, social and environmental ones. The main objective of this activity of the study was to assess indirect impacts of CISs policy options that can improve the support to the implementation of ICZM processes at various scales. Indirect impacts

---

8 This list slightly differs for the one used in the assessment of policy requirements; in particular as suggested by workshop participants it also includes some other direct impacts related to "costs".
were therefore selected, form the list included in the EC Guidelines, referring to this overall scope; i.e. relevant indirect impacts are those significantly affected by the identified policy options and that can therefore enable to assess policy options indirect effects. Other potential economic, social or environmental impacts listed in the EC Guidelines were judged less relevant for the three policy options defined or not applicable to the current study. For example, potential impacts on property rights, consumers and households, macroeconomic environment or even conduct of SMEs are more relevant when looking at impacts of information systems themselves but less when looking at policy requisites to use CIS to support ICZM.

A limited number of key derived impacts were selected also to simplify the evaluation process and keep it as realistic as possible. In this perspective, policy options could potentially affect other issues as well, but these indirect impacts are expected to be smaller than key identified ones or even impossible to qualitatively assess in a reliable way. As underlined in the EC Guidelines, in sorting out the possible derived impacts the time dimension must constantly keep in mind; i.e. whether the impact is short term or long term. Whenever relevant, short and long term distinction was therefore addressed by the assessment. Identified indirect impacts are listed below. Key questions related to their evaluation are highlighted for economic and social impact.

**Economic impacts**

- **Functioning of internal market and competition**
  
  What impact (positive or negative) does the policy option have on the free movement of goods, services, capital and workers?
  
  Will it lead to a reduction in consumer choice, higher prices due to less competition, the creation of barriers for new suppliers and service providers, the facilitation of anti-competitive behaviour or emergence of monopolies, market segmentation, etc.?

- **Competitiveness, trade and investment flows**
  
  What impact does the policy option have on the global competitive position of EU firms?
  
  Does it impact on productivity?
  
  What impact does the option have on trade barriers?
  
  Does it provoke cross-border investment flows (including relocation of economic activity)?

- **Administrative Burden**
  
  Does the option have budgetary consequences for public authorities at different levels of government (national, regional, local); both immediately and in the long run?
  
  Does it bring additional governmental administrative burden?
  
  Does the option require the creation of new or restructuring of existing public authorities?

- **Innovation and research**
  
  Does the policy option stimulate or hinder research and development?
  
  Does it facilitate the introduction and dissemination of new production methods, technologies and products?
  
  Does it affect intellectual property rights (patents, trademarks, copyright, other know-how rights)?
Does it promote or limit academic or industrial research?
Does it promote greater productivity/resource efficiency?

Social impacts

- Employment and labour market;
  
  Does the option facilitate new job creation?
  Does it lead directly or indirectly to a loss of jobs?
  Does it have specific negative consequences for particular professions, groups of workers, or self-employed persons?
  Does it affect the demand for labour?
  Does it have an impact on the functioning of the labour market?

- Better living conditions in terms of effects on social protection, health and safety, education system;
  
  Does the option have an impact on services in terms of quality/access for all?
  Does it have an effect on the education and mobility of workers (health, education, etc.)?
  Does the option affect the access of individuals to public/private education or vocational and continuing training?
  Does it affect universities and academic freedom / self-governance?
  Does the option affect the health and safety of individuals/populations, including life expectancy, mortality and morbidity, through impacts on the socio-economic environment (working environment, income, education, occupation, nutrition)?

Environmental

- Integration of risk in coastal planning and management, leading to less coastal vulnerability and higher resilience/adaptation;

- Biodiversity, flora, fauna and landscapes;

- Sustainable use of coastal space (or sustainable land use planning)

As described in the following two chapters, policy options were assessed in terms of expected direct and indirect impacts. Each policy option is formed by various policy requirements; the impact assessment attempted to evaluate the integrated effects of the different policy requirements taking into consideration synergy, contrasting and cumulative effects.

Impact evaluation focused on the analysis of the principal links among policy options, direct impacts and indirect impacts, thus not considering minor and more uncertain ones. The evaluation implied the definition of qualitative scores (expressed by the following possibilities: ---; --; -; 0; +; ++; ++++) and the related description of potential effects (see next two sections). Negative values indicate a negative interpretation of the expected effect (for example decrease in civil society participation in ICZM or increase in costs related to maintenance and updating of the CIS), whereas positive values indicate an expected positive impact (e.g. increase in civil society participation in ICZM or decrease in costs). Policy options have been evaluated in relation to the baseline scenario; i.e. scores represent delta differences with respect to the baseline scenario condition.
The above methodology was also used to qualitatively assess the cost implications of the three policy options. As described in section 7.2.2, cost analysis also included the quantitative estimation of the required effort for each policy option implementation at the European and regional sea level and the elaboration of quantitative estimations of development and management costs.

7.2 **Assessment of direct impacts of policy options**

This section illustrates the assessment of each policy option in terms of their contribution (i.e. benefits or positive direct impacts) to the achievement of the general and specific objectives identified in step 2 of the methodology. The analysis also highlights main negative implication, also including development, management and learning costs of the three policy options. Qualitative scores corresponding to the assessment of direct impacts are summarised in Table 7-1. The table highlights (in blue) the major expected benefits and therefore contributions to the improvement of CIS support to the ICZM process; major negative impacts are marked in orange.

As described in chapter 6, four policy requirements were considered as common to all the three policy options, thus their likely main effects are also common to the three policy options. A1 (Include end-user in the system design), A2 (Address different user expectation and needs) and D3 (Develop on line-tools to measure the real use of CIS) policy requirements generally aim to better meet real user needs and are expected to determine some benefits related to the following issues:

- Bridge gap between scientific information and policy/decision making in the ICZM process; the three policy requirements can help to match user (including policy and decision makers, coastal planners and managers) needs with scientific knowledge and to proper use this latter in the ICZM process;
- Involvement of stakeholders in the ICZM process; ready involvement of final users in the system design and a multi-users oriented system can significantly improve the real use and usefulness of CISs and therefore the participation within the ICZM process;
- Simplification of the use of the system, by properly orientating the CIS design and development and specifically its user interface.

Main benefits of the D4 (Participate to CIS and/or ICZM networks) policy requirement are related to opportunities offered by sharing of worldwide experiences and best practices, as well as knowledge related to more technical aspects related to CISs. Main related benefits are expected for the following issues:

- Integrated knowledge on the coastal system;
- Bridge gap between scientific information and policy/decision making in the ICZM process;
- Cooperation among different institutions and institutional levels;
- Implementation of ICZM in a regional sea context.
For all the four above policy requirements, costs can be rather limited in comparison to expected benefits. Some costs are expected to address different user expectation and needs, in particular in relation to the CIS development, and to develop on-line tools to measure the real CIS’s utilisation, while participation to CIS and ICZM networks can require dedicated resources and time. The ready involvement of users in the system design can help to partially optimise the use of resources thus contributing to cost reduction. Knowledge and experience exchange through CIS and ICZM networks can also help in addressing the proper solution to specific needs, thus contributing, although partially, to cost reduction.

The expected benefits (i.e. contribution to the identified general and specific objectives) of the three policy options are described in the following section. The impact assessment of the three policy options also considers the evaluation of two other important criteria:

- Limitation and possibly reduction of costs related to the development, maintenance and updating of coastal information system; cost implications are assessed in sections 7.2.1;

- Provision of benefits on relevant key economic, social and environmental issues that can be indirectly affected by the improvement of CIS use within the ICZM process; this aspect is analysed in section 7.3.

The diagram of Figure 7-1 highlights main direct impacts (benefits and costs) of the three policy options. In particular continuous lines refer to direct benefits and costs that were respectively associated to +++ and --- scores as described below; dashed lines refer direct benefits and costs that were respectively associated to ++ and -- scores.
Figure 7-1 Main policy options’ direct impacts.
7.2.1 Direct impacts: expected benefits

Integrated knowledge on the coastal system

This direct impact is relevant for the three policy options, since all of them contribute in enhancing the knowledge on the coastal system and its diffusion towards different targets and users. Efforts aiming to improve integrated data and knowledge are particularly important for this direct impact.

- P1 – Improving data and information base; P1 directly aims to further develop the CISs data and information base in particular to cover all aspects relevant for the knowledge of the coastal system (i.e. including social, economic and governance data as well as environmental and territory data) as well as to deal with time dimension through multi-time data. These requirements are essential to underpin the adoption of a holistic approach and the integrated knowledge of the coastal system. Integrated knowledge is specifically addressed by P1 policy option through the improvement of information resulting from the integrated analysis of data related to different topics (such as indicators and integrated maps) - (Score: +++).

- P2 – Improving and innovating functions and tools; benefits related to this policy option are again relevant since P2 aims to improve the functions directly supporting the ICZM decision making process; these functions strongly rely on the availability of integrated information. 3D and in particular climate change related tools can contribute in generating integrated information; coastal vulnerability to climate change for example requires to approach physical (e.g. coastal typology or climate drivers), social (e.g. population density), economic (e.g. land and infrastructure economic values) and governance (e.g. land planning and adaptation planning) information throughout an integrated evaluation. Improvement of e-participation tools appears to have a negligible effect on this impact - (Score: ++).

- P3 – Enhancing cooperation; among the three policy options P3 is the one likely producing less benefits on this specific ICZM aspect. These benefits are mainly related to the progressive adoption of an ecosystem-based approach that can indirectly help the integrated analysis of different sector data. Indirect benefits can be also produced by CISs policy requirements enhancing data exchange (i.e. development of a common ontology and use of protocols facilitating geo-spatial data sharing); these can enlarge possibility to improve the CISs data base for all the information dimensions (territory, environment, society, economy and governance). Hence, P3 benefits are expected to be less relevant than P1 and P2 ones - (Score: +).
Bridged gap between scientific information and policy/decision making in the ICZM process

This direct impact aims to assess the contribution that each policy option can give to the proper use, within the ICZM, of scientific knowledge; this is often available but not always fully used in decision making. This direct impact is not only related to the improvement of data and information (that is although essential) but also to their integration in forms and typologies (e.g. indicators or integrated maps) that can result in being ready useful for the decision making process.

- P1 – Improving data and information base; P1 main benefits on this specific aspect are related to the improvement of integrated analysis and relative results that can result really useful in supporting ICZM decision making, in particular in relation to cross-sector analysis and assessment. Improvement of the CISs data base can also indirectly contribute to bridge the gap between science and decision making for those aspects currently poorly covered (i.e. society, economy and governance) - (Score: ++).

- P2 – Improving and innovating functions and tools; P2 is the more effective policy in terms of improvement of the links between scientific knowledge and decision making. It specifically aims to further develop and diffuse CISs’ functions and tools directly supporting ICZM decision making that necessarily need to rely on scientific knowledge. 3D and climate change related functions can also contribute to this benefit; similarly they strongly depend on scientific knowledge and tools (such as models) and can enable to analysis data to generate information ready useful for decision makers, coastal planners and coastal managers - (Score: +++).

- P3 – Enhancing cooperation; P3 does not directly affect this benefit; however an enhanced cooperation can contribute to improve the proper use of scientific information in coastal planning and management. This can be in particular pursued through a better cooperation among CIS managers and the structure responsible for the ICZM implementation; a better cooperation can bring to a clear definition of needs within the ICZM process and to a better use of available information and more in general of scientific knowledge. Other requirements are relatively less important for this benefit - (Score: +).

Involvement of stakeholders in the ICZM process, also aiming to improve awareness on sustainable coastal planning and management

There is a clear need to move from communication to real participation in the ICZM process, to fully benefit from the great experience and expertise that stakeholder can provide to the ICZM process. CISs can include facilities improving the real participation in two directions: stakeholders can fully benefit from the use of CISs functions and data or they can feed CISs with information and any other indication relevant for the ICZM process. This issue is specifically addressed by the P2 policy option.

- P1 – Improving data and information base; P1 option does not specifically contribute to improve stakeholder participation into the ICZM process. Indeed, a greater availability of data does not immediately imply an improved participation. Indirect benefits can be generated by the improved availability of information resulting from the integrated analysis of data related to different topics; integrated maps, indicators or in-
dexes can support communication and awareness rising on coastal planning and management. However, in general P1 effects are considered negligible - (Score: 0).

- P2 – Improving and innovating functions and tools; P2 specifically aims to improve stakeholders’ involvement and participation, in particular through the further development and innovation of e-participation tools. Innovation is expected to play a significant role since can provide new modalities for a real participation in the ICZM process. Positive effects on this aspect can be also generated by improved decision supporting tools; although these are mainly intended for more expert users they can efficiently summarise data and information in more communicative products (e.g. indicators, integrated maps, scenarios, process simulation, etc.) - (Score: +++).

- P3 – Enhancing cooperation; the effect of this policy option might be rather significant even if less relevant than P2 one. Main positive implications are related to possibilities offered by a specific policy requirement included in this policy option. Wider use of protocols facilitating geo-spatial data sharing can support a proper diffusion and use of data and information as well as data exchange among different stakeholders. However, this requirement directly affects participative use of coastal information system, rather than real stakeholder participation into the ICZM process - (Score: +).

Support and facilitation in climate change adaptation of coastal zones within the wider context of ICZM

Climate change vulnerability and adaptation are key issues for coastal management and will likely become more important in the future. These issues are related to the availability of data and tools specifically focusing on the climate change sectors, but need also to be addressed in terms of better cooperation and coordination among different subjects.

- P1 – Improving data and information base; more data and information can support a proper knowledge of the system and a better planning and management process, also including the identification of adaptation measures to climate change. Socio-economic information is essential in correctly understanding climate change vulnerability of the coastal system (for example in terms of people or infrastructure at risk for flooding). P1 option also includes the improvement of availability of climate change related data; in this perspective acquisition and integration (with the CISs) of data on current and planned adaptation measures are essential. Multi-time data are also important in particular to understand historical trends and evaluate their future evolution, which is particularly relevant for climate change related assessments. Although necessary, the improvement of the information base does not immediately imply a more efficient adaptation strategy – (Score: ++).

- P2 – Improving and innovating functions and tools; P2 specifically addresses this aspect through the improvement of the availability of functions dealing with climate change vulnerability and adaptation. Similarly to the P2 option, it is important to stress that these functions should not be limited to vulnerability assessment but also attempt to take in consideration adaptation issues, too. 3D data and tools can be very useful in side supporting more complex climate change related functionalities; 3D is actually essential in dealing with elevation, relative sea level rise and flooding data. The real effect of this policy option on this ICZM aspect strictly depends on developed functions, being also very much related to the application scale – (Score: +++).
• P3 – Enhancing cooperation; main positive effects of P3 policy option are related to the adoption of an ecosystem-based approach. This enables to properly deal with multi-scale analysis and to connect the local scale to the regional one, thus linking the specific interventions (local scale) to a wider plan looking at the whole coastal system (regional or supra-regional scale), as necessary when dealing with climate change risks assessment and the related definition of adaptation measures – (Score: ++).

Periodical evaluation process of ICZM planning and management; support an ICZM adaptive process

This issue attempts to evaluate how policy requirements and options can help the adaptive planning process, in particular through the creation of tools and mechanism supporting the periodical and shared assessment of the ICZM process.

• P1 – Improving data and information base; Main P1 positive effects are related to the increase availability of multi-time data that can enable to understand how processes evolve in time, and of integrated analysis results. Standardised indicators (such as the one defined by the Deduce project) or other standardised products (for example integrated maps related to pressure on the coast, state of the coast, coastal and marine uses or coastal and marine conflicts) can support the periodical assessment process that is one of the essential basis of adaptive management – (Score: ++).

• P2 – Improving and innovating functions and tools; similarly to the previous policy option, main P2 expected benefits are related to a specific requirement, i.e. the improvement of functions directly supporting decision making. Tools including advanced ICZM process related functions (i.e. assessment of alternative in planning and management, vision building, scenario development, monitoring of the ICZM process) can be useful in supporting adaptive management – (Score: ++).

• P3 – Enhancing cooperation; P1 and P2 can provide useful data and tools to support adaptive management. However they are totally ineffective if a proper mechanism aiming to promote the adaptive process is not put in place and fully implemented. In this perspective cooperation is really essential, in particular when referred to collaboration between CIS managers and ICZM experts. A close cooperation among these two subjects can maximise the benefits produced by the use of CISs in feeding and underpinning the periodical process of evaluating, problem conceptualising, planning, managing and monitoring – (Score: +++).

Cooperation among different institutions and institutional levels

This direct impact is particular relevant for the P3 policy option that is actually based on a strong enhancement of cooperation involving various aspects of the development, operation and use of coastal information systems.

• P1 – Improving data and information base; P1 expected effects on cooperation among different institutions are considered not relevant. Some positive effects could be indirectly generated by the improved integrated analysis of data, if this implies a greater cooperation among different data managers or producers. The net effect of this policy option is however considered not relevant in comparison to the baseline scenario – (Score: 0).
• P2 – Improving and innovating functions and tools; P2 option evaluation for this impact is very similar to the previous one. Positive effects, although limited, could be generated by the further development of functions supporting the decision making process, that can require or facilitate cooperation among different institutions. These effects are however expected to be relatively limited if compared to the baseline scenario and the P3 policy option – (Score: 0).

• P3 – Enhancing cooperation; this direct impact is specifically addressed by the P3 policy option; actually almost all P3 policy requirements significantly contribute to enhance cooperation among different subjects involved in the CISs implementation and management and more in general in the ICZM process. The progressive adoption of an ecosystem-based approach strictly needs and promotes horizontal and vertical cooperation among all the bodies involved in the integrated management of a specific coastal ecosystem. Cooperation is also essential among different departments or offices belonging to the same public administration, as fostered by the D1 policy requirements. The increase in the use of protocols for geo-spatial data sharing and the development of a common coastal ontological system requires and support close collaborations among data producers and managers (not only including public administration, but also research institutions, NGOs and the representatives of the economic sector) – (Score: +++).

Adoption of a long-term perspective for ICZM

All the three policy options include some CISs requirements that can be relevant in promoting the adoption of a long-term perspective. The three policy options have effects that can be associated to similar evaluation of the final score related to this impact, even if these effects are rather different.

• P1 – Improving data and information base – main P1 benefits in terms of long term perspective are related to the improved availability of multi-time data that can enable to understand processes evolution and to define scenarios for the future. A scientifically-based elaboration of future scenario is essential to properly deal with long-term planning and management. P1 also considers the improvement of availability of climate change data, including projections that are directly related to a long-term vision - (Score: ++).

• P2 – Improving and innovating functions and tools; P2 option aims to improve functions directly supporting decision making in a short and long-term perspective. This policy option has also positive implications on the considered direct impacts since aims to promote the further development of specific functions dealing with climate change. Tools enabling to generate climate change impact scenarios (e.g. coastal scenarios related to flooding, permanent inundation and loss of land, saltwater intrusion, and erosion) enable to address specific issues of the long-term coastal planning and management. The other policy requirements of this option does not specifically affect this impact – (score: ++);

• P3 – Enhancing cooperation – A strong cooperation between the ICZM responsible structure and CIS managers and operators can reinforce the real and lasting use of CIS contents and functions within the ICZM process. This can enable continuous CIS support to coastal planning and management that is essential for a long-term perspective, thus not limiting the use of CIS to specific short-term needs. The progressive
adoption of an ecosystem-based approach also needs the long-term vision that is essential to understand most of the natural processes and to plan and implement measures to counteract possible problems affecting them, such as in the case of the reconstruction of natural coastal habitats just to mention an example - (Score: ++).

Implementation of ICZM in a Regional Sea context

The adoption of a holistic and ecosystem-based approach also implies the need to refer to the wide scale represented by the regional sea level that enables to properly take in consideration regional (environmental, social, economic and governance) drivers and problems. Cooperation at this level can be really powerful and efficient to join the resources (including economic ones) to tackle major problems and benefit for more relevant opportunities. The assessment of this impact is similar to the one related to “cooperation among different institutions and institutional levels”; indeed cooperation is essential to promote ICZM implementation at the regional sea context.

- **P1** – Improving data and information base; P1 expected effects on this issue are considered not relevant. Some positive effects could be indirectly generated by the improved integrated analysis of data, if this implies a greater cooperation at the regional sea level. The net effect of this policy option is however considered not relevant – (Score: 0).

- **P2** – Improving and innovating functions and tools; some positive effects are expected for this policy option. Increased cooperation within the regional sea could be supported by improved tools and functions for decision making that could facilitate exchange of ideas and mutual understanding among coastal decision makers. Improved e-participation functions can also point to the same direction, facilitating best practise exchange among stakeholders of different countries. Sharing and discussion are initial and fundamental steps towards a more advanced cooperation between countries of the same Regional Sea – (Score: +);

- **P3** – Enhancing cooperation; Implementation of ICZM in a regional sea context is particularly promoted by P3 policy option due in particular to the progressive adoption of an ecosystem-based approach. At a greater level this implies that ICZM problems are also tackled within a regional sea perspective. Actions supporting data sharing and the definition of common data and information platforms (including a common ontology) can definitively improve a shared regional sea’s knowledge. An important role can be also played by the Regional Sea Commissions and Conventions. Proper use of CIS in supporting ICZM implementation can be further promoted by a strong link within these Commissions between CIS managers and coastal experts dealing with ICZM (in particular for those regional seas that have a proper CIS; such as the Helcom MDS for the Baltic Sea Commission or the SDI for the Mediterranean Sea that the EU funded PEGASO project is developing) – (Score: +++).
Support to the integration of ICZM with other closely related policies

This direct impact aims to evaluate main policy options implication on the integration between ICZM and most relevant closely related EU policies, referring specifically to the Maritime Spatial Planning (MSP), as one of the key cross-cutting tools to underpin the Integrated Maritime Policy (IMP) and climate change adaptation. The below described effect can be considered as added-values for the implementation of policies closely related to ICZM.

Maritime Spatial Planning

The Blue Paper and the related progress report on the EU’s IMP identify MSP as one of the key cross-sector tools (together with integrated surveillance and the building of a marine knowledge base) to support integrated policy and decision making and to underpin IMP. The Roadmap on MSP sets ten key principles to properly address the implementation of maritime spatial planning with the EU context. All the three identify policy options can contribute to support most of the MSP principles. In this context the analysis focuses in particular on key principle number 9 “Achieving coherence between terrestrial and maritime planning – relation with ICZM”.

- P1 – Improving data and information base; integration between ICZM and MSP is not specifically addressed by this policy option. However a greater availability of social, economic and governance data, integrating the already available terrestrial and environmental information, can underpin the adoption of a holistic and cross-sectors approach that necessarily requires dealing with the evaluation of cross land-sea boundaries issues. For similar reasons some limited benefits can be determined by the further improvement of integrated analysis – (Score: +).

- P2 – Improving and innovating functions and tools; P2 benefits on MSP-ICZM integration are expected to be modest. Similarly to the P1 option, they are mainly related to effort put in further supporting integrated assessment and related decision making, towards the development of specific functions and tools – (Score: +).

- P3 – Enhancing cooperation; among the three P3 option is the one expected to generate major positive impacts on MSP-ICZM integration. The progressive adoption of an ecosystem-based approach in the definition of the CIS’s context and area of application rightly moves toward this direction. Actually, the ecosystem approach is an overarching principle for MSP and for the same ICZM. Enhanced cooperation among CIS managers and structures or groups responsible for the ICZM implementation can properly addresses the CIS progressive development, in order to provide proper support to ICZM-MPS integration in terms of data, integrated analysis and functions - (Score: +++).

---


Climate change

The EU framework proposed by the White Paper on climate change adaption for the first Phase (2009-2012) focuses on four actions: (1) building a solid knowledge base on the impact and consequences of climate change for the EU, (2) integrating adaptation into EU key policy areas, (3) employing a combination of policy instruments to ensure effective delivery of adaptation and (4) stepping up international cooperation on adaptation. The first and second actions are the most relevant in terms of integration between climate change and ICZM (and IMP-MSP) policies.

- **P1 – Improving data and information base;** positive effects are mainly expected in terms of contribution to the development of a scientific knowledge base on climate change impacts, vulnerability and adaptation. P1 directly deal with the improvement of the availability of climate change related geo-spatial data. Benefits can be also produced by increase in historical series (multi-time data), particularly useful in assessing past and expected future trend of coastal processes, and the further collection of social, economic and governance data. These latter are necessary to define a clear picture of the coastal vulnerability as well as to understand the current level of adaptation and plan future interventions. In a broader perspective, the improvement of CIS contents could also positively affect the on-going development of the Clearing House Mechanisms, by providing data and information about climate change issues – (Score: ++);

- **P2 – Improving and innovating functions and tools;** similarly to P1 options, P2 is likely to generate benefits mainly in term of the further development of the knowledge base on climate change, also specifically including methods, models and prediction tools. Indeed P2 option specifically includes the improvement or functions related to climate change vulnerability and adaptation. It also aims to promote the proper use and innovation of functions and tools addressing climate change relevant aspects for the coastal zones, including indicators that are expressly mentioned by the White Paper to monitor the impact of climate change and progress on adaptation. Functions directly supporting policy and decision making can also help mainstreaming climate change adaptation into coastal planning and management, thus concretely contributing to the integration with ICZM and MSP – (Score: +++);

- **P3 – Enhancing cooperation;** main positive effects are expected by the progressive adoption of an ecosystem-based approach. This enables to properly deal with multi-scale analysis and to connect the local scale to the regional one, thus linking the specific interventions (local scale) to a wider plan looking at the whole coastal system (regional or supra-regional scale), as necessary when dealing with climate change risks assessment and the related definition of adaptation measures. Main effects are expected on White Paper’s actions related to the integration of adaptation into key EU policy dealing with the coastal and marine system (IMP-MSP and the same ICZM), in particular at the regional sea level. Enhanced cooperation at various levels can also facilitate exchange of knowledge and best practices thus contributing to a common understanding of climate change adaptation and to the development of European guidelines for coastal and marine adaptations, as requested by the White Paper - (Score: +++).
Simplification of the use of the coastal information system

This impact intends to evaluate the effect of policy options on the operative use of the coastal information system. A simpler and more immediate use is expressed by positive scores, while a more complex and less intuitive use is expressed by negative scores. The general assumption is that user friendliness is not much affected by the number and typologies of data included in the CISs, while is relevantly influenced by provided CISs’ functions and by mechanisms governing the use of the system. Indeed, the evaluation of this impact is difficult since it depends on the specific implementation modalities of considered requirements (for example in terms of user interfaces and system ergonomics) and target users (user friendliness for an expert user could not be affected at all even for very relevant modification of the system). In relation to this latter aspect, the evaluation of this impact refers to a generic non-expert user.

- **P1 – Improving data and information base;** user-friendliness should not be very much affected by the improvement of data and information contained in the coastal information systems, if the same is provided with efficient tools for database management and user-friendly interfaces for data query and search. A consistent increase in the number and typology of data may however determine some difficulties for the users who have to search throughout a wider database. Limited positive effects can be associated to the improvement of the availability of integrated information if this is in readily accessible and useful forms (e.g. indicators). The net score is considered slightly negative, although it depends very much on the specific CIS – (Score: -).

- **P2 – Improving and innovating functions and tools;** P2 direct impacts related to user-friendliness are different in sign and magnitude and depend on the specific policy requirement. The improvement of functions supporting ICZM decision making or e-participation are expected to facilitate the use of the systems since they will provide tools and interfaces directly responding to non-expert users’ needs. However, user-friendliness will be very much affected by the specific design of functions and related user interfaces. 3D and climate change related functions are expected to complicate, at least partially, the use of the system since they are specifically aimed at expert users. The net effect is considered slightly positive – (Score: +).

- **P3 – Enhancing cooperation;** great part of the elements forming the P3 policy option are likely to positively influence the user-friendliness of the system. A stronger cooperation between CIS developers and managers and ICZM experts can successfully orientate the system design and progressive development towards real user needs and facilitate user interaction with CIS’ functions and contents. Use of standardised protocols and the development of a common ontology aims to define a common platform for data exchange that is particularly helpful in the simplifying the use of the system – (Score: ++).
7.2.2 Direct impacts: cost implications

This part of the impact assessment focuses on the analysis of costs and efforts required for the implementation of the three policy options, including both a qualitative and a quantitative evaluation of related implications. The analysis is in particular structured in the following three steps:

- Qualitative evaluation of costs;
- Quantitative evaluation of the effort required for the policy implementation;
- Quantitative evaluation of costs.

The qualitative evaluation of costs is based on the definition of qualitative scores according to the same methodology used to evaluate the other impacts, thus ensuring consistency and homogeneity of the applied approach. Qualitative evaluation considers three cost categories: development or initial cost, cost related to the maintenance and updating of the system (management cost) and learning (or training) cost. The three costs are jointly analysed to better understand mutual links among them. Development cost refers to economic and/or human resources needed to design and develop a CIS function or to initiate an initiative related to a specific policy requirement, such as for example data collection or the creation of stronger links between the structure responsible for the CIS management and the structure responsible for the ICZM implementation. The second cost (management costs) refers to economic and/or human resources needed to maintain the policy option during time and bringing the necessary updates, while learning cost refers to economic and/or human resources needed to develop skills needed to operate the specific policy requirements.

The quantitative evaluation of the effort needed to implement each of the three policy option was based on the appraisal of the level of implementation of the three policy options in the CIS illustrative cases considered in the study, according to a 0-3 range, as further described in the specific section dealing with this issue.

Cost quantification was based on the analysis of cost data gathered by Task 1 (see Table 4-4) and the results of the previous two steps, i.e. qualitative evaluation of cost and quantitative evaluation of the required effort. The specific adopted methodology is described in the section dealing with this issue.

Qualitative evaluation of costs

Negative scores represent a negative effect, i.e. an increase in costs, while positive scores are indicative of a positive effect, i.e. costs reduction.

- P1 – Improving data and information base; P1 mainly focuses on the progressive improvement of data and information contents of CISs, likely implying the integration within CISs of already existing data and information rather than the acquisition of new data or the realisation of new study. Main costs are related to maintenance and updating of a wider database, while the initial costs may be more limited and expected to be determined by the definition of a conceptual scheme for the new data integration and the related development needs. Major costs are expected for the management and updating of multi-time data, due to their quantity and the heterogeneity of data typolo-
gies to be considered, and information resulting from the integrated analysis of sector data. Learning costs should be rather limited since needed skills are already available being mainly related to “standard” data management. Some investment could be necessary to improve capacity related to the integrated analysis of data related to different topics. The following scores were defined:

- Developing costs: -
- Maintenance and updating costs: --
- Learning costs: 0

• P2 – Improving and innovating functions and tools; P2 mainly focuses on the improvement and innovation of functions addressing different specific needs (support to ICZM decision making, e-participation, 3D data analysis and climate change related assessment). Development costs are expected to be high, requiring initial economic investments and specific skills, although these can be easily provided by specialised software houses. Costs related to maintenance and updating of the system are expected to be still significant; specific human resources are required to keep the new functions alive and ensure they properly work, as well as to provide support to users. Some learning costs must be taken in consideration, since training and time could be needed to internally develop new skills to deal with the function management. The following scores were defined:

- Developing costs: --
- Maintenance and updating costs: --
- Learning costs: -

• P3 – Enhancing cooperation; assessment of cost related to this option is particularly complex since it also need to take into account short and long term effects as well as strong difference among different policy requirements. Development costs are clearly relevant for the wider diffusion of protocols facilitating geo-spatial data sharing. Medium-high investment, in particular in terms of dedicated human resources and time, is also required to start the adoption of an ecosystem based approach and to initiate a stronger cooperation between CIS and ICZM groups. Development costs are significant also for the definition of a common ontology.

CISs maintenance and updating costs vary significantly. The adoption of an ecosystem-based approach requires dedicated resources also in this phase and participation to coordinating platform between CIS and ICZM groups can be time and resource consuming as well. However, this latter requirement can have some slightly positive effects in terms of cost reduction in the long-term since it can positively influence the system optimisation. After the initial phase, major cost reductions are expected by the improvement in the use of protocols facilitating geo-spatial data sharing. This can imply the following advantages (and related reduction in maintenance and updating costs): data and metadata are updated by data producers, responsibility of data and metadata quality check is shared among different subjects (again the data producers), reduction of management costs in particular related to the previous two issues, reduction of limitation to data accessibility related to restrictive data policies and Intellectual Property Rights.
Learning costs are considered more relevant than those characterising P1 and P2 options. New specific skills are required to properly approach the ecosystem-based management and in particular to transform it in concrete modifications and integration of the CIS contents and functions. New skills are likely required to deal with Open Geospatial Consortium standards and the definition of a common ontology, which normally are not part of public authorities’ competence. No specific learning investment should be expected to improve coordination among CIS and ICZM groups. In relation to above considerations, the following scores were defined:

- Developing costs: ---
- Maintenance and updating costs: --- in the short term, + in the long term
- Learning costs: --

Qualitative scores corresponding to the assessment of costs are summarised in Table 7-1.
Table 7-1 Qualitative scores for direct impact assessment.

<table>
<thead>
<tr>
<th>Aspects related to ICZM principles</th>
<th>P1</th>
<th>P2</th>
<th>P3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrated knowledge on the coastal system</td>
<td>+++</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>Bridged gap between scientific information and policy/decision making in the ICZM process</td>
<td>++</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td>Involvement of stakeholders in the ICZM process, also aiming to improve awareness on sustainable coastal planning and management</td>
<td>0</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td>Support and facilitation in climate change adaptation of coastal zones within the wider context of ICZM</td>
<td>++</td>
<td>+++</td>
<td>++</td>
</tr>
<tr>
<td>Periodical evaluation process of ICZM planning and management; support an ICZM adaptive process</td>
<td>++</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td>Cooperation among different institutions and institutional levels</td>
<td>0</td>
<td>0</td>
<td>+++</td>
</tr>
<tr>
<td>Adoption of a long-term perspective for ICZM</td>
<td>++</td>
<td>++</td>
<td>++</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Links with a broader policy context</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Implementation of ICZM in a regional sea context</td>
<td>0</td>
<td>+</td>
<td>+++</td>
</tr>
<tr>
<td>Support to the integration of ICZM with other closely related policies (MSP)</td>
<td>+</td>
<td>+</td>
<td>+++</td>
</tr>
<tr>
<td>Support to the integration of ICZM with other closely related policies (climate change)</td>
<td>++</td>
<td>+++</td>
<td>+++</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Use of the system</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Simplification of the use of the coastal information system</td>
<td>-</td>
<td>+</td>
<td>++</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Costs and use of resources</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Development or initial costs</td>
<td>-</td>
<td>--</td>
<td>---</td>
</tr>
<tr>
<td>Costs related to maintenance and updating of the CIS</td>
<td>--</td>
<td>--</td>
<td>ST: --- LT: +</td>
</tr>
<tr>
<td>Learning costs</td>
<td>0</td>
<td>-</td>
<td>--</td>
</tr>
</tbody>
</table>
Quantitative evaluation of the effort required for the policy implementation

The impact assessment includes the evaluation of the order of magnitude of the effort (in terms of human and/or economic resources) needed to implement each policy option in relation to the current situation, i.e., the baseline scenario. This evaluation was based on the appraisal of the level of implementation of the three policy options in the CIS illustrative cases considered in the study, according to a 0-3 range; a 3 score represents the proper implementation of the policy option for the considered CIS, 0 is the condition of no implementation of any aspect of the policy option, 1 and 2 represent an intermediate situation being 2 a condition closer to the proper policy option implementation.

The study evaluated the implementation level of all the aspects (i.e., policy requirements) characterising each of the three policy options; however greater importance was given to the following key policy requirements, i.e.:

- For the P1 policy option: (i) Improve economic and in particular social and governance information within CISs (B1); (ii) Improve availability of information resulting from the integrated analysis of data related to different topics (B2);
- For the P2 policy option: (i) Improve functionalities directly supporting ICZM decision making in a short and long term perspective (C1); (ii) Improve diffusion and innovation of e-participation tools (C2);
- For the P3 policy option: (i) Progressively move towards the adoption of an ecosystem-based approach (A3); (ii) Establish strict link and cooperation between the structure responsible for the CIS management and operation and the structure responsible for the implementation of the ICZM process (D1).

Table 7-2 summarises the percentage results of the analysis. Although these results depend on the specific CIS cases considered by Task 1 analysis, the resulting overall situation can be roughly considered representative of the current condition of European CISs; the analysed CISs sample is indeed rather wide and includes a great variety of CIS typologies, scale of application and geographic locations.

Table 7-2 Level of implementation (0-3 scale) of the three policy options in the CISs illustrative cases; results are expressed in percentage of the total number of analysed CISs.

<table>
<thead>
<tr>
<th>Policy Option</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>P1</td>
<td>15.4%</td>
</tr>
<tr>
<td>P2</td>
<td>20.5%</td>
</tr>
<tr>
<td>P3</td>
<td>25.6%</td>
</tr>
</tbody>
</table>
The P1 policy option, focusing on the improvement of the CIS' information base, is properly or almost properly implemented (3 and 2 values) by about the 59% of existing coastal information systems, while P2 and P3 are less diffuse, respectively covering approximately the 43.5% and 36% of existing CISs. The level or real proper implementation (score equal to 3) is obviously less diffuse: 28.2% for P1, 12.8 for P2 and 10.3 for P3.

This implies that the full implementation of the P3 policy option would require an effort (to upgrade about the 64% of existing CISs) that is 1.6 greater than the one required by the full implementation of the P1 option; P3 expected effort is also greater than P2 one.

The same analysis was also geographically disaggregated to look at any differences among the various European sea basins: Baltic Sea, North Sea, Celtic Sea, Bay of Biscay and Atlantic Iberian Coast, Mediterranean Sea, Black Sea (Norwegian Sea was not considered since it was possible to analyse only one CIS for that basin). Figure 7-2, Figure 7-3 and Figure 7-4 show the percentage results for the three policy options for each of the above basin:

- P1 policy option is properly or almost properly (score 3 or 2) implemented in particular in the Baltic Sea (86%). CISs representative of the Celtic Sea and the Bay of Biscay and Atlantic Iberian Coast are also characterised by percentage values (respectively 71% and 67%) greater than the average value (59%). The Mediterranean (54%) and the North Sea (60%) are characterised by a value very similar to the average one. P1 option, like the other two options, appears to be very poorly implemented at the current state in the Black Sea CISs; however these data should be very carefully considered since for the Black Sea only three CIS cases were available and therefore analysed.

- P2 policy option is better represented in the Mediterranean (54%) and the North Sea (50%) CISs. The Baltic Sea and the Celtic Sea are characterised by smaller percentage values (43%), very close to the average one (43.5%). Besides the Black Sea, which again is biased by the small number of cases that was possible to analyse, Bay of Biscay and Atlantic Iberian Coast is the regional sea basin where P2 policy appears to be less implemented (33%).

- P3 policy is in particular implemented in the North Sea CISs (50%). The Mediterranean presented a slightly better situation (38%) than the one characterising the Celtic Sea and the Baltic Sea. Again, the Bay of Biscay and the Atlantic Iberian Coast presents the less implemented situation also for the P3 option, at least according to the analysed CISs.
Figure 7-2 Current level of implementation of the P1 policy option in each European Sea Basin.

Figure 7-3 Current level of implementation of the P2 policy option in each European Sea Basin.
Although the above described results surely depend on the specific considered CISs, some overall conclusions can be drawn:

- Baltic Sea CISs appear to already properly or almost properly meet P1 requirements, while a significant effort is still required for the P2 (57%) and P3 (71%) policy option implementation;
- The three policy options are diffuse in about the 50% of the North Sea analysed CIS, with a slight prevalence of P1 options (60%);
- Celtic Sea CISs are characterised by a situation similar to the Baltic Sea ones; P1 requirements appear to be quite well diffused (71%), while P2 and P3 implementation still requires relevant effort;
- The Bay of Biscay and Atlantic Iberian Coast CISs are also characterised by a situation similar to the Baltic Sea (and the Celtic Sea) one; however “2 and 3” percentage values are lower (also for the P1 option) and a greater effort in their policy implementation is required;
- P1 and P2 policy options appear to be properly or almost properly represented in more than the 50% of the Mediterranean CISs. A consistent effort is still required for the other 50%, but a greater effort is required for the implementation of the P3 policy options (62%);
- The Black Sea current situation appears to need a consistent effort to help CISs in meeting any of the three policy options, as also confirmed by the qualitative analysis of acquired information. It must be again stressed that it was possible to analyse only three Black Sea CIS cases. However, it is worth mentioning some relevant on-going
initiatives that will definitely improve the Black Sea situation, such as in particular the development of the Black Sea Information System (BSIS). Other interesting initiatives have been developed by the Ukrainian Scientific Centre of Ecology of the Sea (UkrSCES) that also implemented the Odessa CIS considered by this study.

The above discussed numbers mask a great variability of specific conditions in terms of policy option and policy requirement implementation. The general derived considerations are useful to address the overall picture at the European or Regional Sea scale, while choice for and future evolution of single CISs will depend on: the specific CIS current situation, the CIS’ main objectives and context of application, the CIS typology, its main target users, etc.

Quantitative evaluation of costs

The quantitative analysis of the cost implication of the three policy options was based on the data gathered by Task 1 of the study (see Table 4-4). Although much effort was dedicated to the acquisition of these kind of data, cost (or human resources) figures resulted in being available for a limited number of CIS cases (i.e. 19 cases on the total of 40 considered CISs, including in particular the twelve cases considered by the in-depth analysis). In relation to the available data, the quantitative analysis attempted to treat separately development and management costs. Quantitative estimation of cost implications of the three policy options was done according to the methodological approach described below.

Cost data acquired by Task 1 were initially homogenised. In particular data on human resources involved in the CIS development and/or management were expressed in monetary terms. The annual cost of one full-time equivalent person was estimated to 50000 €, representing the average yearly costs in EU as estimated by taking into account the tariffs used as a basis for the calculation of administrative costs in the context of the Action Programme for reducing administrative burdens in 2008-2009 (Secretariat General European Commission). Data jointly referring to development and management costs (i.e. those related to the Dorset Coastal Explorer, the Rio Formosa CIS or to the Cork Harbour GIS) were split in two, assuming an equal distribution. Data referring to the GÉOBretagne application were not considered since they are related to the whole project and not specifically referring to the development and management of the CIS tool. This methodological step generated a dataset of homogenised costs related to 18 illustrative CIS cases.

Afterwards, the study analysed the level of implementation of the three policy options in the 18 CIS cases for which cost data are available, according to the quantitative evaluation described in the previous section. Cases getting a score of 3 or 2 at least for one of the three policy options (i.e. cases with a “good” level of policy option implementation) were finally selected; this brought to discard only one CIS case that was considered to not properly implement any of the three policy options. The final dataset therefore included 17 cases, and in particular data on development costs for 9 cases and data on management costs for 16 cases.

The study assumes that the cost related to the development and/or management of each of the finally selected CIS case is determined by:

- Cost not depending on the three policy options implementation, i.e. cost related to the development and management of the “baseline scenario” (for example related to the CIS basic structure, acquisition and management of essential territorial spatial data
and metadata, acquisition and management of environmental data and metadata, simple Web-GIS application enabling spatial data visualisation, etc.)

- Cost specifically related to the implementation of the policy options for which the specific CIS assumed a score of 3 or 2 (representing a “good” level of policy option implementation). Most of the CIS cases properly implement a combination of two or three different policy options.

Given the above consideration, development and/or management costs of each CIS case were split according to the following steps. The cost of the baseline scenario was assumed to be a fixed percentage of the total cost. The literature review did not enable to find a representative figure for this cost component, thus the study applied a sensitivity analysis approach, considering a range of different percentage values; i.e. baseline scenario cost equal to 40%, 50% and 60% of the total costs. The remaining cost (policy options cost) was associated to the implementation of the policy options for which the specific CIS assumed a score of 2 or 3. This cost was further split according to percentage weights defined on the basis of the qualitative evaluation of development and management costs (see Table 7-1), to properly take in consideration the relative importance of expected cost implications. The following cases were possible:

- The CIS gives “good” implementation (score of 3 or 2) to a single policy option (e.g. P1); in this case the policy options cost was totally attributed to this specific policy option (e.g. P1);
- The CIS gives “good” implementation (score of 3 or 2) to two policy options. The policy options cost was attributed to the two specific policy options according to the following percentage weights:
  - In case P1 and P2 policy options are properly implemented: (i) 0.33 (P1) and 0.66 (P2) for the development costs; (i) 0.50 (P1) and 0.50 (P2) for the management costs;
  - In case P1 and P3 policy options are properly implemented: (i) 0.25 (P1) and 0.75 (P3) for the development costs; (i) 0.40 (P1) and 0.60 (P3) for the management costs;
  - In case P2 and P3 policy options are properly implemented: (i) 0.40 (P2) and 0.60 (P3) for the development costs; (i) 0.40 (P2) and 0.60 (P3) for the management costs;
- The CIS gives “good” implementation (score of 3 or 2) to all the three policy options. The policy options cost was attributed to three policy options according to the following percentage weights: (i) 0.17 (P1), 0.33 (P2), 0.50 (P3) for the development costs; (ii) 0.29 (P1), 0.29 (P2), 0.42 (P3) for the management costs.

For each of the considered CIS cases, the application of the above procedure enabled to derive the development and/or management costs associated to the proper implementation of the three policy options. Finally, costs were averaged. Table 7-3, Table 7-4 and Table 7-5 illustrate the obtained estimations of development and yearly management costs associated to

---

11 The impact assessment of the “Proposal for a Directive of the European Parliament and the Council establishing an infrastructure for spatial information in the Community (INSPIRE)” – SEC(2004)980 provides some average figures for information systems at the sub-national and national level. However, these specifically refer to the implementation of the INSPIRE requirements, that are only a part of the “baseline scenario” considered by this study.
the three policy options implementation. In particular for the two cost categories (development and maintenance) the tables include the following data (representing additional costs respect to the baseline situation, thus specifically referring to the policy options implementations.):

- Average cost of the policy option implementation for a single CIS:
  - Average development costs for a single CIS related to the policy option implementation varies (depending on assumption on the baseline scenario costs) between: 20300 and 30500 € for P1 option; 23100 and 34700 € for P2 option; 52600 and 78900 € for P3 option;
  - Average yearly management costs for as single CIS related to the policy option implementation varies (depending on assumption on the baseline scenario costs) between: 39600 and 59400 € for P1 option; 38500 and 57800 € for P2; 65200 and 97900 € for P3. Yearly management costs are greater than development costs.

- Standard deviation related to the above average value. As highlighted by the high standard deviation values, cost data are characterised by relevant heterogeneity. This is related to the heterogeneity of analysed CIS cases that significantly differ in terms of scale of application, scope, typology and concrete use. The cost of policy option implementation for a single CIS can therefore significantly differ from the derived average values, depending on the above identified factors.

- Number of cases considered to derive the average and standard deviation values. Due to the adopted methodology this number is different for the three policy options; Average costs were then used to derive the estimations of the overall cost of the policy options implementation in the European Union. The total number of coastal information systems in EU is not known or easily inferable. Within the study, this number was defined considering the following assumptions:
  - Each coastal Member States develops its coastal information system; the total number of national CISs is therefore equal to 22;
  - Each EU coastal costal region develops its coastal information system, the total number of regional (i.e. sub-national) CISs is therefore equal to 446\(^{12}\);
  - The number of local coastal information systems in Europe is similar to the assumed number of regional CISs (i.e. 446). This hypothesis is based on the assumption that each European coastal region includes on average a specific coastal system (e.g. delta, coastal lagoon, estuary, marine protected area, etc.) deserving particular attention and thus needing a specific CIS;
  - The total number of intra-national and international cooperative CISs is negligible in relation to the estimation of an overall cost figure for the European Union.

\(^{12}\) An EU coastal region is a statistical region defined at NUTS3 level, responding to one of the following criteria: (i) Region with a sea border (372 regions correspond to this criterion); (ii) Region with more than half of its population within 50 km from the sea (73 regions correspond to this criterion); Hamburg, this German region, which does not correspond to the definition criteria, has been added to the EU coastal regions list, taking into account its strong maritime influence. According to this definition 446 EU coastal regions have been identified. These regions belong to the 22 Member States with a coastline (source: Eurostat Statistic in Focus 38/2010; http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-SF-10-038/EN/KS-SF-10-038-EN.PDF; last access: 26.08.2011).
On the basis of the above assumptions the total number of coastal information systems in the European Union is assumed to 914.

The analysis of the level of implementation of the three policy options (see previous section “Quantitative evaluation of the effort required for the policy implementation”) showed that a certain percentage of the existing coastal information systems already properly match (score 3) the requirements of such policy options; i.e. 28.2% for P1, 12.8% for P2 and 10.3% for P3. These percentage values were then used to estimate the total number of CISs that presently do not properly implement the three policy options in the EU; i.e. 656 for P1, 797 for P2 and 820 for P3. Finally the overall costs of the policy options implementation in the EU were estimated by multiplying these latter numbers for the computed average cost. This procedure enabled to avoid the percentage of CISs already conforming to P1, P2 and P3 to be included in the total cost estimation.

Considering the above assumptions, the following overall cost estimations (representing additional costs respect to the baseline situation, thus specifically referring to the policy options implementations) for the European Union were obtained (see Table 7-6):

- P1 policy option: 13.3 – 20.0 million € for the development cost and 26.0 – 38.9 million € for yearly management costs;
- P2 policy option: 18.4 – 27.6 million € for the development cost and 30.7 – 46.1 million € for yearly management costs;
- P3 policy option: 43.1 – 64.7 million € for the development cost and 53.5 – 80.2 million € for yearly management costs;

It is finally important to stress that the obtained cost estimations significantly depend on a series of important assumptions that the study necessarily had to include in order to deal with: (i) the heterogeneous nature of existing coastal information systems in terms of application scale, scope, use and typology, (ii) the fragmented and heterogeneous cost data on existing CISs that were possible to acquire within the study; (iii) the sub-division of cost data in components representing the baseline scenario and the three policy options, (iv) the estimation of the total number of coastal information systems (at the local, sub-national or regional and national level) in the European Union.
Table 7-3 Estimation of the average (development and management) costs for a single CIS related to the policy options implementation – assumption on cost of the baseline situation = 40% of the total cost (all costs are expressed in thousands Euros).

<table>
<thead>
<tr>
<th>Cost of the baseline scenario: 40%</th>
<th>Option P1</th>
<th>Option P2</th>
<th>Option P3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development costs</td>
<td>Mean</td>
<td>30.5</td>
<td>34.7</td>
</tr>
<tr>
<td></td>
<td>Standard deviation</td>
<td>28.3</td>
<td>25.4</td>
</tr>
<tr>
<td></td>
<td>Number of cases</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>Management costs (yearly)</td>
<td>Mean</td>
<td>59.4</td>
<td>57.8</td>
</tr>
<tr>
<td></td>
<td>Standard deviation</td>
<td>33.0</td>
<td>32.9</td>
</tr>
<tr>
<td></td>
<td>Number of cases</td>
<td>13</td>
<td>13</td>
</tr>
</tbody>
</table>

Table 7-4 Estimation of the average (development and management) costs for a single CIS related to the policy options implementation – assumption on cost of the baseline situation = 50% of the total cost (all costs are expressed in thousands Euros).

<table>
<thead>
<tr>
<th>Cost of the baseline scenario: 50%</th>
<th>Option P1</th>
<th>Option P2</th>
<th>Option P3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development costs</td>
<td>Mean</td>
<td>25.4</td>
<td>28.9</td>
</tr>
<tr>
<td></td>
<td>Standard deviation</td>
<td>23.6</td>
<td>21.1</td>
</tr>
<tr>
<td></td>
<td>Number of cases</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>Management costs (yearly)</td>
<td>Mean</td>
<td>49.5</td>
<td>48.2</td>
</tr>
<tr>
<td></td>
<td>Standard deviation</td>
<td>27.5</td>
<td>27.5</td>
</tr>
<tr>
<td></td>
<td>Number of cases</td>
<td>13</td>
<td>13</td>
</tr>
</tbody>
</table>

Table 7-5 Estimation of the average (development and management) costs for a single CIS related to the policy options implementation — assumption on cost of the baseline situation = 60% of the total cost (all costs are expressed in thousands Euros).

<table>
<thead>
<tr>
<th>Cost of the baseline scenario: 60%</th>
<th>Option P1</th>
<th>Option P2</th>
<th>Option P3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development costs</td>
<td>Mean</td>
<td>20.3</td>
<td>23.1</td>
</tr>
<tr>
<td></td>
<td>Standard deviation</td>
<td>18.9</td>
<td>16.9</td>
</tr>
<tr>
<td></td>
<td>Number of cases</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>Management costs (yearly)</td>
<td>Mean</td>
<td>39.6</td>
<td>38.5</td>
</tr>
<tr>
<td></td>
<td>Standard deviation</td>
<td>22.0</td>
<td>22.0</td>
</tr>
<tr>
<td></td>
<td>Number of cases</td>
<td>13</td>
<td>13</td>
</tr>
</tbody>
</table>
Table 7-6 Estimation of the overall costs of the policy options implementation in the European Union (all costs are expressed in million of Euros).

<table>
<thead>
<tr>
<th>Assumed cost of the baseline scenario</th>
<th>Option P1</th>
<th>Option P2</th>
<th>Option P3</th>
</tr>
</thead>
<tbody>
<tr>
<td>60%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Development cost</td>
<td>13.3</td>
<td>18.4</td>
<td>43.1</td>
</tr>
<tr>
<td>Management cost (yearly)</td>
<td>26.0</td>
<td>30.7</td>
<td>53.5</td>
</tr>
<tr>
<td>50%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Development cost</td>
<td>16.7</td>
<td>23.0</td>
<td>53.9</td>
</tr>
<tr>
<td>Management cost (yearly)</td>
<td>32.5</td>
<td>38.4</td>
<td>66.9</td>
</tr>
<tr>
<td>40%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Development cost</td>
<td>20.0</td>
<td>27.6</td>
<td>64.7</td>
</tr>
<tr>
<td>Management cost (yearly)</td>
<td>38.9</td>
<td>46.1</td>
<td>80.2</td>
</tr>
</tbody>
</table>

7.3 Assessment of indirect impacts of policy options

This section illustrates the assessment of each indirect impact for the three policy options. Corresponding qualitative scores are summarised in Table 7-7. For each impact the same table highlights (in light blue) the option associated to major expected benefits. Links between policy options and indirect impacts are less strong than direct impacts ones; this actually implies that most of the expected indirect effects and related scores are relatively smaller. Social impacts are the most difficult to assess not only because there are less documented with “hard” data but also because they often take more time to take place and are subject to a multitude of factors influencing them. Derived environmental impacts, like social ones, could take more time to happen.

Functioning of internal market and competition

- P1 – Improving data and information base; P1 option aims at improving data and information base of CIS helping multi-sector and integrated knowledge and long-term evaluation in supporting the ICZM process. Social, economic and governance information within CIS, integrated analysis of data related to different topics and multi-time data are all policy requirements within P1 which can help long-term evaluations and thus reduce uncertainty on the market and ease competition. In addition, information regarding socio-economics and governance are particularly relevant to help the functioning of internal market and competition. P1 could therefore impact on the mobility of capital and services in a first place (as they are easier and less costly to move around) and goods and workers in a second place. Increase in information is one of the pillars of free movements and competition (Porter, 1985)\(^\text{13}\) and decreasing barriers for new suppliers and services providers. Monopolies and market segmentations could also diminish as the new information and data provided will help recognise them and help

new comers (outsiders) to enter the market by reducing the comparative advantage that the insider had by being in the market for longer and having more information - (Score: ++).

- P2 – Improving and innovating functions and tools; P2 effects on this indirect impacts is expected to be less relevant that P1 one. Functions supporting ICZM decision making can partially help people and goods to travel, by reducing uncertainty and risks and helping planning of their decision. E-participation tools aims to increase participation and can have positive effect on free exchange of information about elements that can ease coastal management. This could increase competition by providing free information to the market, therefore helping new comers to enter the market and diminishing the comparative advantage of insiders – (Score: +).

- P3 – Enhancing cooperation; the adoption of an ecosystem-based approach generally implies the increase of the CIS’ area of application. This can also increase impacts on internal market and competition, therefore determining potentially decreased prices due to more transparency. P3 also implies a better cooperation both for institutions and for data producers and managers, this better cooperation means that more and better data can be provided easily to the market thus helping its functioning and competition. This policy option is also more ambitious than the two others and should have a stronger impact on the internal market and competition – (Score: ++).

Competitiveness, trade and investment flows

- P1 – Improving data and information base; in theory P1 policy option should help EU firms in accessing economic, social and governance data useful to increase their competitiveness and their productivity, at least partially. No effect on trade barriers can be easily detected. Cross-border flows should be facilitated by the availability of multi-time and cross-sector data. In the scientific literature, there has been an increase in the attention paid to the strategic potential of information systems and a new willingness to accept the possibility that information systems can be the source of strategic gains. This belief is reflected in a host of publications, from the popular press to respected journals. Much of this has been supported by a set of studies, principally involving marketing and distribution, financial services, and the airlines14 - (Score: +)

- P2 – Improving and innovating functions and tools; improving and innovating functionalities could partially help the competitive position of EU firms by providing them with new tools better supporting coastal planning and decreasing related uncertainty. Improvement and innovation of e-participation tools and functionalities is also related to competitiveness and might have an impact on productivity, although this is expected to be limited - (Score: +).

- P3 – Enhancing cooperation; the ecosystem based approach should be of crucial importance for helping cross-border investment flows (as this approach is likely to cover several regions/countries). The development of a common ontology for coastal and marine information should help firms to access information and data more easily. An easier access to data and information should also fostered by the improvement in the

---

use of protocols facilitating geospatial data sharing and the related cooperation among data providers – data managers. P3 option also includes the creation of cooperative mechanisms among different subjects involved in the CIS implementation and management and in ICZM process. Enhanced cooperation could increase investment flows in the region both because the cooperation reflects a better image of efficiency of the system in general, but also in terms of stability and governance - (Score: ++).

Administrative Burden

This indirect impact refers to benefits and costs induced by the policy options for the public administration in general. It does not specifically address CIS’ development and management costs as determined by the implementation of the policy requirements forming the policy options; these are actually considered in the list of direct impacts.

- P1 – Improving data and information base; public administrations could be able to benefit from the policy requirements increasing the information on economic, social and governance; but it is likely that they will have to provide part of the information as well, implying thus time and labour force to do this. No restructuring should be necessary for this option but a minimum cost will be sustained in terms of workers being involved in providing the contents. As a net effect positive and negative impact might balance, although it is rather difficult to really predict the prevailing effect – (Score: 0);

- P2 – Improving and innovating functions and tools; public administrations just like private firms can benefit from additional decision making tools and e-participation tools. Direct costs (development, maintenance and training costs) could be relatively high in the short run for public administrations directly involved in the CIS implementation, or more in general in the ICZM process. Administrations could support costs (mainly learning costs) in the short term. It is very likely that in the long run, these costs will decrease or even disappear and only net benefits will remain. The indirect benefits for public administrations in general (and not only the ones dealing with CIS and ICZM) should be strong because this policy option is aimed at providing decision making tools in particular supporting public administration - (Score: short term - ; long term ++).

- P3 – Enhancing cooperation; establishing a link or increase cooperation between CIS management and operation responsible structure and implementation structure of ICZM could also be a cost for public administration involved in the process. This cost will be higher with the requirement to adopt an ecosystem-based approach because of the need for new skills, contacts and management changes. Assuming that the use of protocols is mostly dealt with by public administrations this policy option could end up being the more costly in particular in the short-term. In the long-term the benefits of having a working cooperation system in the field of CIS (and relative link to ICZM) together with adopting an ecosystem based approach will outcome the initial costs producing evident benefits for the public administration – (Score: short term -- ; long term ++).
Innovation and research

Reduced operational costs and greater competition stimulate research. Better access to a comprehensive system of information and data also act in stimulating innovation and research. In the same way that public authorities and the private sector can benefit from additional data and increased availability of information, the research community can improve productivity through reduced operating costs for finding and assembling data. This indirect impact is one of the most evident and straightforward coming from the three policy options as defined. As a basis, the impact will be positive for all policy options.

- P1 – Improving data and information base; providing more information can help research and thus innovation. This is particularly true when, such in the case of the P1 policy option, new data attempts to fill existing gaps (social, economic and governance information or multi-time geospatial data). Both industrial and academic research can benefit from it and resource efficiency as well as productivity can benefit from it too - (Score: ++);

- P2 – Improving and innovating functions and tools; - P2 option aims to innovate CIS’ functions supporting integrated decision making and e-participation, as well as specific tools addressing 3D analysis and climate change vulnerability assessment. These tools are not basically oriented to researchers since they rather attempt to improve support to decision making. However a significant effect on this issue is expected in terms of demand to the research community for innovative solutions to develop the required tools. E-participation tools can facilitate communication between research and policy-decision makers, enabling to better clarify ICZM needs and orientate research activities as well as to argue for more funding for research on key ICZM issues – (Score: ++).

- P3 – Enhancing cooperation; this policy options is expected to have lower effects on research and innovation. Some benefits could be triggered by a possible demand of innovative solutions for geo-spatial data sharing. Improved cooperation, also at the transnational level as required by the adoption of the ecosystem-based approach, could help in focusing the right demands to the research community to better support ICZM – (Score: +).

Employment and labour market

Effects of policy options on the employment and the labour market are important to take in consideration; some professions could have a higher offer and the policy options will require new training. However, if compared to the other indirect impacts and the comprehensive labour market, the magnitude of the effects on this issue is expected to be smaller. In particular in the long run, impacts are probably negligible.

Some job opportunities, in particular in terms of consulting services, could be created by the three policy requirements common to all the policy options. Consulting services could be required to train and/or advise the public administration workers to deal with end-user involvement in the system design and networking. Some specific expertise could be required to develop multi-user systems. So this could create additional work in the short term. Knowing the extent of the additional workload and if the labour market could be affected significantly is impossible but a rough estimate tells us that the whole labour market should not be modified.
• P1 – Improving data and information base; improving availability of information and data will probably require additional workload in the implementation and maintenance phase of P1. Employment or more accurately specific skills professionals will benefit from additional job offer in the marketing particular in the short term; this increase will not be sustainable in the long term as the number of workers to maintain the information updated and relevant will likely decrease and will be less than in the initial phase. The expected result is relatively small – (Score: short term + ; long term 0).

• P2 – Improving and innovating functions and tools; in addition to the short term requirement of specific skilled workers in the system design phase common to all policy options, the development of new functionalities and tools will require training of present workers and/or employing highly skilled workers (in particular to design and develop the new functions and tools). This will twist the labour market towards an increase in job offer in particular for professions with high skills and young workers. This impact will not modify drastically the labour market but only a segment of it. Again benefit effects will be more consistent in the short term and likely negligible in the long-term – (Score: short term + ; long term 0).

• P3 – Enhancing cooperation; P3 option is probably the one with most impact on labour market in the short term; however these are also the most complex to be envisaged. Again workers implied directly in improving the mechanisms linked to the adoption on an ecosystem based approach, in developing a common ontology or in applying data sharing protocols will be solicited and jobs could be created in the short term, less in the long term. The higher level of ambition of this policy option could require more labour force involvement; the short term effect on the labour market is expected to be stronger than for the other two policy options. Mechanisms regarding cooperation between structures implied in management and implementation could lead to downsizing of both structures in the name of efficiency (like when two organisations are merging) but could also require more personal to deal with the cooperation itself. In any case this is unlikely to modify the labour market significantly - (Score: short term ++ ; long term 0).

Better living conditions in terms of effects on social protection, health and safety, education system

In general the indirect impact on living conditions in terms of social protection, health and education are important and relevant but also characterised by the long term aspects. The impact short term is mostly negligible.

• P1 – Improving data and information base; CIS users will definitely benefit from a better set of information and will be able to compare the provision of services (provided that social and governance data are included in CIS). Universities and experts will greatly benefit from it (see Research and Innovation impacts), whereas social or health services organisation or financing should not be modified significantly. On the other hand, public health could benefit from additional information on coastal zones. Indeed, human health is affected by climate-related events such as permanent inundation and flooding, degraded water quality, storms, etc. Information on those events should improve public health management. The impact will be mainly long term and relatively small as the availability of new information is not enough to provoke a strong
impact on living conditions; indeed many other factors can influence these conditions - (Score: +).

- P2 – Improving and innovating functions and tools; improving the diffusion and innovation of e-participating tools can help access for all to information and tools. Quality of services in general could be improved but also motivate training and cross-border participation. Public health could also benefit from functionalities regarding climate change assessment and adaptation planning, included in P2 policy option. Expected impacts are partially greater than P1 ones – (Score: ++).

- P3 – Enhancing cooperation; ecosystem based approach could have again one of the most significant impact on improving social protection safety and education by providing a set of information which relies to a geographic area which is usually not considered (or at least data need to be aggregated and therefore might lose their richness). More importantly, the cooperation between data provider and data managers will impact on planning in the sectors of social protection, public health and education. In this context, products and services related to coastal hazards could be provided in a better way – (Score: ++).

Integration of risk in coastal planning and management, leading to less coastal vulnerability and higher resilience/adaptation

All policy options are likely to contribute to increase knowledge, understanding and analysis of coastal risks, thus contributing to its integration into coastal planning and management and in the long-term to an increase in coastal resilience and adaptation.

- P1 – Improving data and information base; increase in the role of scientifically-based approach, multi-sector and integrated (holistic) knowledge and long-term evaluation in supporting the ICZM process should have a relevant impact on awareness of coastal risk and vulnerability. Additional data on climate change, governance and socio-economic contexts are the essential basis to actually be able to realise complete coastal risk management, understand true risks for the economy and the population and thus promote integration of risk, vulnerability, resilience and adaption concepts and related strategies in coastal planning and management. Multi-time data can further help in correctly addressing this issue, since they enable to analyses past (natural and technological) risk events and evaluate future scenarios characterised by different occurrence probabilities and impacts (Score: ++).

- P2 – Improving and innovating functions and tools; to better support ICZM decision makers and coastal planners and managers, as well as to increase stakeholders’ involvement and participation in the ICZM process are of the utmost importance for understanding and increasing awareness on coastal risk and vulnerability, thus promoting their integration within the planning and management process. Decision support tools and functions can be specifically designed and developed in order to deal with coastal risk problems, in particular to analyse available information to generate coastal risk and vulnerability maps for the past, current and future situation or to provide possible alternative options for coastal adaptation – (Score: +++)

- P3 – Enhancing cooperation; to increase cooperation among different subjects involved in the CISs implementation and management and more in general in ICZM
process could have a discreet benefit on integration of coastal risk in coastal planning and management; this can be particularly evident for the progressive adoption of an ecosystem-based approach that enables to set the right context to properly deal with the spatial scale relevant for coastal risk management - (Score: ++)

Biodiversity, flora, fauna and landscapes

This indirect impact aims to evaluate if defined policy options may have some positive (or negative) effect on the sustainable management of natural coastal habitats, including related flora and fauna biodiversity and landscape values.

- P1 – Improving data and information base; effects of P1 policy option are rather limited and mainly related to the increase in the integrated knowledge on the coastal system. A better understanding of coastal processes, in particular due to higher availability of multi-time data, and increased availability of socio-economic data may support understanding of pressures on habitats and biodiversity and the definition of proper protection measures. Promotion of integrated analysis can provide further understanding of pressures and conflicts induced by human uses on natural systems (Score: +);

- P2 – Improving and innovating functions and tools; P2 assessment is similar to P1 one. Limited benefits are expected as consequences of improved decision making, coastal planning and coastal management capacities induced by new functions. E-participation tools can provide relevant feedbacks on the status of coastal natural systems (for example through geo-tagging functions) and the opportunity to contribute to the shared definition of sustainable management options for natural systems (Score: +)

- P3 – Enhancing cooperation; P3 option is the one likely having more relevant effects on this indirect impact. This is mainly due to the progressive adoption of an ecosystem-based approach, which is very important in properly addressing sustainable management of coastal ecosystem. Ecosystem-based definition of the CIS and ICZM geographic area is essential in correctly dealing with the continuum land – coast – marine systems. It can also imply transnational cooperation in addressing protection and sustainable management of large natural ecosystems - (Score: ++).

Sustainable use of coastal space (or sustainable land use planning)

Results of the assessment of this indirect impact are rather similar to those related to the previous ones. All the three policy options are likely to positively affect the sustainable use of the coastal space.

- P1 – Improving data and information base; effects of P1 policy option are rather limited and mainly related to the increase in the integrated knowledge on the coastal system. Increased availability of socio-economic and governance data may support improved understanding of current uses of the coastal and marine space, related conflicts and already adopted planning and management measures. Promotion of integrated analysis can provide further understanding of pressures and conflicts induced by human uses on the coastal space, as well as generate summary maps on coastal uses and related conflicting or synergic overlaps. All these issues can improve integrated planning of the coastal space thus contributing to its sustainable management and use - (Score: +);
• P2 – Improving and innovating functions and tools; to better support ICZM decision makers and coastal planners and managers through customised tools, as well as to increase stakeholders’ involvement and participation in the ICZM process are of the utmost importance to support the sustainable management and use of the coastal space. Decision support tools and functions can be specifically designed and developed in order to deal sustainable coastal planning, while increase participation in the ICZM process can facilitate resolution of conflicts among different uses and consensus building – (Score: ++);

• P3 – Enhancing cooperation; P3 option is the one likely having more relevant effects on this indirect impact. This is mainly due to the progressive adoption of an ecosystem-based approach, which is very important in properly addressing sustainable management of the coastal space, also in relation to the closely related drainage basin and marine area. Greater cooperation among all different levels involved in the CIS management and operation and/or in the whole ICZM process is also essential in promoting the sustainable use of coastal resource, including in particular the coastal space. The increased use of data sharing protocols can further underpin sustainable land use planning through a higher availability of data – (Score: +++).
### Table 7-7 Qualitative scores for indirect impact assessment.

<table>
<thead>
<tr>
<th></th>
<th>P1</th>
<th>P2</th>
<th>P3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Economic indirect impacts</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Functioning of internal market and competition</td>
<td>++</td>
<td>+</td>
<td>++</td>
</tr>
<tr>
<td>Competitiveness, trade and investment flows</td>
<td>+</td>
<td>+</td>
<td>++</td>
</tr>
<tr>
<td>Administrative Burden</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ST</td>
<td>0</td>
<td>-</td>
<td>--</td>
</tr>
<tr>
<td>LT</td>
<td>0</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Innovation and research</td>
<td>++</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td><strong>Social indirect impacts</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employment and labour market</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ST</td>
<td>+</td>
<td>+</td>
<td>++</td>
</tr>
<tr>
<td>LT</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Better living conditions in terms of effects on social protection, health and safety, education system</td>
<td>+</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td><strong>Environmental indirect impacts</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Integration of risk in coastal planning and management</td>
<td>++</td>
<td>+++</td>
<td>++</td>
</tr>
<tr>
<td>Biodiversity, flora, fauna and landscapes</td>
<td>+</td>
<td>+</td>
<td>++</td>
</tr>
<tr>
<td>Sustainable use of coastal space (or sustainable land use planning)</td>
<td>+</td>
<td>++</td>
<td>+++</td>
</tr>
</tbody>
</table>
7.4 Policy options comparison

Table 7-9 summarises the main expected benefits and costs for the three defined policy options. In particular the comparative tables includes for each policy option:

- Main positive direct effects; i.e. those with a score of ++++. For the direct impact “Simplification of the use of the coastal information system” a score of ++ was considered being this the maximum value given to any of the three policy option;
- Main negative direct impacts, i.e. costs with a score of -- or ----;
- Main positive indirect effects, i.e. those with a score of ++ or +++;
- Main negative indirect effects, i.e. those with a score of -- or ----.

Table and histograms included in section 7.2 are also very useful to compare the three policy options.

P3 option is the one expected to generate the greatest direct benefits, this contributing more significantly to further improve CISs support to the ICZM process. Enhanced cooperation (P3 option) within the management and use of the coastal information system can produce relevant positive effects in relation to: support to the ICZM adaptive process, cooperation among different institutions and institutional levels, adoption of a long-term perspective for ICZM, implementation of ICZM in a regional sea context, support to the integration of ICZM with other closely related policies (MSP and climate change). Significant direct benefits are also expected for the P2 policy option, in particular in relation to: bridged gap between scientific information and policy/decision making in the ICZM process, involvement of stakeholders in the ICZM process, support and facilitation in climate change adaptation of coastal zones within the wider context of ICZM, adoption of a long-term perspective for ICZM, support to the integration of ICZM with other closely related policies (climate change). Finally, according to the analysis P1 option is the one related to relatively more limited benefits, in particular in relation to: integrated knowledge on the coastal system, adoption of a long-term perspective for ICZM. In relation to the direct benefits the following rough schematisation can be proposed: P3 ≥ P2 > P1.

P3 is also the option likely producing more positive effects (i.e. simplification) in terms of operative use of the coastal information system. Positive effects are also expected for the P2 option, while P1 could determine some increase, although slight, difficulties for the users.

The analysis of indirect impacts confirmed that P3 is the option likely determining the greatest benefits on key economic, environmental and social aspects. P2 main positive effects are likely on: innovation and research, better living conditions and integration of risk in coastal planning and management. Relevant indirect positive effects of P1 policy are related to innovation and research and functioning of internal market and competition. The administrative burden associated to P2 and P3 are expected to increase in the short term, while should be positively affected in the long-term; P1 option should not have significant (positive or negative) effects on administrative burdens. In relation to the indirect impacts the following rough schematisation can be proposed: P3 > P2 > P1.
Although P3 is the option expected to generate more consistent direct and indirect impacts, it is also the one for which implementation would require a greater economic and human resource effort. All the three typology of costs (development or initial, maintenance and updating, and leaning costs) are expected to be higher than the one likely characterising the other two policy options. After the initial phase, cost reductions are expected by the improvement in the use of protocols facilitating geo-spatial data sharing; thus in the long term management cost could decrease. P2 costs are also expected to be relevant, although minor of P3 ones, and in particular related to the development and maintenance of the new CIS functions. P1 option should be associated to relatively lower development costs; costs will be mainly related to the maintenance and updating of a wider CIS database, in particular in relation to the improvement of economic, social and governance geo-spatial data. Quantitative assessment of costs produced the following rough estimations (all estimations represent additional costs to the baseline scenario) related to the implementation of the three policy options in the European Union:

- P1 policy option: 13.3 – 20.0 million € for the development cost and 26.0 – 38.9 million € for yearly management costs;
- P2 policy option: 18.4 – 27.6 million € for the development cost and 30.7 – 46.1 million € for yearly management costs;
- P3 policy option: 43.1 – 64.7 million € for the development cost and 53.5 – 80.2 million € for yearly management costs;

The quantitative evaluation of the effort needed for the policy option implementation confirmed the above described situation. P3 is the option currently less developed, thus requiring a greater effort for a proper implementation at the European level, corresponding to about 64% of existing CISs. This effort is significantly greater than the one required by the full implementation of the P1 option (corresponding to 42% of existing CISs) and greater than the P2 one (corresponding to 56% of existing CISs).

Significant differences exist among the various European regions in relation to the current implementation level of the three policy options and the related effort needed for their further improvement. The analysis showed the greatest challenges in general are related to: (i) the P3 option implementation in all the regions with relatively minor relevance for the North Sea and (ii) the Black Sea region for all the three policy options, where however there are significant on-going initiatives. Compared to P3, P2 option is better represented in the current CISs, although a relevant effort is still required, in particular for the Baltic Sea, the Celtic Sea and the Bay of Biscay and Atlantic Iberian Coast, at least according to the analysis performed in this study. Finally main challenges related to P1 implementation are expected to be in general lower than P3 and P2 ones, being slightly more consistent for the Mediterranean and the North Sea.

It is finally important to assess and compare policy options in terms of who’s mainly affected by expected benefits. The analysis considered the following subject categories: international institutions and bodies, public administrations involved in ICZM in terms of decision making and coastal planning and management, private companies, research institutions and civil society. Table 7-8 summaries the effects of each policy option on the considered target groups. International institutions and bodies (e.g. Regional Sea Commission) are expected to be in particular affected by the P3 policy option. Enhanced cooperation in general, and in particular the progressive adoption of an ecosystem based approach within CISs, can significantly con-
tribute to the collaboration among different institutions acting at the international level, support the ICZM implementation within regional sea contexts and support the work of these institutions in integrating ICZM and IMP-MSP. Some slight benefits for the international governance level can also be generated by the P2 option, too, being in particular related to better exchange of idea and good practise due to innovative CIS functions.

All the three policy options will likely generate significant positive effects for decision makers and coastal planners/managers of the public administrations. Greater benefits are associated to P2 and P3 options. P2 specifically aims to address this category through the development of new basic and advanced CIS functions and tools supporting ICZM decision making. P3 considerations are mainly related to the reinforcement of strict links between CIS managers and operators and experts and decision makers of the public administration responsible for the ICZM implementation. P1 benefits will be also relevant, being related to the development of a wider CIS information base, including socio-economic and governance data as well as integrated information; these can provide better support to the decision making process.

Private companies are expected to be in particular positively affected by the greater data availability included in the P1 policy option. Slight P2 positive effects on this category are related to the improved availability of functions to interactively analyse geo-spatial data; the expected benefits are however limited since these functions aim to mainly address decision makers and coastal planners/managers needs. Slight positive effects are expected for the P3 policy option, too, mainly as a consequence of an increase in the use of protocols facilitating geo-spatial data sharing.

Benefits for research institutions would likely be more significant for the P1 and P2 policy options. Effects of the first option on this category are mainly related to the increased availability of data and information on the coastal system that can result in being useful for research and innovation, too. P2 effects are mainly due to an increased demand to the research community for innovative solutions to develop new on-line tools and functions for decision making, e-participation, 3D analysis and climate change vulnerability and adaptation assessment.

Finally, the civil society is specifically addressed by the P3 policy option including also the specific requirement aiming to design and develop new tools to improve stakeholder involvement and participation in the ICZM process. Wider use of protocols facilitating geo-spatial data sharing (P3 option) can support a proper diffusion and use of data and information, also involving the civil society category.

Table 7-8 Summary table on key subjects mainly affected by the three policy options.

<table>
<thead>
<tr>
<th></th>
<th>P1</th>
<th>P2</th>
<th>P3</th>
</tr>
</thead>
<tbody>
<tr>
<td>International institutions</td>
<td>0</td>
<td>+</td>
<td>+++</td>
</tr>
<tr>
<td>Public administrations</td>
<td>++</td>
<td>+++</td>
<td>+++</td>
</tr>
<tr>
<td>Private companies</td>
<td>++</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Research institutions</td>
<td>++</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>Civil society</td>
<td>0</td>
<td>+++</td>
<td>+</td>
</tr>
</tbody>
</table>
The impact assessment and the policy options comparison confirmed that P3 represents the most ambitious policy option, in terms of economic and human resources likely required for its implementation, but also in terms of expected direct and indirect benefits. P2 is in a relative medium position, while P1 is characterised by a relative lower level of ambition. The following rough schematisation of policy ambition and implementation challenge can be therefore defined: P3 > P2 > P1. However, as highlighted by the analysis described in section 7.2.2, the implementation of all the three policy options at the European and Regional Sea levels still require significant efforts (with important geographic differences), in particular to address the key challenges related to the requirements requiring greater investment of human and economic resources. i.e.:

- Improve economic and in particular social and governance information within CISs (B1), for the P1 policy option;
- Improve functionalities directly supporting ICZM decision making in a short and long term perspective (C1), for the P2 policy option;
- Establish strict link and cooperation between CIS management and operation and the ICZM process (D1) and in particular progressively move towards the adoption of an ecosystem-based approach (A3), for the P3 policy option.
Table 7-9 Summary comparative table for the policy options.

<table>
<thead>
<tr>
<th>Positive direct effects</th>
<th>P1 Option</th>
<th>P2 Option</th>
<th>P3 Option</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Integrated knowledge on the coastal system</td>
<td>Bridged gap between scientific information and policy/decision making</td>
<td>Periodical evaluation process of ICZM planning and management; support an ICZM adaptive process</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Involvement of stakeholders in the ICZM process</td>
<td>Cooperation among different institutions and institutional levels</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Support and facilitation in climate change adaptation of coastal zones</td>
<td>Implementation of ICZM in a regional sea context</td>
</tr>
<tr>
<td></td>
<td></td>
<td>within the wider context of ICZM</td>
<td>Support to the integration of ICZM with other closely related policies (MSP)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Support to the integration of ICZM with other closely related policies (climate change)</td>
<td>Support to the integration of ICZM with other closely related policies (climate change)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Simplification of the use of the coastal information system</td>
<td>Simplification of the use of the coastal information system</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Negative direct impacts</th>
<th>Costs related to maintenance and updating of the CIS</th>
<th>Development or initial costs</th>
<th>Development or initial costs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Costs related to maintenance and updating of the CIS</td>
<td>Costs related to maintenance and updating of the CIS (some positive effects are expected in the long-term)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Learning costs</td>
</tr>
<tr>
<td>Positive indirect effects</td>
<td>P1 Option</td>
<td>P2 Option</td>
<td>P3 Option</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-----------</td>
<td>-----------</td>
<td>-----------</td>
</tr>
<tr>
<td>Functioning of internal market and competition</td>
<td>Administrative burden (long term)</td>
<td>Functioning of internal market and competition</td>
<td></td>
</tr>
<tr>
<td>Innovation and research</td>
<td>Innovation and research</td>
<td>Competitiveness, trade and investment flows</td>
<td></td>
</tr>
<tr>
<td>Better living conditions in terms of effects on social protection, health and safety, education system</td>
<td>Better living conditions in terms of effects on social protection, health and safety, education system</td>
<td>Administrative burden (long term)</td>
<td></td>
</tr>
<tr>
<td>Integration of risk in coastal planning and management</td>
<td>Integration of risk in coastal planning and management</td>
<td>Employment and labour market (short term)</td>
<td></td>
</tr>
<tr>
<td>Sustainable use of coastal space (or sustainable land use planning)</td>
<td>Sustainable use of coastal space (or sustainable land use planning)</td>
<td>Better living conditions in terms of effects on social protection, health and safety, education system</td>
<td></td>
</tr>
</tbody>
</table>

| Negative indirect effects | | |
|---------------------------| | Administrative burden (short term) |
8 Conclusions

The study “Options for coastal information systems” principally aimed at defying possible policy options for the further development of coastal information systems finalised to improve their operative support to the ICZM process at various scales (local, sub-national, national, transnational and regional sea one). The results of the study will contribute, together with other studies and activities promoted by the EC DG Environment, to the follow-up proposal to the EU-ICZM Recommendation (2002/413/EC). To reach this objective the study implied the realisation of technical activities – including the analysis of CIS’ illustrative cases, the definition of CIS’ policy requirements and policy options and their impact assessment – and involved a group of stakeholders that provided precious feedbacks on various aspects.

The overview and in-depth analysis highlighted significant strengths of existing CISs, which however are not always properly exploited to fully support the ICZM process at various scales. The same analysis enabled to identify main current CIS’s weakness and gaps; i.e. key issues to be dealt with in terms of new, and often innovative, requirements. The main problem to be addressed is therefore a twofold problem that can be summarised as follows:

- Underuse or improper use of existing coastal information systems within the ICZM process at various scales.
- Existence of weaknesses and gaps to be addressed through the development of new CIS’ features to further improve their use within the ICZM process at various scales.

The general objective of the policy options addressing the above problem is to improve the concrete support of coastal information systems to the ICZM process, enhancing CISs diffusion and strengthening their use in strict connection to integrated coastal planning and management. This in particular implies: (i) the improvement of CISs’ support to the implementation of the key ICZM principles, in particular as defined by the Recommendation 2002/413/EC, (ii) the support to the on-going integration process between ICZM and MSP, (iii) the simplification of the use of coastal information systems in order to make easier and more immediate their support to the ICZM decision making. In relation to the identified problems and objective, the study formulated the following three policy options:

- **P1 – Improving data and information base**; P1 option deals with the principal identified data and information gaps, i.e.: socio-economic and governance data, integrated information, multi-time data (i.e. historical series) and climate change data. The implementation of the P1 policy option mainly relies on the integration within CISs of already existing data and information, still not included in the system, rather than on the acquisition of new data or the realisation of new study. The final goal is therefore the creation of a wider database able to address the various sectors and integrated aspects of the ICZM holistic approach as well as its long-term perspective.

- **P2 – Improving and innovating functions and tools**; P2 option mainly aims to improve the availability of functionalities and tools directly supporting ICZM decision makers and coastal planners and managers, as well as to increase stakeholders’ involvement and participation in the ICZM process. This policy option is therefore characterised by two main objectives. The first goal is to provide users with on-line functions and tools enabling them to interactively analyse and elaborate CIS’s data, thus supporting ICZM decision making through customised information produced by these new tools. In this
perspective P2 policy option can be strictly related to P1 one; a wider and more complete data and information base can better support data analysis and elaboration through the newly available tools. The second goal is to further develop on-line tools to involve stakeholders in the generation and use of coastal information and more in general in the ICZM process.

- **P3 – Enhancing cooperation**: P3 policy option mainly aims to enhance cooperation among different subjects involved in the CISs implementation and management and more in general in ICZM process, thus improving the CISs support to this latter. Specifically, increased horizontal and vertical cooperation is desirable among: structures of the same authority involved in ICZM and/or the CIS’ management and operation, different public authorities involved in the ICZM process, different coastal data providers and managers, managers of different CISs related to the same area of interest.

The study also highlighted the importance to:

- Properly involve users since the initial phase of the CIS design and subsequently in its management;
- Continue and strengthen the effort in matching the INSPIRE Directive provisions, including in particular any initiative aiming to improve availability of data and metadata.

Policy option impact assessment and comparison showed that the three policy options can be conceptually distributed along a gradient. P3 represents the most ambitious policy option, in terms of economic and human resources likely required for its implementation, but also in terms of expected direct and indirect benefits. P2 is in a relative medium position, while P1 is characterised by a relative lower level of ambition. The following rough schematisation of policy ambition and implementation challenge can be therefore defined: P3 > P2 > P1. However, the implementation of all the three policy options still requires relevant efforts.

Quantitative assessment of costs produced the following rough estimations related to the implementation of the three policy options in the European Union (all estimations represent additional costs to the baseline scenario):

- **P1 policy option**: 13.3 – 20.0 million € for the development cost and 26.0 – 38.9 million € for yearly management costs;
- **P2 policy option**: 18.4 – 27.6 million € for the development cost and 30.7 – 46.1 million € for yearly management costs;
- **P3 policy option**: 43.1 – 64.7 million € for the development cost and 53.5 – 80.2 million € for yearly management costs;

These estimations give an indication of the expected order of magnitude of the policy option implementation at the EU level. They significantly depends on a series of relevant assumptions that the study necessarily had to include in order to deal with the heterogeneous nature of existing coastal information systems and the main gaps in the input data needed for the analysis.

Significant differences exist among the various European regions in relation to the current implementation level of the three policy options and the related expected benefits and effort needed for their further improvement. The analysis showed the greatest challenges in general are related to: (i) the P3 option implementation in all the regions with relatively minor relevance for the North Sea and (ii) the Black Sea region for all the three policy options, where however
there are significant on-going initiatives. Compared to P3, P2 option is better represented in the current CISs, although a relevant effort is still required, in particular for the Baltic Sea, the Celtic Sea and the Bay of Biscay and Atlantic Iberian Coast, at least according to the analysis performed in this study. Finally main challenges related to P1 implementation are expected to be in general lower than P3 and P2 ones, being slightly more consistent for the Mediterranean and the North Sea.

As above described, P1, P2 and P3 policy options can be considered progressive scenarios in terms of policy ambition and implementation challenges. In this perspective the following considerations can be drawn in relation to the follow-up of the EU ICZM Recommendation

P1 policy option includes essential requirements (i.e. the enlargement of the information base according to a holistic and integrated approach and long-term management needs) to improve the CISs’ capacity in supporting the ICZM process; indeed P1 option may be considered as a necessary (or basic) step to evolve the current CISs’ situation as depicted by the baseline scenario. In this perspective, this policy option can be incorporated in an EU binding legislative framework (i.e. EU Directive) defining obligations for the ICZM implementation, also in relation to the CISs further improvement. A strict link with the INSPIRE Directive is also essential for the P1 policy option implementation.

An EU binding legislative framework could also fit with the second policy option (P2), which also includes some essential requirements for the improvement of the CISs support to the ICZM process (i.e. the development of new tools to better support ICZM decision making and stakeholders’ participation). However this could be more efficiently implemented through the Recommendation policy instrument that enables a higher level of flexibility. A greater flexibility is required since the P2 implementation could actually depend consistently on the specific needs of the considered ICZM process and the characteristics of the considered CIS, including its main objectives and context of application, typology and prevalent target users. For examples, some ICZM processes could need to mainly focus on the improvement of stakeholder involvement through new e-participation tools, while others could primarily focus on improving direct support to decision makers through on-line functions and tools; some other CISs could also need to balance these two aspects thus addressing both requirements with a similar effort.

P3 policy option focuses on the enhancement of cooperation in the CIS management and operation as well as in the progressive adoption of an ecosystem-based approach. The implementations of this policy option can be likely more efficiently supported through incentives, e.g. a policy programme providing a common framework for and financial support to projects and studies dealing with P3 key issues. The higher costs related to the P3 policy option also suggest to avoid the adoption of a strictly binding approach for the implementation of this policy and to prefer a more flexible and progressive mechanism. An incentives-based policy programme can be surely efficient in improving methodological aspects and disseminating pilot case studies. A more substantial P3 implementation and member states commitment (including international cooperation among member states, also within a Regional Sea perspective) would likely require other types of policy instruments (e.g. a specific Recommendation).

In terms of temporal evolution of the improvement of CIS’ support to the ICZM process, the proposal is to adopt a two phase approach. The first four-five years phase would focus on P1 and P2 policy options (to be implemented through an EU Directive and/or an EU Recommendation). Different effort could be given to each of the two policy option according to the differences highlighted in the current implementation level among the various European Regions;
i.e.: greater attention to P2 for the Baltic Sea, the Celtic Sea and the Bay of Biscay and Atlantic Iberian Coast; equal attention to P1 and P2 for the North Sea and the Mediterranean Sea for which however almost half of the analysed systems are currently characterised by a good level of P1 and P2 implementation; great attention to CIS strengthen and CIS-ICZM link reinforcement in general for the Black Sea.

The first phase should not totally neglect the P3 option; whenever opportunities arise this should be promoted through a dedicated policy programme, even if the major focus would be on P1 and P2, and its implementation monitored to correctly depict the occurring progresses. An interim and final evaluation of the first phase results will be useful to prepare the second phase that will specifically focus on the implementation of the P3 option. This evaluation will be also useful to fine-tune the policy instrument to be used to successfully implement the P3 option in the second phase, i.e. the continuation of an incentives-based policy programme and/or a specific EU Recommendation.
Annex 1 – Overview analysis: analytical tables of European CIS cases
**HELCOM Map and Data Service**

<table>
<thead>
<tr>
<th></th>
<th>General Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>Name</td>
</tr>
<tr>
<td></td>
<td>Description</td>
</tr>
<tr>
<td>1c</td>
<td>Operating entity</td>
</tr>
</tbody>
</table>
|   | Contacts | Joni Kaitaranta, e-mail: joni.kaitaranta@helcom.fi  
Data administrator  
HELCOM Secretariat  
Katajanokanlaituri 6 B  
FI-00170 Helsinki Finland  
| 1e | Typology | Operational |
## Operational context and information content

### 2 ICZM dimensions

The HELCOM MDS mainly addresses four of the five considered information dimensions. The environment and the territory dimensions are in depth developed. The economic information in the system is provided with layers regarding commercial fishery, nuclear facilities, offshore wind farm, oil platform, maritime traffic, etc. Finally, the social dimension is represented by population density.

### 2b ICZM Sectors

The main information contained in the HELCOM MDS is structured in the following main topics:

- Ecological features (e.g. ecosystem health status, modelled photic zone, important birds area, coastal fish abundance, etc.);
- Protected area and monitoring (e.g. UNESCO sites, fisheries closure area, Baltic sea protected area, RAMSAR sites, Natura 2000 sites, etc.);
- Monitoring (e.g. coastal fish monitoring, COMBINE project monitoring, MORS project monitoring for radioactive substance, etc.);
- Pollution (e.g. hazardous substances, waterborne loads, river loads, atmospheric loads, etc.);
- Shipping (maritime traffic, accident, emergency capabilities, etc.);
- Pressures (e.g. Baltic Sea Pressure Index, Baltic Sea Impacts Index, coastal defence structure, etc.);
- Fisheries (e.g. total commercial fishery, etc.);
- Eutrophication status (e.g. nutrients, chlorophyll, benthic invertebrate communities);
- Background layer information related to the marine and terrestrial environment (e.g. Corine land cover, population density in the Baltic basin, etc.).

Lists reported within parentheses are only indicative and not exhaustive.

### 2c Integration

The HELCOM MDS provides various examples of integration among data related to different sectors and information dimensions, such as: shore sensitivity to oil spills in different period of the year, the Baltic Sea Pressure Index (BSPI) or the Baltic Sea Impact Index (BSII).

Other examples of integration among data are indicators on the overall ecological, biological, chemical, eutrophication status of water in coastal and marine areas. These indicators are calculated through different tools (BEAT, CHASE, HEAT) on the basis of monitoring data (1999-2007) concerning biological, chemicals, and eutrophication issues.

### 2d Spatial scale

Regional - Baltic Sea, including the whole marine area and coasts of the Baltic Sea.

The system can operate at different scales: from the Regional Sea one to local scales.
2e Flexibility  HELCOM MDS is specifically developed to address Baltic Sea specificities.

3 ICZM functionalities

<table>
<thead>
<tr>
<th>3a Knowledge related functionalities</th>
<th>HELCOM MDS provides some of the knowledge related functionalities considered by the analysis; specifically:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- Integration among different information sectors (see point 2c);</td>
</tr>
<tr>
<td></td>
<td>- Availability of spatial data; the system allows the download of GIS layers in shape file format;</td>
</tr>
<tr>
<td></td>
<td>- Operation at the different spatial scale; some of the available spatial data can be re-scaled according to the considered spatial extent; thus enabling to visualize more details at a higher scales;</td>
</tr>
<tr>
<td></td>
<td>- Some of the information provided match some of the ICZM indicators, such as for example amount of pollution, concentration of nutrients, volume of port traffic, area of sea protected by statutory designation.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3b Process related functionalities</th>
<th>HELCOM MDS provides a high variety of data on the marine and coastal system organised in an articulated structure; it can therefore support problem understanding and structuring in the Baltic Sea.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>More in general the system is intended to provide knowledge-based support to the activities of the Helsinki Commission related to the integrated planning and management of the marine and coastal environment of the Baltic Sea. Indeed, HELCOM MDS acting as data integrator is one of the fundamental information systems for the Baltic Sea management at the Regional Sea level.</td>
</tr>
</tbody>
</table>

4 Users

<table>
<thead>
<tr>
<th>4a User typology</th>
<th>List of target users, including the following ones:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- Decision-makers, at the Regional Sea level;</td>
</tr>
<tr>
<td></td>
<td>- Coastal planners and/or managers, at the Regional Sea level;</td>
</tr>
<tr>
<td></td>
<td>- Specialised and expert users;</td>
</tr>
<tr>
<td></td>
<td>- Civil society, for awareness and communication issues related to the sustainable use of the Baltic Sea;</td>
</tr>
<tr>
<td></td>
<td>- Others: teachers and students for education programmes.</td>
</tr>
</tbody>
</table>

5 Use of the system

<table>
<thead>
<tr>
<th>5a Accessibility</th>
<th>Free access on-line to all contents and functionalities.</th>
</tr>
</thead>
<tbody>
<tr>
<td>5b User-friendliness</td>
<td>Highly user-friendly</td>
</tr>
<tr>
<td></td>
<td>HELCOM MDS is provided with customised interfaces that are</td>
</tr>
</tbody>
</table>
rather simple to be used. Moreover use of the system is supported by a detailed and simply usable “User Manual” and a FAQ (frequently asked questions) section that provides ready information on main questions related to the use of system. All the system interfaces and metadata sheets are in English.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5c</td>
<td>Interactivity</td>
</tr>
<tr>
<td></td>
<td>HELCOM MDS includes a feedback tool to send suggestions in order to improve system’s functionalities and contents.</td>
</tr>
<tr>
<td>5d</td>
<td>Data access</td>
</tr>
<tr>
<td></td>
<td>The system enables the download of the great part of spatial data and also provides functionalities for the direct connection to the HELCOM GIS-Server via Web Map Service (WMS) interface. Finally, HELCOM MDS allows the easy access to detailed and clear metadata (metadata sheets) for all the available layers.</td>
</tr>
</tbody>
</table>

### 6 Technological characteristics

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>6a</td>
<td>Used technology</td>
</tr>
<tr>
<td></td>
<td>ESRI ArcGis Server 9.3.1 and Flex (licensed software).</td>
</tr>
<tr>
<td>6b</td>
<td>Integration with other tools</td>
</tr>
<tr>
<td></td>
<td>HELCOM MDS is configured as a Web-GIS collecting (via WMS) handling and visualising data from different GIS databases operated by independent data centres in the Baltic Sea area. The adopted solution enables to directly link the above GIS databases to the HELCOM MDS platform that is used to visualise this information in an integrate way. Management and update of single databases are ensured by the relative data managers and providers.</td>
</tr>
<tr>
<td></td>
<td>The site of the Helsinki Commission provides links to other relevant - for the Baltic Sea – web-sites for database and map services related to the activities of the same Commission, whose data are at least partially viewable through and integrated within the HELCOM MDS. These are</td>
</tr>
<tr>
<td></td>
<td>- COMBINE monitoring data, downloadable from ICES Oceanographic database and viewable and downloadable in the ICES EcoSystemData map service (<a href="http://ecosystemdata.ices.dk/map/index.aspx">http://ecosystemdata.ices.dk/map/index.aspx</a>);</td>
</tr>
<tr>
<td></td>
<td>- HELCOM MORS; database of the MORS project dealing with monitoring of radioactive substances in water, sediments, and biota downloaded via International Atomic Energy Agency's Marine Information System (<a href="http://maris.iaea.org">http://maris.iaea.org</a>). In the HELCOM MDS only monitoring stations, not data, are shown;</td>
</tr>
<tr>
<td></td>
<td>- Data and metadata produced by the EU funded project BALANCE (Baltic Sea Management – Nature Conservation and Sustainable Development of the Ecosystem through Spatial Planning, <a href="http://www.helcom.fi/GIS/BalanceData/en_GB/main/">http://www.helcom.fi/GIS/BalanceData/en_GB/main/</a>). Part of the BALANCE datasets can be visualized and downloaded in the HELCOM Map and Data Service.</td>
</tr>
<tr>
<td></td>
<td>HELCOM Baltic Sea Protected Area (BSPA) database, containing a wide range of information on protected areas of this Regional Sea, hosted in the HELCOM website (<a href="http://bspa.helcom.fi/">http://bspa.helcom.fi/</a>), is completely disjointed from HELCOM MDS.</td>
</tr>
<tr>
<td>6c</td>
<td>Integration with other CIS</td>
</tr>
<tr>
<td></td>
<td>In the case of HELCOM this issue is strictly connected with and therefore addressed in point 6b.</td>
</tr>
</tbody>
</table>
6d Interoperability
High.
Most of the dataset included in the HELCOM MDS are available via WMS. The HELCOM MDS provides Open Geospatial Consortium compliant Web Map Services (WMS) so that the user can access available layers directly from its own client. This guarantees a high interoperability of the system.
Metadata are structured and described according to the standard ISO 19115, being therefore complying with the INSPIRE Directive.

7 Cost/Resources

| 7a | Resources | 3 persons full time from 2009 for CIS implementation. 4 persons for system management. |

Web-site consultation for the overview analysis of HELCOM Map and Data Service:

- [http://maps.helcom.fi/website/mapservice/index.html](http://maps.helcom.fi/website/mapservice/index.html); last visit on 07/02/2011 at 10.40.
- [MARIS: Maritime Accident Response Information System:](http://www.ymparisto.fi/default.asp?node=13181&lan=en); last visit on 07/02/2011 at 13.00.
- [http://gis.ekoi.lt/gis/index.php](http://gis.ekoi.lt/gis/index.php); last visit on 18/02/2011 at 10.00.
# Lounaispaikka Map Service

<table>
<thead>
<tr>
<th>1 General Information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1a Name</strong></td>
</tr>
<tr>
<td><strong>1b Description</strong></td>
</tr>
<tr>
<td><strong>1c Operating entity</strong></td>
</tr>
<tr>
<td><strong>1d Management structure</strong></td>
</tr>
<tr>
<td><strong>1e Contacts</strong></td>
</tr>
<tr>
<td><strong>1f Typology</strong></td>
</tr>
</tbody>
</table>

## Operational context and information content

<table>
<thead>
<tr>
<th>2 Operational context and information content</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2a ICZM dimensions</strong></td>
</tr>
<tr>
<td><strong>2b ICZM Sectors</strong></td>
</tr>
</tbody>
</table>
|  | - Aerial photographs;  
|  | - Topographic map;  
|  | - Natural aspects (e.g. nature conservation areas, spawning areas, traditional rural biotopes, etc.)  
|  | - Administrative boundary;  
|  | - Geological information and surface and water system (e.g. geological map, soil map, elevation, drainage basins);  
|  | - Land and water use;  
|  | - Weather and climate data from fixed stations;  
|  | - Transport and traffic information (e.g. railroad network and terrestrial viability);  
|  | - Harbour and commercial traffic line;  
|  | - Cable network for the communication;  
|  | - Military infrastructure and areas;  
|  | - Regional plan and local master plans;  
|  | - Social data (e.g. population density);  
|  | - Services (e.g. public services in Turku, accessibility of public schools and hospitals, recreation)  
|  | - Cultural heritage (built heritage, archaeological sites, historical maps);  
|  | - Energy production.  

<table>
<thead>
<tr>
<th>2c</th>
<th>Integration</th>
<th>The service does not appear to provide examples of integration among different information and sectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>2d</td>
<td>Spatial scale</td>
<td>Sub-National Scale - South-Western Region of Finland. Data contained in the LMS are related to the land component of the coastal and marine system.</td>
</tr>
<tr>
<td>2d</td>
<td>Flexibility</td>
<td>The LMS has been developed in order to be applied specifically to the South-Western Region of Finland. The Lounaispaikka network can support the dissemination of the LMS experience.</td>
</tr>
</tbody>
</table>

3 **ICZM functionalities**

| 3a | Knowledge related functionalities | LMS provides some of the knowledge related functionalities considered by the analysis, specifically:  
|  | - Availability of spatial information; LMS does not allow to directly download data (spatial data may be visualised). However it provides a very good knowledge about a wide number of data sources, thus supporting data acquisition from direct providers;  
|  | - Operation at the different spatial scale; some of the available spatial data can be re-scaled according to the considered spatial extent; thus enabling to visualize more details at a higher scales. |

| 3b | Process related functionalities | LMS includes a high number and a wide variety of spatial information; these are organised according to a two level tree structures. LMS structure is well articulated and complete, thus enabling the users to easily find data and information. Thus LMS is well-shaped for problem understanding and structuring. |
LMS support data sharing among different regional actors, thus proving a wide set of data for regional planning. In this perspective, it is important to mention that the LMS developing process has involved stakeholders in order to address usability problems of the provided data.

### 4 Users

| 4a User typology | LMS combines a vast collection of spatial information contents into a single and easy to use map interface, mainly dedicated to public authorities and planning experts. |

### 5 Use of the system

| 5a Accessibility | Lounaispaikka is a map service with free access on-line. |
| 5b User-friendliness | High/Medium user friendly. The easy to use service interface takes into account the needs of both Geographic Information (GI) professionals and every day users with no prior GI knowledge. Intuitive operation of the system. Help on-line documentation could be further improved. Currently the only used language for all the LMS is the Finnish. In-going implementation includes the development of the English version of the LMS. |
| 5c Interactiveness | LMS is totally accessible on-line, although only enabling interactive data visualisation. The service does not directly provide e-participation tools, except for a simple feedback tool used by the users to provide suggestions in order to improve the functionality of the system. However, the Lounaispaikka network strongly supports cooperation and interaction; in particular it provides an Internet forum bringing regional professionals together to discuss issues related to geographic information. |
| 5d Data access | Only metadata consultation is currently available from the LMS. Spatial data cannot be downloaded; however LMS provides complete information on data sources, thus supporting data request to original data providers. |

### 6 Technological characteristics

<p>| 6a Used technology | The LMS is based on open source technologies (MAP SERVER and GEOSERVER and other). Previously the system was developed using ESRI software, but during the last two years the system was converted to open source. |
| 6b Integration with other tools | LMS is connected with the University of Turku Spatial Data Achieve. This share the metadata search functionality with the LMS service. |
| 6c Integration with other CIS | The standardised Web Map Service (WMS) interface enables the map application to import geographic data directly from the data providers. For example the LMS includes WMS layers from National Land Survey of Finland, Finnish Meteorological Institute and Geological Survey of Finland etc. |</p>
<table>
<thead>
<tr>
<th></th>
<th>Interoperability</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>6d</td>
<td>High.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LMS is based on a distributed architecture and Web Map Service (WMS) interfaces that provide spatial from multiple servers to the same map layout.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>WMS interfaces guarantee that the information is up-to-date and the system respects the INSPIRE Directive. Also the metadata aim to be organised complying standards of the INSPIRE directive.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>7</th>
<th>Cost/Resources</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>7a</td>
<td>Resources</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LMS is supported by the Regional Council of South-West Finland, University of Turku, Southwest Finland Regional Environment Centre, Yrkehögskolan Sydväst, Turku School of Economics, Åbo Akademi and Turku University of Applied Sciences.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The development of the system involved a full-time project planner for two years who was in charge of the service renewal and did most of the work related on map service development. In addition, two software developers were hired full-time for a couple of months.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>At the moment, operation activities involve only one person dealing with the general coordination of the network. However, the need to involve a full-time person specifically dealing with the map service implementation and update has been highlighted by Kaisa (mail sent on the 28.03.2011).</td>
<td></td>
</tr>
</tbody>
</table>
Information sources for the overview analysis of Lounaispaikka Map Service:

- Antti Vasanen, 2006. Presentation titled: "Lessons learnt on distributed viewing services Lounaispaikka Map Service and ICZM Map Viewer of the ENVIFACILITATE". GI-ENVI Workshop Turku 6 October 2006;


- Kaisa Savola, 2011. Information provided by mail on the 28.03.2011 at 14.20, CET time.

Web-site consultation for the overview analysis of Lounaispaikka Map Service:


- [http://www.lounaispaikka.fi/](http://www.lounaispaikka.fi/); last visit on 9/03/2011 at 16.00;

**General Information**

**1a Name**
Integrated Atlas of the State of the Coast in the South-Eastern Baltic

**1b Description**
The main aim of the “Sustainable Development Indicators for ICZM in the South-Eastern Baltic - SID4SEB" project was to follow and implement the main strategy of the European Parliament and the Council concerning adopted recommendations for the Integrated Coastal Zone Management in the South-Eastern Baltic. The Integrated Atlas of evaluated coastal and marine indicators, set up through GIS tools, is the main result of the project achievements. It covers the Baltic coast of three neighbouring countries: Poland, Russia (Kaliningrad region) and Lithuania. The report of the state of the coast and the related database, accessible from the main web site of the project, show the (static) maps and graphics for each of the 27 indicators (and all related parameters) defined by the Deduce project.

The project web-site also includes a description of the adopted methodology for each developed indicator and the final recommendation identified by the project.

**1c Operating entity**
The project involved the following three partners:
- Maritime Institute in Gdansk (Poland);
- Atlantic Branch of P.P. Shirshov Institute of Oceanology of the Russian Academy of Sciences in Kaliningrad (Russia);
- Coastal Research and Planning Institute at Klaipėda University (Lithuania).

**1d Management structure**
The work has been jointly produced by the 3 partners mentioned at the point 1c.

**1e Contacts**
Contacts:
Klaipėda University; nb@geo.it, tel. +370 46398848
Maritime Institute in Gdansk; anstas@im.gda.pl, tel. +48 583013718
Atlantic Branch of Institute of Oceanology, Russian Academy of Sciences in Kaliningrad: chuboris@ioran.baltnet.ru, tel. +7 (4012) 451574.
Web site: http://corpi.ku.lt/~SDI-4-SEB/index.html

**1f Typology**
Operational

**Operational context and information content**
### ICZM dimensions

Including the complete list of the 27 ICZM indicators identified by the Deduce project, the Atlas addresses all the ICZM dimensions: territory, environment, economy, society and governance.

### ICZM Sectors

Data and various information typologies (static maps and/or graphics) are provided for the following 27 indicators.

- Demand for property at the coast
- Area of built-up land
- Development on 'brownfield' land
- Demand for road travel at the coast
- Pressure for coastal and marine recreation
- Land take by intensive agriculture
- Amount of semi-natural habitat
- Area of land and sea protected by statutory designations
- Effective management of designated sites
- Changes to significant coastal and marine habitats and species
- Loss of cultural distinctiveness
- Patterns of employment
- Volume of port traffic
- Intensity of tourism
- Sustainable tourism
- Bathing water quality
- Amount of coastal and marine litter
- Amount of nutrients in coastal waters
- Amount of oil pollution
- Degree of social inclusion
- Household prosperity
- Number of second homes
- Fish stocks and fish landings
- Water consumption
- Sea level rise and extreme weather conditions
- Coastal erosion and accretion
- Natural and human assets at risk from flooding

### Integration

ICZM indicators are in some cases developed through the integration of different information. This is for example the case of the indicators related to flooding risk, including maps on the number of people living in ‘at risk’ area for flooding and the protected areas within the river flood risk zone.

### Spatial scale

Transitional scale – Baltic coast of Poland, Russia and Lithuania

### Flexibility

The system has been developed in order to be applied specifically to the selected area of the Baltic Sea
### 3 ICZM functionalities

#### 3a Knowledge related functionalities

The Atlas is specifically designed and developed on the basis of the 27 ICZM indicators. These provide other ICZM knowledge related functionalities:

- Integration among sectors (see point 2c) for the computation of some of the indicators;
- Multi-time data and information are available for some indicators in the form of graphs.

The Atlas does not contain information specifically referring to coastal vulnerability to climate change; however it includes some maps and graphics about sea level rise and storming in the study area.

#### 3b Process related functionalities

The Atlas provides a high variety of data on the marine and coastal system organised in an articulated and easy to use structure.

The “State of the coast report”, available in 4 languages (English, Lithuanian, Romanian and Polish) is composed of 27 chapters, correspondent to the 27 ICZM indicators. Every chapter includes extended texts, images and graphs describing the main results of each monitored indicator, reporting several information such as data sources, results, implication for planning, further needed work. A key message is also provided, summarizing the main achieved results.

This information can support various phases on an ICZM process addressing the South-Eastern Baltic, in particular in relation to planning, monitoring and adaptive management in general.

It is also important to stress that the Atlas is the result of a trans-national cooperation among three Baltic States, thus setting the basis for a further cooperation in the management of this specific area.

### 4 Users

#### 4a User typology

A wide typology of target users is expected, since the results of the project achievements have been presented to the public, regional, central and local authorities, associations and research organizations through publications, conferences and meetings.

Target users possibly include:

- Decision makers;
- Coastal managers/coastal planners
- Civil society

### 5 Use of the system

#### 5a Accessibility

All indicators, and related maps and graphics, are freely accessible online.

#### 5b User-friendliness

Highly user friendly

Maps and graphs can be quickly visualised. Wide explanation on
the use and the meaning of each indicator is provided in the methodology section. The system is available in English.

<table>
<thead>
<tr>
<th>5c</th>
<th>Interactiveness</th>
<th>No specific e-participation tools are provided</th>
</tr>
</thead>
<tbody>
<tr>
<td>5d</td>
<td>Data access</td>
<td>The Atlas enables to save (as image) only static maps and graphs. Data used to derive the indicators are not available in Internet. Metadata related to each indicator are included in deception sheet accessible through the methodology section. This sheet includes information on: indicator objective, parameters used to calculate the indicator, spatial and temporal coverage, data sources, methodology, modality used to present the data, adding value to the data, information on aggregation and disaggregation, notes.</td>
</tr>
</tbody>
</table>

### Technological characteristics

<table>
<thead>
<tr>
<th>6a</th>
<th>Used technology</th>
<th>Not-applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>6b</td>
<td>Integration with other tools</td>
<td>No specific integration with other tools</td>
</tr>
<tr>
<td>6c</td>
<td>Integration with other CIS</td>
<td>No specific integration with other CIS</td>
</tr>
<tr>
<td>6d</td>
<td>Interoperability</td>
<td>Not-applicable in relation to the INSPIRE Directive The Atlas fully meets the requirements of the Deduce Project in relation to the ICZM indicators.</td>
</tr>
</tbody>
</table>

### Costs/resources

| 6a  | Resource | |

Web-site consultation for the overview analysis of the Integrated Atlas of the State of the Coast in the South-Eastern Baltic:

- [http://corpi.ku.lt/~SDI-4-SEB/index.html](http://corpi.ku.lt/~SDI-4-SEB/index.html), last visit on 24/02/2011 at 09.50
## Rewal CIS

### 1 General Information

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>Name</td>
</tr>
<tr>
<td></td>
<td>Rewal CIS</td>
</tr>
</tbody>
</table>

Rewal CIS was developed within the MESSINA Project (Managing European Shoreline and Sharing Information on Nearshore Areas, part funded by the INTERREG III C West Zone programme) aiming at implementing the European recommendations for the design of dedicated Geographical Information Systems for the coastal areas developed within the EUROSION EC project.

Rewal CIS mainly focuses on erosion problems and on the related hazards of a long term near-shore investment in the Rewal area in Poland, and in particular in the Trzęsacz village. The main aim is to monitor past and future cliff erosion, thus providing elaborated scenarios (for the next 1000 years) and maps to coastal authorities and local government and supporting local spatial planning. Urban sprawl and massive tourism (for the archaeological ruins of village of Trzesacz) issues were also considered, completing a socio-economic assessment of the area.

Many datasets (including spatial layers and related attributes) were collected for Rewal area. The data reaching back even to year 1933 consisted of archival and present raster and vector maps, pictures, high resolution space images, coefficients of erosion rate and future investment plans up to 2015. All data were organized in one coordinate system with the use of ArcGIS software and presented in a way to enable display and analysis.

<table>
<thead>
<tr>
<th>1b</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rewal municipal authority</td>
</tr>
<tr>
<td></td>
<td>The CIS was developed by the University of Szczecin (Poland) in collaboration with the same Rewal municipality.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1c</th>
<th>Operating entity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rewal municipal authority in collaboration with the Laboratory of Remote Sensing and Marine Cartography of the University of Szczecin (Poland)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1d</th>
<th>Management structure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Kazimierz Furmanczyk; email: <a href="mailto:kaz@sus.univ.szczecin.pl">kaz@sus.univ.szczecin.pl</a> University of Szczecin (Poland)</td>
</tr>
<tr>
<td></td>
<td>Szakowsky Igor; e-mail: <a href="mailto:szakow@univ.szczecin.pl">szakow@univ.szczecin.pl</a> University of Szczecin (Poland)</td>
</tr>
<tr>
<td></td>
<td>Web-site of the MESSINA Project: <a href="http://www.interreg-messina.org">http://www.interreg-messina.org</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1e</th>
<th>Contacts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Operational</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2</th>
<th>Operational context and information content</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>2a</td>
<td>ICZM dimensions</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>
| 2b | ICZM Sectors | Main relevant data included in the Rewal CIS are:  
- Satellite data and aerial photographs;  
- Cadastral/land parcelling data;  
- Topographic database;  
- 3D digital terrain model;  
- Local development and strategy;  
- Socio-economic data. |
| 2c | Integration | No specific integrated data among different information is directly provided within the system |
| 2d | Spatial scale | Local – Rewal coastal area.  
Rewal municipality is located along the Western Pomeranian coast |
| 2d | Flexibility | Rewal CIS was developed according to recommendations for the design of dedicated Geographical Information Systems for coastal areas defined within the EUROSION EC project.  
Furthermore, its design and development was based on a previous experience implemented in the neighboured city of Dziwnow, focused on topography and socioeconomic aspects of this city. |
| 3 | ICZM functionalities | |
| 3a | Knowledge related functionalities | In relation to ICZM knowledge related functionalities, the CIS provides multi-time information especially concerning the erosion process, assessed through comparison of rectified air photographs dated 1951, 1973 and 1996.  
No other functionalities are provided. |
| 3b | Process related functionalities | The CIS was specifically developed to address the current and future erosion risk of the Rewal coastal area within an ICZM perspective, in particular considering effects on the archaeological ruins of village of Trzesacz and related tourism activity.  
In this perspective, Rewal CIS provides data and functionalities supporting scenario development and assessment of planning alternatives. Taking into account the past erosion rate the CIS was used to elaborate future erosion scenarios related to two planning alternatives for the archaeological ruins of village of Trzesacz:  
- Cliff protection through different systems;  
- No specific coastal protection and move existing ruins of Trzesacz to a not affected place.  
The main CIS output were coastal risk maps for the next 20, 50, 100 years for the two different proposed scenarios.  
The CIS does not provide specific tools and functionalities for the stakeholder participation. However, the design and the development to the CIS involved the municipality since the early
beginning. The CIS was also used as a demonstrative tool, informing local stakeholders on coastal problems related to erosion.

### 4 Users

#### 4a User typology

As alternatives are analyzed in coastal planning and their effects on coastal erosion are evaluated, the main target users can be:

- Decision-makers;
- Coastal planners and/or managers.

Given the tourist attraction of the site, general public can also be interested in the CIS data.

### 5 Use of the system

#### 5a Accessibility

Only off-line access

#### 5b User-friendliness

#### 5c Interactiveness

No specific e-participation tools are provided

#### 5d Data access

At the moment, the access of the system is restricted only to off-line users; thus no data and metadata are provided to free access.

### 6 Technological characteristics

#### 6a Used technology

The CIS was developed with ArcGIS - ESRI software

#### 6b Integration with other tools

The system makes use of a buffering tool, in order to calculate the shoreline changes, based on coefficients of erosion rate. A Model Builder module was also developed to automate the time-consuming analysis of scenario generation (Szakowski and Benedyczak, 2007).

#### 6c Integration with other CIS

No specific integration with other CIS

#### 6d Interoperability

### 7 Cost/resources

#### 7a Resources

Information sources for the overview analysis of Rewal CIS:

- MESSINA practical guide, 2006. Integrating the shoreline into spatial policies.
- MESSINA Newsletter issue 5 - December 2006.
Coastal Information System Oder Estuary

<table>
<thead>
<tr>
<th></th>
<th>General Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Name</strong></td>
</tr>
</tbody>
</table>
| 1a | **Description** | The Coastal Information System (CIS) Oder Estuary is a Web-portal collecting scientific information (data, projects results, publications, etc.) about the Oder Estuary Region. The CIS Oder Estuary is part of the ICZM-Oder project "Research for an Integrated Coastal Zone Management in the German Oder Estuary Region", fully described in the Web portal ad this specific address: [http://www.ikzm-oder.de/en/projekt-ikzm-oder.html](http://www.ikzm-oder.de/en/projekt-ikzm-oder.html). The ICZM-ODER project has been dealing mainly with the following key topics:
- Dialogues and regional participation;
- Internet supported tools for ICZM (e.g. the CIS Oder Estuary);
- Spatially integrated regional ICZM;
- Coastal waters in transition (climate change);
- National strategy, training and international integration.

Within the above framework, the CIS Oder Estuary mainly aims to:
- serve as a container for data information, project results, publications etc.;
- give access to this data and information to a broad public;
- support integrated management and planning processes;
- serve as a transferable model for other regions. The aim was to develop a system, that is spatially expandable and transferable to other regions;
- establish a German-Polish dialogue concerning coastal areas;
- set up concrete tools in order to build a basis for a sustainable development for the Oder estuary.

The CIS Oder Estuary Web portal provides access to a Web GIS tool, called GIS-ICZM, in the same web portal. The GIS ICZM allows free access to regional spatial information. The system includes multi-disciplinary spatial data related to a cross-border (German-Polish) coastal and marine area, i.e. the Oder Estuary and the part of the wider Mecklenburg-Vorpommern German region.

More in general, the Oder Estuary region has been included in numerous project dealing with ICZM and related aspects, such as:
- LOICZ-IGBP (Land Ocean Interactions in the Coastal Zone);
- Indicator programme of UNESCO-IOC (Intergovernmental Oceanographic Commission);
- Integrated Coastal Area - River Basin Management (ICARM)* of UNEP (United Nations Environment Programme);
- EU FP6 SPICOSA project (Science and Policy Integration
Information and results of these projects are included in the CIS Oder Estuary web portal. In particular some of the results are included in the GIS-ICZM tool (e.g. those generated by the ASTRA project).

**1c Operating entity**
EUCC Germany; German branch of the Coastal & Marine Union

**1d Management structure**
EUCC Germany; German branch of the Coastal & Marine Union

**1e Contacts**
Nardine Stybel, e-mail: stybel@eucc-d.de; nardine.stybel@io-warnemuende.de
EUCC Germany
Baltic Sea Research Institute/Institut für Ostseeforschung Warnemünde (IOW) Seestr 15

**1f Typology**
Operational

**2 Operational context and information content**

**2a ICZM dimensions**
The GIS-ICZM addresses four of the five considered ICZM dimension: territory (e.g. in relation to geographic descriptors, administrative boundaries, infrastructure, coastal protection, etc.), environment (biological reserve, water pollution, results of the eutrophication model, harmful substance in fish and mussels), social and economic dimensions (church, hospital, museum, tourism facilitates, pipeline, wind-farm and traffic features).

**2b ICZM Sectors**
The GIS-ICZM contains a wide variety and as high number of spatial information; main addressed information sectors are:
- Bathymetry;
- Sediment characteristics;
- Shoreline typology and coastal structures (dune, dike, moles etc.);
- Coastal protection;
- Flooding zones according to different levels of flood risk;
- Biological aspects (benthic species, feeding area for birds, fish species);
- Biological reserves (national protected areas and international reserves, etc.);
- Seasonal sensitivity to oil spills for the coast and for the marine area;
- Coastal water typology according to the Water Framework Directive;
- Water eutrophication (i.e. concentration of nitrate and phosphate);
- Results of the eutrophication model in different years;
### 2c Integration

The GIS ICZM provides some good examples of integrated analysis, including in particular layers related to:

- Flooding zones according to four different levels of flood risk;
- Sensitivity of the coastal and marine areas to oil spills, determined by the Precaution Pollution Control (VPS) Model.

### 2d Spatial scale

Sub-National – Oder estuary and coastal-zone of the Mecklenburg-Vorpommern Region.

### 2d Flexibility

The Web Portal (CIS Oder Estuary) may be considered as a highly flexible tool. Its structure can be replicated in similar context. Indeed, one of the objectives of the CIS Oder Estuary is to develop a system spatially expandable and potentially transferable to other regions.

The GIS-ICZM has been developed in order to be mainly applied to Oder Estuary area.

### 3 ICZM functionalities

#### 3a Knowledge related functionalities

Analysis of the ICZM knowledge related functionalities specifically focuses on GIS-ICZM, that includes many of the considered functionalities:

- GIS-ICZM provides good examples of integrated information, such as those described in 2c;
- Operation at the different spatial scale. Some of the available spatial data can be re-scaled according to the considered spatial extent; thus enabling to visualize more details at a higher scale. For example the information regarding the coastal ship traffic can be scaled until the very local scale.
- GIS-ICZM includes multi-disciplinary spatial data related to a cross-border (German-Polish) coastal and marine area, thus contributing to support the German-Polish dialogue and cooperation on ICZM;
- Inclusion of functionalities or maps related to assessment of coastal vulnerability to climate change. Oder Estuary was included in the ASTRA project as a case study, whose results (flood risk assessment) are included in the GIS-ICZM.

#### 3b Process related functionalities

Analysis of the ICZM process related functionalities mainly focuses on GIS-ICZM, that includes some of the considered functionalities:
- The GIS-ICZM includes a high number and a wide variety of spatial information; these are organised according to a two level tree structures. The structure can support research of information useful for problem understanding;
- The GIS-ICZM tool is constantly used to support the various phases of the Oder ICZM process and related projects (including EU funded ones). The development of the whole Web portal was strongly supported by several institutions and administrations, providing a demand driven implementation of the system;
- Support to the German-Polish dialogue and cross-border cooperation on ICZM; indeed many layers refer to a cross-border area;
- Besides being a Web-GIS, the GIS-ICZM does not specifically include tools supporting stakeholder participation. However the portal provides an E-learning Platform “ICZM-D Lerner”. This is a freely accessible web-based learning system consisting of on-line study, information and teaching modules that is a useful tool for the participation and dissemination of the information.

### 4 Users

| 4a | User typology | The system is addressed to local and regional authorities, scientists, Polish and German actors and citizens (also including students and teachers). |

### 5 Use of the system

| 5a | Accessibility | Free access on-line to all of the CIS Oder Estuary and the GIS-ICZM. Many sections of the CIS Oder Estuary and of the Web-GIS are available in three languages: Polish, German and English. |
| 5b | User-friendliness | Both the web-portal and GIS-ICZM are highly user-friendly. The system is available in three languages: German, Polish and English. |
| 5c | Interactiveness | Besides being a Web-GIS, the GIS-ICZM does not specifically include tools supporting stakeholder e-participation. However the portal provides an E-learning Platform “ICZM-D Lerner”. This is a freely accessible web-based learning system consisting of on-line study, information and teaching modules that is a useful tool for the participation and dissemination of the information. |
| 5d | Data access | Only metadata are completely available from this GIS-ICZM through the Metadata Management System (MMS). |

### 6 Technological characteristics

| 6a | Used technology | A first release of the GIS ICZM was developed through ESRI technology. Use of a licensed software was than perceived as a limitation, mainly for economic reasons. In a second step it was therefore decided to abandon the ERSI technology and adopt an open source software. In particular the system now is developed with |
| 6b | Integration with other tools | The GIS ICZM is not directly integrated with other tools. However it includes outcome of an eutrophication model related to various years. |
| 6c | Integration with other CIS | The GIS ICZM of the Oder Estuary is linked (however not directly) to the GIS ICZM M-V, containing data about the coastal area of the whole federal state of Mecklenburg - Vorpommern (M-V). The GIS-ICZM M-V acts as an umbrella system for the GIS ICZM of the Oder Estuary, also aiming to establish a connection to the systems of neighbouring regions: i.e. the federal state Schleswig-Holstein and those in Denmark and Poland. |
| 6d | Interoperability | High. ISO 19115 is the core of the metadata standard of INSPIRE. The ISO 19115 standard was chosen as the GIS ICZM metadata standard. More in general the Web-GIS refers to INSPIRE Directive. |
| 7 | Cost/Resources | The whole project ICZM Oder started in May 2004 with a budget of 2 million of Euros for the first 3 years period. It was supported by the Federal Ministry of Education and Research Germany (BMBF). After this successful first three years period (2004-2007), the project was being renewed for other three years (2007-2010). Between 2004 and 2008, the realisation of the CIS Oder Estuary Web Portal was funded with about € 425,000 provided BMBF, part of phase I and II of the ICZM Oder project. The cost of the implementation of the Web-GIS is about € 365,000. |
Information sources for the overview analysis of GIS ICZM-Oder:

- Körfer A., 2008. COPRANET (Coastal Practice Network) – Case study: Integrated Coastal Zone Management in the Oder (Odra) Estuary Region.

Web-site consultation for the overview analysis of GIS ICZM-Oder:

- [http://www.ikzm-oder.de/en/startseite.html](http://www.ikzm-oder.de/en/startseite.html); last visit on 08/03/2011 at 10.00;
- [http://ec.europa.eu/ourcoast/index.cfm?menuID=9&articleID=202](http://ec.europa.eu/ourcoast/index.cfm?menuID=9&articleID=202); last visit on 08/03/2011 at 11.00;
- [http://balticlagoons.net/?p=291](http://balticlagoons.net/?p=291); last visit on 08/03/2011 at 10.30.
# GeoSeaPortal

<table>
<thead>
<tr>
<th></th>
<th>General Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>Name</td>
</tr>
</tbody>
</table>
| 1b | Description | GeoSeaPortal is a marine geo-information portal of the German Federal Marine and Hydrographic Agency (BSH), for marine and coastal protection, navigation safety, offshore industry and integrated marine spatial planning. It provides an unique access point to the currently available hydro-oceanographic and geographic data from the BSH. The BSH is also currently developing a central Spatial Data Infrastructure (SDI-BSH); within this SDI the GeoSeaPortal represents a tool allowing to search scientific information using a meta-information system and showing Web-GIS interactive maps. The SDI-BSH will be an important contribute, for marine data, to the national spatial data base (NGDB) and the national spatial data infrastructure (GDI-DE), encouraging sharing and exchanging territorial data in Germany, also in the perspective of the European INSPIRE Directive. GeoSeaPortal displays data on the Map-Viewer, through WMS services, from several BSH information systems including:  
- NAUTHIS, Nautical hydrographic Information System of BSH, offering aid to the commercial navigation, showing e.g. wrecks, obstruction to navigation, seaward limits, hydrography etc.  
- CONTIS, Continental Shelf Research Information System, a marine database of BSH on the several (current and planned) uses of the sea  
- GVU, a BSH database on water pollution in the German area and the exclusive economic zone;  
- MARNET, about BSH environmental monitoring network;  
- SGE, Shelf Geo Explorer, about BSH geodata on sediment distribution, thickness, structure of the seabed etc.  
- MUDAB, German data base for marine data, a joint project between BSH and the Federal Environmental Agency (UBA), displaying physical and chemical parameters for water and sediment, as well as radiochemical data of seawater.  
An overview of the contents of these Web Map Services and the relative URL are provided by the GeoSeaPortal website. The website provides also:  
- an overview of the ongoing Spatial Data Infrastructure (SDI - BSH) initiative;  
- An user manual for the use of GeoSeaPortal (German only);  
- The access to the Metadata Portal (to search data and metadata through keywords or spatial selection), and to the Map-viewer, enabling to visualize, customize, save and print maps. |
| 1c | Operating entity | German Federal Maritime and Hydrographic Agency (BSH) |
| 1d | Management structure | German Federal Maritime and Hydrographic Agency (BSH) |
### 1d Contacts

- Johannes Melles, e-mail: [johannes.melles@bsh.de](mailto:johannes.melles@bsh.de) (specialist issues).
- Jöerg Gerdes, e-mail: [joerg.gerdes@bsh.de](mailto:joerg.gerdes@bsh.de) (technological issues)

GeoSeaPortal site: [http://www.bsh.de/de/Meeresdaten/Geodaten/index.jsp](http://www.bsh.de/de/Meeresdaten/Geodaten/index.jsp)

### 1e Typology

Operational

### 2 Operational context and information content

#### 2a ICZM dimensions

The system (in particular through the Map-Viewer component) mainly addresses four of the five ICZM dimensions: territory (e.g. administrative boundaries, nature/ecological reserve) environment (e.g. monitoring network, pollution data, geological data), economy (e.g. exclusive economic zone, fishery zone, exploitation of resources) and governance dimension (in particular in relation to detailed information on maritime zoning).

#### 2b ICZM Sectors

The information content of GeoSeaPortal is structured in the following themes, each of them includes several layers:

- Bathymetry and coastline
- Administration limits
- Energy related information (e.g. platforms, pipeline, offshore wind farms)
- Marine Environmental monitoring network
- Hydrography
- Navigational aids (e.g. buoys, lights, radio radar, etc.)
- Rocks wrecks and related obstruction to navigation and other uses;
- Seawards limits, including spatial data on maritime zoning;
- Skin of the Earth (dredged areas, depth areas, land areas, berthing, pontoons…)
- Topography
- Remote sensing Sea Surface Temperature
- Sea Surface Temperature analysis
- Prediction model water current, level, salinity and temperature;
- Palaeographic structures;
- Seabed sediments
- Subsurface sediments
- Seabed survey
- Sediment contamination (HCB, PCB, metals)
- Water contamination (metals, nutrients, PAHs, PCB, pesticides).

The above listed information is all relative to the marine area. No information on land is currently available in GeoSeaPortal.

However the GeoSeaPortal structure enables to integrate in the Map Viewer any spatial data available through a WMS connection. In particular the Map Viewer already enables to show spatial data of integrated CIS (see point 6c).

#### 2c Integration

No specific integrated information among different data is directly provided within the system.
<table>
<thead>
<tr>
<th>2d</th>
<th>Spatial scale</th>
<th>National - German marine area</th>
</tr>
</thead>
<tbody>
<tr>
<td>2e</td>
<td>Flexibility</td>
<td>GeoSeaPortal has been specifically developed in order to be applied to German marine and coastal area.</td>
</tr>
</tbody>
</table>

### 3 ICZM functionalities

#### 3a Knowledge related functionalities
GeoSeaPortal provides some of the knowledge related functionalities:
- Although spatial layers cannot be directly downloaded, the system is designed to share them through Web Map Service (WMS). All relative url are provided by GeoSeaPortal;
- Operation at the different spatial scale; some of the available spatial data can be re-scaled according to the considered spatial extent; thus enabling to visualize more details at a higher scales, e.g. bathymetry, etc.

#### 3b Process related functionalities
The system does not currently provides specific ICZM process related functionalities.

### 4 Users

#### 4a User typology
Potential users are:
- Marine planners and/or managers; actually the system provides useful information (such as spatial data on maritime zoning and uses of the marine spaces)
- Private sector (e.g. industry/energy companies), as for information regarding petroleum platforms, offshore wind farms;
- Specialised/expert users, since original data can be access through WMS connection. These users can be also particularly interested spatial data resulting from modelling activities (e.g. modelling of current, water level, temperature, salinity).

### 5 Use of the system

#### 5a Accessibility
Data related to the sectors described in point 2b are all freely accessible on-line through the Web-GIS component.
The system also includes a restricted area dedicated to authorised users.

#### 5b User-friendliness
Highly/Medium user friendly
Some components of the web-portal are highly user friendly. This is case of the Metadata Portal that quickly and easily enables to search for metadata and spatial data, also enabling visualization of the latter through a direct integration with the Web-GIS component.
Some other components can be further improved in terms of user-friendliness; such as in the case of the Web-GIS for which for example the spatial data loading is not totally intuitive.
User manual is available in German. The web-portal is in German, including some parts in English

#### 5c Interactiveness
The system does not currently include e-participation tools and
5d Data access

All spatial data are accessible by Web Map Services. The Web-GIS enables users to export and print maps. The system includes a component (Metadata Portal) specifically dedicated to metadata management. This enables to search for and show complete metadata (complying with the ISO 19139 standard.) for each layer. In most of the cases direct link to the specific data web-site is also provided.

6 Technological characteristics

6a Used technology

Through WMS application, Geoseaportal displays data from several information systems managed by BSH (see 1b). GeoSeaPortal is also integrated with BSH remote sensing activities, operating since 1990 with an own facility for the real-time reception and immediate processing of high resolution data from meteorological US satellites. Finally, as part of oceanographic services, BSH manage a model to simulate the present and future hydrodynamic behaviour of the North Sea and Baltic. GeoSeaPortal is integrated with this tool, displaying data on modelled oceanic currents, sea level height, water temperature and salinity.

6b Integration with other tools

Through WMS, GeoSeaPortal is directly integrated to the following systems:

- HELCOM map and data service, providing data for the whole Baltic Regional Sea;
- GRID-Arendal system, collaborating centre of the United Nations Environment Programme (UNEP), established by the Government of Norway as a Norwegian Foundation, to communicate environmental information to policy-makers and facilitate environmental decision-making for change;
- Geography network, geographic data provided by ESRI

6c Integration with other CIS

High

Metadata are compliant with the ISO 19139 international standard, related to the INSPIRE Directive. Interoperability is properly managed through WMS.

6d Interoperability

Web-site consultation for the overview analysis of the GeoSeaPortal.

- [http://www.bsh.de/de/Meeresdaten/Geodaten/index.jsp](http://www.bsh.de/de/Meeresdaten/Geodaten/index.jsp); last visit on 01/04/2011 at 13.00.
Coastal Information System supporting Fish Farming in Denmark

<table>
<thead>
<tr>
<th>1</th>
<th>General Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>Name</td>
</tr>
<tr>
<td>1b</td>
<td>Description</td>
</tr>
<tr>
<td>1c</td>
<td>Operating entity</td>
</tr>
<tr>
<td>1d</td>
<td>Management structure</td>
</tr>
<tr>
<td>1e</td>
<td>Contacts</td>
</tr>
<tr>
<td>1f</td>
<td>Typology</td>
</tr>
</tbody>
</table>

2 Operational context and information content
### 2a ICZM dimensions

The Web-GIS addresses more ICZM dimension: territory (e.g. marine protected areas, Ramsar Site, etc.), economy (pipeline, corridor for the navigation, mining for beach nourishment, etc.) and environment (e.g. chemical and physics characteristics of the sea water, such as temperature and salinity). The governance dimension is also considered in this CIS; besides including some background information (licensed area to be used for sand excavation), the CIS also contains a specific layer representing the results of the planning effort, i.e. classification of licensable reservation for the location of marine fish farming in Denmark. Indeed this CIS has been used as an important tool in the planning process.

### 2b ICZM Sectors

GIS layers are organised in three categories:

- Constraints for fish farming development due to other uses, e.g.: areas already used for fish farming, safety zone for maritime transportation and underwater cables and pipelines, mining zones, freshwater areas, safety zone around oil platforms, hazard zones (e.g. due to the presence of mines on the sea bottom);
- Constrains to fish farming development due to regulation, e.g.: Nature 2000 areas, Ramsar site, other high-values areas, military areas, areas of biological relevance, areas under other specific regulations, etc.
- Territorial and environmental information useful for the identification of suitable areas for fish farming development, related to: proximity of existing fish farming sites, proximity to dumping sites, proximity to wastewater discharges, water depth, water salinity and temperature, wave height and hydrodynamic, tidal characteristics.

### 2c Integration

This Web-GIS supports the integrated assessment of the Danish marine coastal area, providing a common platform to integrate spatial and environmental information, aiming to identify the most suitable area for fish farming in the Exclusive Economic Zone of Denmark. Final results of the assessment (map of the areas with total or partial or any restriction to fish farming) are included in the CIS.

### 2d Spatial scale

National Scale – Sea and coastal zone in Denmark. Basically, the analysis was conducted for (and the Web-GIS refers to) the entire Exclusive Economic Zone (EEZ) of Denmark.

### 2d Flexibility

The Web-GIS been developed in order to be applied to the specific marine coastal territory of Denmark. Even if it has been specifically developed to identify area suitable for fish farming and to support related licensing procedures, the CIS provides data useful for other aspects related to ICZM. The Web-GIS structure is very similar to the one used to implement the Limfjorden Coastal Information System.

### 3 ICZM functionalities
3a Knowledge related functionalities

The Web-GIS supports the integrated assessment of territorial and environmental information of the Danish EEZ, in particular enabling to identify and map those areas that are suitable (totally or partially) for fish farming.

3b Process related functionalities

This Web-GIS provides a conceptual model for problems related to fish farming in the marine areas of Denmark. It therefore clearly supports problem understanding and structuring. Although the CIS is focusing on sector aspects (fish farming), there is clear intention to evaluate interrelations and conflicts with other human activities (e.g. navigation, sediment dredging, port activity, nature protection, environmental quality preservation, recreation activities) in an ICZM perspective.

4 Users

4a User typology

Users of the system are mainly coastal planners and/or managers dealing with fish farming regulation as well as representative of the private sector (fishermen and fish farmers).

5 Use of the system

5a Accessibility

Free access on-line to the complete Web-GIS.

5b User-friendliness

Medium. The use of the web-GIS on-line is rather simple and user-friendly, however a specific help on-line documentation is not available. The Web-GIS is available only in Danish language.

5c Interactiveness

No specific e-participation tools are available.

5d Data access

The Web-GIS does not enable to download spatial data, while it provides the possibility to print simply customized maps. Metadata description is available for each layer; however metadata do not fulfil the INSPIRE Directive requirements.

6 Technological characteristics

6a Used technology

The Web-GIS is developed with ArcIMS server (ESRI licensed software).

6b Integration with other tools

No specific integration with other tools

6c Integration with other CIS

The Web-GIS is not directly integrated with other coastal information systems. However, the DTU Aqua (National Institute of Aquatic Resources) provides link to other GIS on related arguments from the same Web-page from which the Limfjorden CIS can be accessed. These are:
- “Blåmuslinger”: GIS containing information regarding the productivity of mussels in the Danish territorial water.
- “Limfjorden”: Web-GIS tool specifically aiming to provide data and functionalities for the planning and management of mussel farming and fishing activities in the Limfjord area.
<table>
<thead>
<tr>
<th>6d</th>
<th>Interoperability</th>
<th>Low. There is no compliance with the INSPIRE DIRECTIVE and with the standard of the collected metadata (ISO 19115).</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Cost/Resources</td>
<td></td>
</tr>
<tr>
<td>7a</td>
<td>Resources</td>
<td></td>
</tr>
</tbody>
</table>

Web-site consultation for the overview analysis of the CIS-FFD:

- [http://www.praesten.dtu.dk/Inst/AQUA/Om_DTU_Aqua/Afdelinger/Faglige_stottefunktioner/GIS.aspx](http://www.praesten.dtu.dk/Inst/AQUA/Om_DTU_Aqua/Afdelinger/Faglige_stottefunktioner/GIS.aspx); last visit on 01/03/2011 at 14.00.

- [http://gis.dfu.min.dk/website/Havbrug/viewer.htm](http://gis.dfu.min.dk/website/Havbrug/viewer.htm); last visit on 01/03/2011 at 16.00.
NOKIS - North Sea and Baltic Sea Coastal Information System

NOKIS web site (www.nokis.org) has not been active during the implementation of the overview analysis since it is undergoing significant further development. The current description is therefore based on available literature. Due to the unavailability of the on-line system the description of NOKIS is partial; the new development could significantly change the contents of this description. For these reasons, a full analytical sheet is not provided for the NOKIS system.

NOKIS was a joint project of KFKI (German Coastal Engineering Research Council) and BAW (Federal Waterways and Research Institute) with the main objective to establish a metadata information system for the North Sea and Baltic Sea coastal regions (Kazakos, 2004). The project NOKIS (2002-2004) is now finished but its activity is continuing and widening within NOKIS ++ , "Information Infrastructures for the North Sea and Baltic Sea Coast as Contribution to Integrated Coastal Zone Management" (2004-2008), focusing on the integration of different data sources from participants all over the coast. NOKIS and NOKIS ++ are both funded by the German Federal Ministry of Education and Research.

The initial motivation for the project NOKIS was the lack of an infrastructure for the exchange of geodata across administrative boundaries between the German Wadden sea national parks and other governmental administrations (e.g. water management and administration of waterways and navigation) on the federal and state levels. Today, around 20 partners from administration, research and industry are cooperating within NOKIS.

The geographical area involved in the NOKIS system includes the German coast of North Sea and Baltic Sea, as shown in Figure 1. It includes the National Park of Schleswig-Holstein, Wadden Sea, with 440,000 ha and 400 km coast.

Figure 1 Geographical coverage of NOKIS (Kohlus and Heidmann, 2007).
The platform offers information about the German coastal zone including abstracts of coastal journals, completed and ongoing research projects, and it provides a number of recent project reports. The database is bi-lingual (German and English) to ensure international accessibility.

Project partners from a variety of research institutions and state agencies cooperated in NOKIS. As a result, the central metadata repository includes documentation about a wide range of data types commonly used. Examples include GIS data from the national park offices, containing monitoring results from the German Wadden Sea as well as extensive time series from tidal gauges which are maintained by coastal protection authorities on state level (Heidmann et al., 2008).

Metadata, “data about data”, supply standardised basic information about data records like documents, maps or series of measurements, making easier data searching, exchanging and processing. The NOKIS metadata model is fully compliant with the standards for geoinformation of the International Organization for Standardization (ISO), guaranteeing sufficient meta information available for documentation and intelligent search methods. The most important standard for NOKIS (Heidmann et al., 2008) are ISO 19115 (Geographic information – Metadata), ISO 19136 (Geographic information – Geography Markup Language) and ISO 19139 (Geographic information - Metadata - XML schema).

The overall architecture of the NOKIS system consists mainly of local metadata bases and a central server located at BAW. Original data remain on local, while metadata, generated locally, are then uploaded to the central NOKIS metadata server. Any proprietary information is filtered out during this replication process (Lehfeldt & Heidmann, 2002). The NOKIS multilingual Editor is the central tool for the generation and maintenance of metadata records, allowing the user in creating valid ISO 19115/19119 metadata. There are no license fees since NOKIS is based on open source software, and each declared partner is granted the right of use for the metadata editor.

Furthermore NOKIS makes available different services, including (Heidmann et al., 2008):

- An OGC Catalogue Services, holding information about the data, about data access services, and about the services available for visualization and analysis. The catalogue services provide standard-compliant metadata to serve higher level metadata information systems in Germany, like Geoportal.Bund of the GDI-DE, PortalU for environmental information and in the future INSPIRE.

- A Coastal Gazetteer, to support users in retrieving spatial information. It stores complete place names (many places may have more than one name, either because it changed with the time or because of different languages) and geometries for the coastal zone allowing users with options to run spatial queries not only defining a spatial extent but also entering geographical search terms. They are checked against the gazetteer vocabulary and all existing geometries. The NOKIS gazetteer also covers the temporal variability of geometries and names, which is normally not included in conventional gazetteers but which is of special interest for the tidal flats along the German coast.

- A Data Access Service, to provide ways to access the information itself and not only to metadata;

- Visualization services, focusing on the visualization of time series and field data, which is not or only insufficiently covered by the OGC services, as for example vector field data (e.g. wind fields or current fields) and vector point data (e.g. wind direction and speed at a certain point).
Information sources for the overview analysis of Atlas of Nokis:


- Heidmann, C., Sellerhoff, F., Lehfeldt, R., Valikov, A., Kazakos, W., 2008. Providing Access to Environmental Data in a SOA in NOKIS. Environmental Informatics and Industrial Ecology. The NOKIS project has been completed. All data are now available in the following portals: Proceedings of 22nd international conference on informatics for environmental protection.


## Limfjorden Coastal Information System

<table>
<thead>
<tr>
<th></th>
<th>General Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Name</strong></td>
</tr>
</tbody>
</table>
| 1b | **Description** | Limfjorden Coastal Information System is a Web-GIS tool specifically aiming to provide data and functionalities for the planning and management of mussel farming and fishing activities in the Limfjord area. In this perspective the CIS includes a wide variety of data related to the coastal area which may be relevant for other purposes related to ICZM, too.  
With a coastline of 1.000 km the Limfjord is the largest fjord in Denmark. The fjord is strongly impacted by intensive mussel (blue mussels and flat oyster) commercial fishery. National policy aims to support the sustainable use of Limfjord’s natural resources, in particular improving the sustainable production of cultured mussels in balance with the extensive fishery of blue mussels and flat oysters.  
In order to ensure an efficient procedure of the preparation and evaluation of applications for culturing licenses, a production area classification was conducted involving central and local authorities and organisations. The production areas were classified in areas not available for mussel production (e.g. harbours, polluted areas), areas with restrictions for certain forms for mussel production (e.g. national and international nature protected areas, navigation corridors, areas of recreational interests), and areas without any restrictions. Furthermore, the stocks of blue mussels and flat oyster were mapped in order to identify important fishing grounds. Through the GIS analysis fishing grounds for trawling of herring and sprat were identified, too.  
Limfjord has also been included as case-study in the European funded SPICOSA project (Science and Policy Integration for COastal System Assessment). |
| 1c | **Operating entity** | National Institute of Aquatic Resources  
Section for Coastal Ecology - DTU Aqua |
| 1d | **Management structure** | National Institute of Aquatic Resources  
Section for Coastal Ecology - DTU Aqua |
| 1e | **Contacts** | Per Dolmer, e-mail: pdo@aquadtu.dk  
Kerstin Geitner, e-mail: kjg@aquadtu.dk  
National Institute of Aquatic Resources  
Section for Coastal Ecology  
DTU Aqua - Technical University of Denmark  
Charlottenlund Slot  
Jægersborg Allé 1  
2920 Charlottenlund  
Denmark  
Web-GIS: [http://gis.dfu.min.dk/website/Limfjord/viewer.htm](http://gis.dfu.min.dk/website/Limfjord/viewer.htm) |
| 1f | **Typology** | Operational |
### 2. Operational context and information content

#### 2a. ICZM dimensions

The CIS addresses more ICZM dimension: territory (marine protected areas, bathing beaches and areas close to summer houses), economy (pipeline, corridor for the navigation) and environment (polluted areas). The governance dimension is also considered in this CIS; besides including some background information (licensed area to be used for sand excavation), the CIS also contains a specific layer representing the results of the planning effort, i.e. classification of licensable productive areas according to total, partial or any restriction to mussel production. Indeed this CIS has been used as an important tool in the planning process.

#### 2b. ICZM Sectors

GIS layers are organised in three categories:

- Areas not available to mussel production: Harbours, Depots of dredged sediments, Streams polluted with discharged water, Local polluted areas, Pipes and cables;
- Areas available for some forms of mussel production: Areas regulated by international nature protection directives (Habitat, Ramsar, Bird Directives); Areas regulated by national nature protection directives; Mussel fishing areas; Areas with eel grass and macroalgae; Areas included in monitoring programme of macroalgae; Areas with stone reefs; Areas close to summerhouses; Areas close to bathing beaches; Navigational corridors; Areas for the extraction of sediments;
- Areas with fishing grounds: Blue mussels; Flat oyster; Herring/sprat

#### 2c. Integration

The CIS supports the integrated assessment of the Limfjorden area, providing a common platform to integrate various spatial and environmental information, aiming to identify the most suitable are for the sustainable production of cultured mussels in balance with the extensive fishery. Final results of the assessment (map of the areas with total, partial or any restriction to mussel farming) are included in the CIS.

#### 2d. Spatial scale

Local scale – Limfjorden fjord in the North-West of Denmark.

#### 2d. Flexibility

The CIS been developed in order to be applied to the specific coastal territory of Limfjorden. Even if it has been specifically developed to identify area suitable for mussel farming and to support related licensing procedures, the CIS provides data useful for other aspects related to ICZM.

### 3. ICZM functionalities

#### 3a. Knowledge related functionalities

The CIS supports the integrated assessment of territorial and environmental information of the Limfjorden area, in particular enabling to identify and map those are that are suitable (totally or partially) for mussel farming and the areas that are important for fishing activities.

#### 3b. Process related functionalities

This CIS provides a conceptual model of problems related to mussel farming and fishing in the Limfjorden area. It therefore clearly supports problem understanding and structuring. Although
the CIS is focusing on sector aspects (mussel farming and fishing), there is clear intention to evaluate interrelations and conflicts with other human activities (e.g. navigation, sediment dredging, port activity, nature protection, environmental quality preservation, recreation activities) in an ICZM perspective. The tool has been actually used in the planning process, also involving mussel farmers and authorities (Dolmer and Geitner, 2004).

4 Users

| 4a | User typology | Users of the system are mainly coastal planners and/or managers dealing with the mussel production regulation as well as representative of the private sector (fishermen and mussel farmers). |

5 Use of the system

| 5a | Accessibility | Free access on-line (access allowed to all users with or without password) to the complete CIS. |
| 5b | User-friendliness | The use of the web-GIS on-line is rather simple and user-friendly, however a specific help on-line documentation is not available. The web-GIS is available only in Danish language. |
| 5c | Interactiveness | No specific e-participation tools are available. |
| 5d | Data access | The does not enable to download spatial data, while it provides the possibility to print simply customized maps. Metadata description is available for each layer; however metadata do not fulfil the INSPIRE Directive requirements. |

6 Technological characteristics

| 6a | Used technology | The CIS is developed with ArcIMS server (ESRI licensed software). |
| 6b | Integration with other tools | No specific integration with other tools |
| 6c | Integration with other CIS | The Limfjorden CIS is not directly integrated with other coastal information systems. However, the Danish Institute for Fisheries Research (Denmark Fiskeriundersøgelser - DFU) provides link to other GIS on related arguments from the same Web-page from which the Limfjorden CIS can be accessed. These are: - “Blåmuslinger”: GIS containing information regarding the productivity of mussels in the Danish territorial water. - “Placering af havbrug”: GIS including information on aquaculture activities in the Danish territorial water. This CIS provides a comprehensive overview of all the regulatory constraints, environmental and territorial act on Danish territorial waters. |
| 6d | Interoperability | Low. There is no compliance with the INSPIRE DIRECTIVE and with the standard of the collected metadata (ISO 19115). |

7 Cost/Resources

| 7a | Resources | |

---
Information sources for the overview analysis of Limfjord Coastal Information System:


Web-site consultation for the overview analysis of Limfjord Coastal Information System:

- http://www.praesten.dtu.dk/Inst/AQUA/Om_DTU_Aqua/Afdelinger/Faglige_stottefunktioner/GIS.aspx; last visit on 01/03/2011 at 14.00.

- http://gis.dfu.min.dk/website/Limfjord/viewer.htm; last visit on 01/03/2011 at 16.00.
# General Information

<table>
<thead>
<tr>
<th>1</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>Name</td>
</tr>
<tr>
<td></td>
<td>The Trilateral Wadden Sea Cooperation web-site</td>
</tr>
</tbody>
</table>

The Trilateral Wadden Sea Cooperation (TWSC) web-site is maintained by the Common Wadden Sea Secretariat (CWSS) to enhance public access to information about the Wadden Sea Area and its protection.

Since 1978, the responsible ministries of the Netherlands (Minister of Agriculture, Nature and Food Quality), Denmark (Minister of the Environment) and Germany (Federal Minister for the Environment, Nature Conservation and Nuclear Safety) have been working together on the protection and conservation of the Wadden Sea covering management, monitoring and research, as well as political matters. Thus they established the Trilateral Wadden Sea Cooperation that was built upon a Joint Declaration on the Protection of the Wadden Sea adopted in 1982. The challenge of the Trilateral Wadden Sea Cooperation (TWSC) is to implement ecosystem management of the Wadden Sea Area by applying and integrating relevant EU Directives, as set out in point 6 of the Schiermonnikoog Declaration (2005).

The TWSC web-site is structured in the following sections:

- “Trilateral Cooperation” provides information on the history of the cooperation, the reference area, the organizational structure, the structured of the CWSS and the international collaboration;
- “News/Service” provides link to the CWSS e-mail Newsletter, and other communication and training services;
- “Management” provides direct access to specific information regarding different topics. In particular this section allows the download of the Wadden Sea Plan 2010. Within this section is also possible to access information regarding the Wadden Sea World Heritage, the NATURA 2000 Wadden Sea zones, the Shipping and the Particularly Sensitive Sea Area (PSSA), Coastal Protection and Sea Level Rise (CPSL) and the Eutrophication Criteria.
- “Trilateral Monitoring and Assessment Program (TMAP),” provides all the information generated by this monitoring program. This in particular is related to twelve main topics; for each of them TMAP section provides static maps, documents and/or graphic (no spatial layers). The same section also includes all the information (documents) contained in the Quality Status Report published in December 2009.

TWSC site does not include on-line mapping viewers or tools.

The same web-site also includes a direct link to the Wadden Sea Forum (WSF; http://www.waddensea-forum.org/). This forum is an independent platform of stakeholders from Denmark, Germany and The Netherlands aiming to contribute to an advanced and sustainable development of the trilateral Wadden Sea Region. The WSF was established in 2002 and consists of representatives of the following main sectors: agriculture, energy,
<table>
<thead>
<tr>
<th></th>
<th></th>
<th>fisheries, industry and harbour, nature protection, tourism, as well as local and regional governments. National governments are represented as observers.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1c</td>
<td>Operating entity</td>
<td>Common Wadden Sea Secretariat (CWSS)</td>
</tr>
<tr>
<td>1d</td>
<td>Management structure</td>
<td>Common Wadden Sea Secretariat (CWSS)</td>
</tr>
<tr>
<td>1d</td>
<td>Contacts</td>
<td>Dr. Harald Marencic, e-mail: <a href="mailto:marencic@waddensea-secretariat.org">marencic@waddensea-secretariat.org</a> e-mail: <a href="mailto:info@waddensea-secretariat.org">info@waddensea-secretariat.org</a> Common Wadden Sea Secretariat Virchowstr. 1 D 26382 Wilhelmshaven Germany Web-site: <a href="http://www.waddensea-secretariat.org/index.html">http://www.waddensea-secretariat.org/index.html</a></td>
</tr>
<tr>
<td>1e</td>
<td>Typology</td>
<td>Operational</td>
</tr>
<tr>
<td>2</td>
<td>Operational context and information content</td>
<td></td>
</tr>
<tr>
<td>2a</td>
<td>ICZM dimensions</td>
<td>TWSC web-site mainly addresses three of the five considered information dimensions. The environment and the territory dimensions are in depth developed and made available in the TMAP section (in the forms of documents, maps and/or graphs). The web-site also provides other documental information through its various section. In this perspective it is important to highlight the planning documents (governance dimension) provide by the “Management” section, in particular including the Trilateral Wadden Sea Plan 2010.</td>
</tr>
<tr>
<td>2b</td>
<td>ICZM Sectors</td>
<td>TMAP section includes documents, static maps and/or graphics related the following twelve topics:  - Physical environment;  - Habitats and maps;  - Climate and sea level rise;  - Hazardous substances;  - Eutrophication;  - Alien species;  - Estuaries;  - Salt marshes;  - Tidal area;  - Dunes;  - Fish;  - Birds;  - Marine mammals.</td>
</tr>
<tr>
<td>2c</td>
<td>Integration</td>
<td>Some of the information contained in the web-site has been produced by integrating different data typologies. An example is the Map of the Particularly Sensitive Sea Area (PSSA); identifying areas needing special protection due to their ecological, socio-economic or scientific relevance and due to their vulnerability to maritime activities.</td>
</tr>
<tr>
<td>2d</td>
<td>Spatial scale</td>
<td>Transnational – Wadden Sea, including the relative Danish, German and Dutch components.</td>
</tr>
<tr>
<td>2e</td>
<td>Flexibility</td>
<td>TWSC web-site was specifically developed to deal with the international cooperation in the Wadden Sea integrated planning and management.</td>
</tr>
</tbody>
</table>

### 3 ICZM functionalities

#### 3a Knowledge related functionalities

Two knowledge related functionalities are provided by the TWSC web-site:
- Integration among different information sectors (see point 2c);
- Inclusion of a specific TMAP thematic section related to climate change impacts on the Wadden Sea (only documents are made available).

It is important to stress again that TWSC web-site does not provide any interactive mapping functionality and therefore spatial data.

#### 3b Process related functionalities

TWSC web-site provides some of the ICZM process related functionalities considered by the analysis; specifically:
- It supports problem understanding and structuring by providing structured and easy-to-use information on various territorial and environmental topics relevant for the Wadden Sea management;
- It includes a direct link to the Wadden Sea Forum (WSF – see: [http://www.waddensea-forum.org/](http://www.waddensea-forum.org/)), thus supporting stakeholder involvement and participation.
- It supports monitoring and evaluation of planning processes; information included in the TMAP section (result of the TMAP project) is used to assess the implementation of the measures set out in the Wadden Sea Plan 2010 (WSP-2010).
- It fully supports cooperation among the three Wadden Sea countries the joint management of this complex marine and coastal system. Indeed, the web-portal itself was designed and development within the cooperative framework.

### 4 Users

#### 4a User typology

Information is mainly provided in terms of documents including static maps and/or graphics. These can be directly used in the planning and management process. Main target users therefore are:
- Decision-makers;
- Coastal planners and/or managers;

The same information can be also very useful for communication purposes, thus involving the civil society user typology.

### 5 Use of the system

#### 5a Accessibility

Free access on-line to all the TWSC web-site contents and functionalities.
### 5b User-friendliness

Highly user-friendly. Logic structure in themes and sub-themes is particularly helpful. Searching and visualising tools support the use of the system. The system is available in English.

### 5c Interactiveness

TWSC web-site does not directly include e-participation tools. However, two initiatives are worth to be mentioned:
- The web-site includes a direct link to the Wadden Sea Forum (WSF – see: [http://www.waddensea-forum.org/](http://www.waddensea-forum.org/)). This forum is an independent platform of stakeholders from Denmark, Germany and The Netherlands aiming to contribute to an advanced and sustainable development of the trilateral Wadden Sea Region;
- The International Wadden Sea School (IWSS); an educational programme for school classes from the Wadden Sea countries, in particular aiming to transfer the trans-boundary approach to the management of the Wadden Sea to the young generations.

### 5d Data access

No alphanumeric and spatial data are directly provided by the web-site. Data and information are available only within documents. Data can be anyhow requested through a registration form.

### 6 Technological characteristics

#### 6a Used technology

TWSC-CIS is a web-site developed with "html" languages and standards.

#### 6b Integration with other tools

No specific integration with other tools.

#### 6c Integration with other CIS

No specific integration with other CIS.

#### 6d Interoperability

Not applicable.

### 7 Cost/resources

#### 7a Resources

Web-site consultation for the overview analysis of the Trilateral Wadden Sea Cooperation:
- [http://www.waddensea-secretariat.org](http://www.waddensea-secretariat.org); last visit on 11/04/2011 at 10.30;
**ScheldeMonitor web portal**

<table>
<thead>
<tr>
<th></th>
<th>General Information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1a</strong></td>
<td>Name</td>
</tr>
<tr>
<td><strong>1b</strong></td>
<td>Description</td>
</tr>
<tr>
<td></td>
<td>Information</td>
</tr>
<tr>
<td></td>
<td>Data portal</td>
</tr>
<tr>
<td></td>
<td>Indicators</td>
</tr>
</tbody>
</table>
In addiction the research can be refine by selecting a specific theme among the following available ones: shipping, safety, hydrodynamics, morphodynamics, physical characteristics and biochemistry, habitat diversity, ecology and diversity, fisheries, socio-economical system, administration and law, recreation and tourism.

The user can also start the research by selecting on of the available theme; in such case, the user can directly access:
- the list of the metadata and the data document related to the chosen theme;
- the data-portal and its web-GIS application with the list of all data (including spatial ones) related with to the chosen theme;
- the list of the indicators related to the chosen theme.

The development of the ScheldeMonitor web-portal was funded by the Executive Secretariat of Flemish-Dutch Scheldt Commission (in Dutch: Vlaams Nederlandse Schelde Commissie) (VNSC).

The Flemish and Dutch governments have drawn up a new working structure for their joint research and monitoring program, involving:
- The Flemish Ministry of Mobility and Public Works, Department of Mobility and Public Works, Maritime Access Division;
- The Dutch Ministry of Infrastructure and the Environment, Rijkswaterstaat, Centre for Water Management Water service.

The representative of the contractor is the Flanders Marine Institute (VLIZ).

Klaas Deneudt, e-mail: klaas.deneudt@vliz.be
Vlaams Instituut voor de Zee
VLIZ - InnovOcean site
Wandelaarkaai 7
8400 Oostende
Belgium
ScheldeMonitor Web-Portal:
http://www.scheldemonitor.org/home.php

The ScheldeMonitor Web-Portal mainly addresses all the five considered information dimensions. The environment and the territory dimension are in depth developed. The economic information in the system is provided with layers regarding tourism, recreation, fisheries, shipping and port development. The social dimension is addressed by the specific socio-economic

Operational context and information content

ICZM dimensions

Operational
2b ICZM Sectors

Information (of different typology) that can be accessed through the “data” options are structured in and related to the following themes and sub-themes:

- Shipping: navigation channel, harbour development, nautical management, inland shipping, ocean shipping, recreation, risk;
- Safety: history, flooding, risks, future;
- Hydrodynamics: water balance, water level and tide, waves, current;
- Morphodynamics: sand extraction, dredging and dumping, geomorphology, ecotopes and physiotopes;
- Physical characteristics and biochemistry: physical parameters, water quality, sediment quality, air quality, pollution, light climate;
- Habitat diversity: ecotopes and physiotopes, nature development, habitats and nature areas;
- Ecology and diversity: vegetation, plankton, benthos, fish, birds, mammals, amphibian, macrophytes, ecological functioning;
- Fisheries;
- Socio-economical system;
- Administration and law;
- Recreation and tourism.

The 17 indicators included in the system are (some of them can be related to various themes):

- Shipping (socio-economic importance of ports, nautical management, soil interfering activities and environmental effects of ports and shipping);
- Safety (safety against flooding and protection and development of natural areas);
- Hydrodynamics (morphology and dynamics in the estuary);
- Morphodynamics (oil interfering activities, morphology and dynamics in the estuary);
- Physical characteristic and biochemistry (surface water quality, environmental effects of ports and shipping, loads of pollutant substances);
- Habitat diversity (status of species and habitats, protection and development of natural areas and opportunities for nature);
- Ecology and Diversity (status of species and habitats, threats to biodiversity and opportunities for nature);
- Fisheries (Fisheries pressure);
- Socio-economical system (population pressure, socio-economic importance of residential tourism, fisheries, societal response and co-operation and use of the instrument 'indicators for the Scheldt estuary');
- Recreation and tourism (opportunities for recreation on water and land and socio-economic importance of residential tourism).
| 2c | Integration | The system provides various information data can be considered as results of an integrated analysis. There are for example various data and information (including maps) related risk, including flooding. Furthermore the system includes 17 indicators that in most of the cases are the results of an integrated evaluation of different data (see point 2b). |
| 2d | Spatial scale | Transnational scale – Schelde Estuary zone, including the Dutch and Belgium areas. |
| 2e | Flexibility | ScheldeMonitor web-portal was specifically developed to address the coastal and the estuary zone of the Schelde river between the Flanders and the Dutch Regions. |
| 3 | ICZM functionalities | |
| 3a | Knowledge related functionalities | ScheldeMonitor web-portal provides many of the knowledge related functionalities considered by the analysis, specifically: |
|   |   | - Integration among different information sectors (see point 2c); |
|   |   | - Full availability of data and information; the system allows the availability of a wide variety of information typology (parameters, data sources, map layers, figures, dataset and publications). Many information (including spatial) can be downloaded. |
|   |   | - Operation at the different spatial scale; some of the available spatial data can be re-scaled according to the considered spatial extent; thus enabling to visualize more details at a higher scales; |
|   |   | - Availability of multi-time data, for example in the case of spatial data, multi-time maps are provided for the geomorphologic features of the territory (7 different time step from the 1936 to 2004); |
|   |   | - Inclusion of ICZM indicators; the web-portal includes 17 indicators related to various themes which are particularly relevant in supporting ICZM steps. The indicator functionality is rather advanced. The specific indicator window makes available: key message related to the indicator, summary sheet, technical sheets on measures used to calculate the indicator, links to data suppliers, link to the data portal enabling to view the data correlated to the specific considered indicator. The indicator summary appears to be particularly useful to support policy and decision making. |
| 3b | Process related functionalities | Schelde Monitor Web-portal provides relevant illustrative and innovative examples of ICZM process related functionalities considered by the analysis, specifically: |
|   |   | - ScheldeMonitor provides a wide support to problem understanding and structuring. It contains a wide variety of information and a high number of data. All are structured according to theme and sub-themes, thus already providing a conceptual structure of the many data and information available. The portal enables users to search for data and information through intuitive and user friendly functionalities. |
|   |   | - Many of the information can properly support planning and
management phases of the ICZM process. This is particularly evident for the indicators, which represent a synthetic information very useful in supporting policy and decision making.

- Indicators can be particularly relevant in supporting progress towards defined targets, and specifically the Target 2030 of the Long Term Vision (LTV); thus they can properly support adaptive management. In this perspective it is interesting to highlight that the set also includes an indicator specifically dealing with the use of the indicators instruments by target users.

- Stakeholder involvement and participation; the ScheldeMonitor web portal includes the "e-room" tool. This is a virtual project-space that offers an online environment where minutes, reports, calendars can be kept and shared with others users within the Research and Monitoring of the Scheldt-estuary (O&M) project. A calendar is used to show a clear overview of planned meetings and workshops. Login and password are needed to gain access to the e-room. Furthermore, An email with new literature, datasets, projects and conferences, is transmitted bimonthly.

- ScheldeMonitor fully supports cooperation among authorities of two different member states in the joint management of the complex Scheldt Estuary system. Indeed, the web-portal itself was designed and development within the cooperative framework.

4 Users

4a User typology

The broad nature of the Schelde Monitor CIS is intended for anyone who may be interested in estuary and marine information in this zone. For this reason potential users are:

- Decision-makers;
- Coastal planners and/or managers;
- Specialised and expert users.
- Civil society.

The various information typologies included in the web-portal have different user targets. Indicators are for example very relevant for policy and decision making as well as for communication. Raw spatial and numeric data can support activities of experts, including researches. Maps may be more useful for coastal planners and managers.

5 Use of the system

5a Accessibility

Free access on-line to all the system described in this sheet. Some parts of the site are protected and can be accessed only with login and password. Accounts are granted to certain groups within the scope of specific projects (MONEOS, VNSC, ...).

5b User-friendliness

Highly user-friendly. The web-portal offers a wide variety of information and searching/visualising tools. Notwithstanding this complexity user-friendliness is particularly evident and use of the web-portal is very
<table>
<thead>
<tr>
<th>5c</th>
<th>Interactiveness</th>
<th>Intuitively, also thanks to an ergonomic optimisation of the tools. Logic structure in themes and sub-themes is particularly helpful. Many parts of the system are available in two languages: Dutch and English.</th>
</tr>
</thead>
</table>
| 5d     | Data access     | Interactivity with the system is particularly high. In particular the web-portal provides three main tools:  
- Feedback; Schelde Monitor includes a feedback tool to send suggestions in order to improve system's functionalities and contents;  
- E-service; used by the users to subscribe to a bimonthly e-mail newsletter on literature, datasets, projects and conferences related to the Schelde Estuary;  
- E-room; this is a virtual project-space that offers an online environment where minutes, reports, calendars can be kept and shared with others users.  
A great part of data (including spatial ones) and other information typologies can be downloaded. Documents and information on the 17 indicators are accessible and downloadable to all users. Metadata sheet are available for alphanumericic and spatial data. |
| 6      | Technological characteristics |  
| 6a     | Used technology | ScheldeMonitor web portal is a web-site developed with “php” languages and standards. |
| 6b     | Integration with other tools | ScheldeMonitor web-portal includes different tools mutually integrated, in particular: the information tool, the data portal and the indicator tool. |
| 6c     | Integration with other CIS | The system is alimented with data and information supplied by various data providers. |
| 6d     | Interoperability |  
| 7      | Cost/resources  |  
| 7a     | Resources       |  

Web-site consultation for the overview analysis of the ScheldeMonitor web portal:  
**General Information**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>Name</td>
</tr>
<tr>
<td>1b</td>
<td>Description</td>
</tr>
<tr>
<td>1c</td>
<td>Operating entity</td>
</tr>
<tr>
<td>1d</td>
<td>Management structure</td>
</tr>
<tr>
<td>1e</td>
<td>Contacts</td>
</tr>
<tr>
<td>1f</td>
<td>Typology</td>
</tr>
</tbody>
</table>

**Operational context and information content**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2a</td>
<td>ICZM dimensions</td>
</tr>
</tbody>
</table>
| 2b | ICZM Sectors | Main sectors covered by the Atlas are:  
- Physical geography, e.g.: depth on the Dutch Continental Shelf, geomorphology, sediment physical characteristics, seasonal current regimes, wind speed, tide, etc.;  
- Characteristics of biological systems;  
- National monitoring stations for sea water and sediment;  
- Chemical concentration of pollutants in sediment and in sea water; |
| 2c | Integration | The Atlas gives much relevance to aspects related to planning and management of the Dutch North Sea Atlas, also including results of integrated analysis. This is the case of the map of the spatial policy document PKB “key planning decision”. PKB defines the objective for the spatial policy of the Dutch North Sea: to enhance the economic significance of the North Sea, and to conserve and develop internationally important ecological and landscape values. Another example of integrated analysis is provided by the map showing elements relevant of the mining uses of the sea and related regulation. |
| 2d | Spatial scale | National Scale – Dutch North Sea
The Atlas focuses on the marine area and does not include information on the coastal territory. For some layers, information is available for a larger portion of the North Sea. |
| 2d | Flexibility | The system has been developed in order to be applied specifically to the zone of Dutch Sea. |

### 3 ICZM functionalities

| 3a | Knowledge related functionalities | Nord Sea Atlas provides some of the knowledge related functionalities considered by the analysis; specifically:
- Integration among different information sectors (see point 2c);
- Availability of spatial data; the Atlas enables direct connection of users thought ESRI Arc Explorer (free software) that allows the visualisation of selected layers on a client computer;
- Inside the Atlas there are different multi-time data and information, such as concentration of pollutants in the sea sediment. |
| 3b | Process related functionalities | The Atlas specifically focuses on the Dutch marine area; in a strict sense it does not provide specific support to ICZM. However, the Atlas is specifically developed to support the activity of the North Sea Interdepartmental Consultation Directorate (IDON) in the perspective of Maritime Spatial Planning (MSP) and Integrated Maritime Policy (IMP), with evident connection to the ICZM issues. In this perspective, the Atlas in particular provides support to assessment of alternatives in marine planning and management. |
### 4 Users

#### 4a User typology

The Atlas is specifically oriented to users dealing with marine planning and management, therefore including:
- Decision-makers, at the national level;
- Coastal planners and/or managers, at the national and regional level.

### 5 Use of the system

#### 5a Accessibility

The North Sea Atlas can be accessed in two different ways:
- Through Web.-GIS interfaces and functionalities;
- Direct connection of users thought ESRI Arc Explorer (free software) that allows the visualisation of selected layers on a client computer;

#### 5b User-friendliness

Medium user-friendly.
The Atlas is built around an interactive map very easy to browse, which allows anyone to visualize provided maps and layers. Description of information contained in each maps (group of layers) is not always totally explanatory. The system is available in English.

#### 5c Interactiveness

No specific e-participation tools are provided.

#### 5d Data access

The Atlas does not allow to download spatial data; however it enables direct connection of users thought ESRI Arc Explorer (free software) that allows the visualisation of selected layers on a client computer. Pre-defined static maps available in the Atlas and customised maps can be exported and print. Metadata are in general provided for the pre-defined maps (groups of layers) included in the Atlas. However, they are not available for the specific layers.

### 6 Technological characteristics

#### 6a Used technology

ESRI ArcSDE (licensed software).

#### 6b Integration with other tools

No specific integration with other tools.

#### 6c Integration with other CIS

The Nord Sea Atlas is included in the European Atlas of the Seas, [http://ec.europa.eu/maritimeaffairs/atlas/index_en.htm](http://ec.europa.eu/maritimeaffairs/atlas/index_en.htm), together with the other following CISs:
- MAGIC (United Kingdom);
- De Kust Atlas (Belgium);
- The Atlas of the Venice Lagoon (Italy);
- Coastal Atlas of Andalusia (SIGLA)
- Cross Channel Atlas.

#### 6d Interoperability

Medium
Data in the system are freely accessible by a client computer through ArcExplorer / ArcExplorerWeb applications and IMS-server.
connections. Direct download of spatial data from the Atlas is not available.
ISO 19115 compliant metadata are available in ESRI sheet format only for some layers. A metadata catalogue is not available, while some additional description is provided for every static map.

<table>
<thead>
<tr>
<th>7</th>
<th>Cost/Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>7a</td>
<td>Resources</td>
</tr>
</tbody>
</table>

Web-site consultation for the overview analysis of the North Sea Atlas:
- [http://www.noordzeeatlas.nl/en/index.html](http://www.noordzeeatlas.nl/en/index.html); last visit on 19/03/2011 at 12.00.
### General Information

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1a</strong></td>
<td>Name</td>
<td>WATLAS (Wadden Sea Atlas) and the Wadden Sea Portal</td>
</tr>
</tbody>
</table>

Watlas is a web-atlas collecting data of the Dutch Wadden-Sea region. Watlas includes interactive thematic maps on topics (e.g. tourism, fisheries, mining, landscape, etc.) relevant for the management of the Wadden Sea. By selecting one of the topic users visualise a pre-defined map including various pre-selected layers that can be further customised. One of the viewable layer enables to recall and visualise photos of the Wadden Sea environment.

Layers and maps included in the web-atlas are provided by various bodies dealing with the management of the Wadden Sea, and mainly by the Rijkswaterstaat - Directorate Northern Netherlands (part of the Dutch Ministry of Transport, Public Works and Water Management) and the related National Institute for Coastal and Marine Management (RIKZ).

Watlas has been developed within the InterWad project involving four Dutch ministries: LNV (agriculture, nature management and fisheries), V&W (transport, public works and water management), EZ (economic affairs) and VROM (housing, spatial planning and the environment). InterWad is a project that has developed and manages the Wadden Sea Portal ([http://www.waddenzee.nl/](http://www.waddenzee.nl/)) also including the Watlas web atlas. In general, the Wadden Sea Portal collects and disseminates news, facts, documents and information on knowledge, policy, management and use of the Dutch Wadden Sea. Besides Watlas, the Wadden Sea Portal provides other tools that can implement the above goals, specifically: the Wadden barometer, the encyclopaedia and the Geoportal.

Watlas is interfaced with the “Wadden barometer” web-tool ([http://www.waddenzee.nl/waddenbarometer.html](http://www.waddenzee.nl/waddenbarometer.html)). The Wadden barometer provides information related to different themes in terms of indicators, qualitative trends and description of processes. Addressed themes are: nature, water environment, climate, social economic, energy and minerals, tourism, safety and coastal protection. Each theme includes more specific sub-themes. For some of them the barometer provides a direct access to Watlas, thus enabling to visualise the layers associated to the selected sub-theme.

The encyclopaedia, accessible by the Wadden Sea Portal, provides basic information (documents) about the history, landscape, culture and human activities of the Wadden Sea area. There are different possibilities for searching a document:

- Through keyword search in the "Quick search" functionality made available by the encyclopaedia;
- Clicking the desired keyword in the "Aquabrowser" tool provided by the encyclopaedia;
- Using "Watlas" to perform a map-search; Watlas is therefore directly interfaced with the encyclopaedia tool;
The Geoportal application (accessible from the Wadden Sea Portal home-page) is used to share and make available spatial data and metadata related to the Wadden Sea. Search can be done through key words and/or a map viewer enabling to select an area of interest. For the selected information:
- Metadata are showed thought an extended and detailed metadata sheet;
- Data can be downloaded as spatial layers;
- Spatial data can be visualised through Interwad OGC services using a WMS connection.

Watlas was developed within the InterWad project involving four Dutch ministries: LNV (agriculture, nature management and fisheries), V&W (transport, public works and water management), EZ (economic affairs) and VROM (housing, spatial planning and the environment).

The web-atlas (and in general the web-site on the Wadden Sea) is still maintained by the InterWad team, whose office is based in Leeuwarden within the “House for the Wadden Sea”.

InterWad team, based in Leeuwarden.

Piet Feddema; e-mail: feddema@waddenzee.nl; info@waddenzee.nl
Kantoorlocatie InterWad, RCW en Waddenacademie:
Huis voor de Wadden
Ruiterskwartier 121 A
8911 BS Leeuwarden
Web-site: http://www.waddenzee.nl/
Watlas: http://mapserver521.waddenzee.nl

Watlas includes information related to three of the five considered ICZM dimensions: territory (e.g. protected areas, landscape), environment (e.g. bathymetry, topography, water quality) and economy (locations of offshore wind-farms, tourism, mining).

Watlas enable to quickly visualise the following thematic maps:
- Topography and bathymetry;
- Water quality monitoring stations;
- Hydrography;
- Landscape;
- Natural features;
- Protected areas;
- Human activities (e.g. fishery, transportation, wind-farm, tourism and recreational activities);
Each thematic map contains some pre-selected layers that however can be customised by the users. Each layer is described by a synthetic metadata sheet.

| 2c | Integration | No specific integration among information is directly provided |
| 2d | Spatial scale | Sub-National – Dutch area of the Wadden Sea. |
| 2e | Flexibility | Watlas has been developed in order to be applied to the specific area of the Wadden Sea. |

### 3 ICZM functionalities

| 3a Knowledge related functionalities | Various ICZM knowledge related functionalities are provided by the Wadden Sea Portal in general, including Watlas and the other previously described tools. Watlas supports the operation at different spatial scale. Available spatial data can be re-scaled according to the considered spatial extent, thus enabling to visualize more details with a higher scale. This is particularly evident for topography and bathymetry data. Watlas is interfaced with the “Wadden barometer” web-tool. The Wadden barometer provides information related to different themes in terms of indicators, qualitative trends and description of processes. Addressed themes are: nature, water environment, climate, social economic, energy and minerals, tourism, safety and coastal protection. Each theme includes more specific sub-themes. For some of them the barometer provides a direct access to Watlas, thus enabling to visualise the layers associated to the selected sub-theme. Even if the Wadden barometer does not specifically refer to the ICZM indicators, it appears to be a good tool providing synthetic information for communication and management objectives. The encyclopaedia tool can be also very useful to quickly search documents related to the knowledge and management of the Wadden Sea area. Spatial data can be downloaded through the Geoportal application that also provides detailed metadata description. |
| 3b Process related functionalities | Watlas does not include specific ICZM process related functionalities. However, it contains a wide and articulated set of maps and layers. Furthermore, the general Wadden Sea Portal provides other tools (Wadden barometer and encyclopaedia) that together with the Watlas information can properly support the ICZM process in its various phases. The Wadden Sea Portal managed by the InterWad project team provides an e-forum space to the users. The forum can be used to provide comments, opinions and suggestions regarding the future improvement of the web-site and the related tools. To join the forum, users must previously register. |
## Users

### 4a User typology
Watlas is mainly acting as maps and data viewer, integrated with the barometer and the encyclopaedia tool providing other synthetic data. Target users appear to mainly be policy and decision makers rather than coastal professionals and expert users. Civil society in general is also included as possible target user of the atlas. Coastal professionals and experts can be more interest in the use of the Geoportal tool that makes available spatial data and metadata.

## Use of the system

### 5a Accessibility
Free access on-line to all the Watlas contents and functionalities, as well as to all the other Wadden Sea Portal’s tools.

### 5b User-friendliness
Highly user-friendly. Watlas is built around an interactive map very easy to browse, which allows anyone to identify, visualize and query datasets relevant to their interest. Use of the Wadden barometer and the encyclopaedia is also very intuitive. Use of the Geoportal is more complex since this tool is mainly addressed to expert users. Watlas is a bi-lingual system, available in Dutch and English.

### 5c Interactiveness
The Wadden Sea Portal managed by the InterWad project team provides an e-forum space to the users. The forum can be used to provide comments, opinions and suggestions regarding the future improvement of the web-site and the related tools. To join the forum, users must previously register.

### 5d Data access
Static maps visualised through Watlas can be exported in different customized format such as png and gif. All layers included in the atlas are described through metadata. All spatial data can be downloaded through the Geoportal application that also provides a detailed description of metadata.

## Technological characteristics

### 6a Used technology
Watlas was developed using the UMN Mapserver Technologies (open source technology). The Geoportal is based on the Open Source application “GeoNetwork” and is strictly related to standards and requirements of the INSPIRE Directive.

### 6b Integration with other tools
Watlas is directly interfaced with the “Wadden barometer” web-tool ([http://www.waddenzee.nl/waddenbarometer.html](http://www.waddenzee.nl/waddenbarometer.html)). The Wadden barometer provides information related to different themes in terms of indicators, qualitative trends and description of processes. Addressed themes are: nature, water environment, climate, social economic, energy and minerals, tourism, safety and coastal protection. Each theme includes more specific sub-themes. For some of them the barometer provides a direct access to Watlas, thus enabling to visualise the layers associated to the
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>6c</td>
<td>Integration with other CIS</td>
</tr>
<tr>
<td></td>
<td>No specific integration with other CIS</td>
</tr>
<tr>
<td>6d</td>
<td>Interoperability</td>
</tr>
<tr>
<td></td>
<td>High. The use of standard protocols for data management (according to INSPIRE Directive) guarantees a high interoperability of the system. Metadata are managed through a specific application (Geoportal) in compliance with INSPIRE protocols and requirements. All spatial data are freely available and can be downloaded through the same application.</td>
</tr>
</tbody>
</table>

### 7 Cost/resources

<table>
<thead>
<tr>
<th>7a</th>
<th>Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>In the 2002, the initial development cost of the Wadden Sea Portal was 35.000 €. Management costs for the whole CIS (Wadden Sea Portal) is 375.000 € per year (including resources for 3.3 full time equivalent per year – fte/year). Management costs for Watlas (web atlas) include in the Wadden Sea Portal is: resources for 0.2 fte/year and 10.000 €/y of external technical costs.</td>
<td></td>
</tr>
</tbody>
</table>

Information sources for the overview analysis of Watlas:
- Piet Feddema, 2011. Information provided by mail on the 02.05.2011 at 09.33, CET time.

Web-site consultation the overview analysis of Watlas:
- [http://mapserver521.waddenzee.nl](http://mapserver521.waddenzee.nl); last visit on 18/03/2011 at 12.00.
- [http://www.waddenzee.nl](http://www.waddenzee.nl); last visit on 18/03/2011 at 12.00.
# KustAtlas - Belgian Coastal Atlas

<table>
<thead>
<tr>
<th></th>
<th><strong>General Information</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td><strong>Name</strong></td>
</tr>
<tr>
<td>1b</td>
<td><strong>Description</strong></td>
</tr>
<tr>
<td>1c</td>
<td><strong>Operating entity</strong></td>
</tr>
<tr>
<td>1d</td>
<td><strong>Management structure</strong></td>
</tr>
<tr>
<td>1d</td>
<td><strong>Contacts</strong></td>
</tr>
<tr>
<td></td>
<td>Typology</td>
</tr>
<tr>
<td>---</td>
<td>----------------</td>
</tr>
<tr>
<td>2</td>
<td><strong>Operational context and information content</strong></td>
</tr>
<tr>
<td>2a</td>
<td>ICZM dimensions</td>
</tr>
<tr>
<td>2b</td>
<td>ICZM Sectors</td>
</tr>
<tr>
<td>2c</td>
<td>Integration</td>
</tr>
<tr>
<td>2d</td>
<td>Spatial scale</td>
</tr>
<tr>
<td>2e</td>
<td>Flexibility</td>
</tr>
</tbody>
</table>
### 3 ICZM functionalities

<table>
<thead>
<tr>
<th>3a</th>
<th>Knowledge related functionalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Several knowledge related functionalities, supporting ICZM process are available in the KustAtlas:</td>
<td></td>
</tr>
<tr>
<td>- Integration among different information sectors (see point 2c);</td>
<td></td>
</tr>
<tr>
<td>- Availability of some spatial information; shape file are available only for a limited number of layers;</td>
<td></td>
</tr>
<tr>
<td>- Multi-time data information, provided by every sustainability indicator and by several chapters of the Atlas (e.g. physical environment, fishery and agriculture, coastal defence);</td>
<td></td>
</tr>
<tr>
<td>- Inclusion of all 27 ICZM indicators identified by the Deduce project; the indicators were developed, by the SAIL project (Schéma d’Aménagement Intégré du Littoral), a partnership of regional and local authorities, maritime organisations, and coastal and marine agencies, working together for the sustainable development of the Southern North Sea tidal area (<a href="http://www.vliz.be/projects/SAIL/db.php">http://www.vliz.be/projects/SAIL/db.php</a>);</td>
<td></td>
</tr>
<tr>
<td>- Inclusion of 21 sustainability indicators, through a link to the so called sustainability barometer (<a href="http://www.vliz.be/projects/indicatoren/">http://www.vliz.be/projects/indicatoren/</a>, Dutch only). It allows to gain an overview of the current state and the trend of several sustainability indicators of the coast, identifying also possible signals for coastal policy adjustment or harmonisation. A trend is given for each indicator stating whether the latter is positive, negative or neutral. The data are presented as graphs and tables but not with geographically explicit spatial referencing.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3b</th>
<th>Process related functionalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>The articulated structure of Kustatlas, organised in different thematic chapters and providing a high variety of data, extended text, graphs and factsheets can support problem understanding and structuring for the Belgian coast area.</td>
<td></td>
</tr>
<tr>
<td>Definition of trend for each sustainability indicator further helps problem understanding, assessing whether the coast is moving towards or away from sustainability, supporting coastal managers and decision-makers.</td>
<td></td>
</tr>
<tr>
<td>Including to wide set of indicators (ICZM and sustainability ones) and relative temporal trends, the KustAtlas can support the definition of possible scenarios for the future evolution of the coastal area.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4</th>
<th>Users</th>
</tr>
</thead>
<tbody>
<tr>
<td>4a</td>
<td>User typology</td>
</tr>
<tr>
<td>The target KustAtlas audience includes:</td>
<td></td>
</tr>
<tr>
<td>- general public, for the wide and easily understandable information content;</td>
<td></td>
</tr>
<tr>
<td>- coastal planners and managers, especially for the information about plans and policies;</td>
<td></td>
</tr>
<tr>
<td>- policy makers and decision makers, especially for the ICZM and sustainability indicators.</td>
<td></td>
</tr>
<tr>
<td>Scientific users (e.g. universities, research institutes), administrations and supporting services and schools, also demonstrated their interest in the Atlas, through the frequent</td>
<td></td>
</tr>
</tbody>
</table>
requests for additional information and maps. In particular the integrated map on the multi-functional use of the sea has been requested many times by different user typologies, also including administrations and research institutions (Belpaeme and Maelfait, 2011).

5 Use of the system

| 5a Accessibility | Free access on-line to all the Atlas. All data contained in the atlas are freely available; data are mostly provided by public authorities and their administrators. No licensing or data release issues apply. Illustrations, pictures, maps and texts of this atlas can be used subject to prior written permission of the copyright owners and an express mention of the source. |
| 5b User-friendliness | Highly user friendly. The user interface is very simple and it presents an intuitive use. The multi-language (French, Dutch, German and English) functionality helps users from different countries. |
| 5c Interactiveness | No specific e-participation tools are provided by the KustAtlas. Feedback process, by means of questionnaires for user satisfaction, was created. The ICZM Coordination Centre is working to move from a static version of the web atlas to an interactive data-driven atlas. The final product will be a policy supporting tool supporting the ICZM process for a wide range of users. |
| 5d Data access | All maps are downloadable in "*.pdf" format. Some data are downloadable also in excel format. Availability of downloadable spatial data is provided only for some cases. The Atlas does not include specific metadata information structured according to a shared standard. However, metadata descriptive sheets are available for the maps and indicators contained in the Atlas. |

6 Technological characteristics

| 6a Used technology | The system uses the Apache web-server and the MSSQL relational database. The web-site is set up in php/html and flash applications and action-scripts were used for the interactive maps. |
| 6b Integration with other tools | The system is linked to the sustainability indicator database developed by the same Coordination Centre for ICZM. ICZM indicators are directly incorporated in the KustAtlas; however these were developed by the SAIL project for a wider area, i.e. Southern North Sea (Essex –UK; Kent – UK, Nord-Pas De Calais - France, West Flanders - Belgium and Zeeland -the Netherlands). Direct integration is therefore set between the KustAtlas and the ICZM indicator web-site (SAIL project web-site). |
| 6c Integration with other | The KustAtlas will be further developed within the C-Scope |
| CIS | project that also foresees the further improvement of the Dorset Explorer and in particular the development of the Dorset Coastal Explorer. However KustAtlas and Dorset Coastal Explorer are different tools, with different aims and different target users: the first one is mainly a communication tool designed as a portal site to wider audience; the second one is mainly a planning tool, designed for stakeholders and planners. KustAtlas is a member of the International Coastal Atlas Network (ICAN). |
| 6d | Interoperability | Low (not properly applicable). At the moment the Atlas is a collection of static maps with limited possibilities to analyze, compare and integrate the different information contents. Future implementation of the Atlas includes the development of a functionality enabling to import GIS format maps within the Google Earth software. |
| 7 | Cost/Resources | Cost for the development of the printed atlas: €46,381. Cost for the development of the on-line atlas: Development on-line version: €25,073, Development/translation German and French version: € 5,855. The cost of updating the atlas is not known. The book and the online version of the Belgian Coastal Atlas were financed by the project partners of the Coordination Centre: the province of West-Flanders and the two main Flemish coastal administrations, and by European structural funds within the objective 2 program for the Belgian coast. |
Information sources for the overview analysis of KustAtlas:


Web-site consultation for the overview analysis of KustAtlas:

- http://ec.europa.eu/ourcoast/index.cfm?menuID=9&articleID=168; last visit on 22/03/2010 at 11.00.

- www.kustbeheer.be; last visit on 24/02/2011 at 12.00.

## General Information

### 1a Name
MAREANO (Marine Area Database for Norwegian coastal and marine regions)

### 1b Description
MAREANO is a Web-portal collecting and distributing data provided by various institutions and organisations. MAREANO includes a relevant Web-GIS component used to share maps on depth and topography, sediment composition as well as seabed biodiversity, habitats, biotopes and pollution of Norwegian marine coastal and offshore regions.

The main aim of MAREANO is to provide a tool giving direct access to reliable knowledge to industry, authorities, researchers and the general public. For examples, MAREANO may provide data and information related to the questions such as:
- How is the seascape of the Norwegian continental shelf?
- What does the seabed consist of?
- How is the biodiversity distributed on the seabed?
- How are habitats and biotopes distributed on the seabed?
- What is the relationship between the physical environment, biodiversity and biological resources?
- How are contaminants stored in sediments?

In this way MAREANO aims to contribute a better knowledge base for managing human activities in the Norwegian coastal and offshore area, such as fishing, oil and gas exploitation.

### 1c Operating entity
MAREANO is coordinated by the Institute of Marine Research, in collaboration with the Geological Survey of Norway and the Norwegian Hydrographic Service. The three programme partners are members of the Executive Group that acts as the MAREANO’s operational management team. Many other institutions and organisations are involved in the programme supporting the MAREANO tool.

### 1d Management structure
The MAREANO Executive Group made by the Institute of Marine Research, the Geological Survey of Norway and the Norwegian Hydrographic Service.

### 1e Contacts
- Ole Arve Misund, e-mail: ole.arve.misund@imr.no
- Kjell Bakkeplass, kjellb@imr.no
- GIS - Institute of Marine Research (IMR)
- General contact: mareano@imr.no

### 1f Typology
Operational

## Operational context and information content
### ICZM dimensions

Environmental information on sea and coastal region are in depth developed. Some economic information is included in the system in relation to industrial activities. No specific social and governance data are provided.

### ICZM Sectors

Main spatial information included in MAREANO are related to:
- Hydrodynamic characteristics;
- Protected areas, such as example protected coral areas;
- Landscapes and land forms;
- Marine habitats, including distribution of benthic fauna, communities, biological diversity and production;
- Detailed bathymetry;
- Sediments physical characteristics;
- Pollution in the sediment;
- Industrial activities, such as maps of pipelines, offshore platforms, aquaculture sites.

MAREANO data refers specific to the marine environment and do not include information on the coastal area.

### Integration

No specific integration among information is directly provided.

### Spatial scale

National – Norwegian marine coastal and off-shore area

### Flexibility

MAREANO is specifically developed for the Norwegian marine area

### ICZM functionalities

#### Knowledge related functionalities

MAREANO is a marine oriented tool that however is also useful in supporting ICZM and related MSP aspects. MAREANO data can support integrated assessment of environmental and economic related information, in particular in relation to the sustainable management of the Norwegian marine resources.

Other knowledge related functionalities include operation at the different spatial scale; some of the available spatial data can be re-scaled according to the considered spatial extent; thus enabling to visualize more details at higher scales.

#### Process related functionalities

Strictly speaking, MAREANO does not provide specific ICZM process related functionalities.

However, the same MAREANO web-site stresses the relevance of the tool in supporting sustainable planning and management. “MAREANO will fill knowledge gaps related to seabed conditions and biodiversity defined in The Integrated Management Plan for the Marine Environment of the Barents Sea and the Sea Areas off the Lofoten Islands presented by the Government in 2006. The Plan is due to be revised in 2010, and MAREANO will contribute to a better knowledge base for managing human activities such as fishing and oil and gas exploitation. Priority mapping areas for this phase are located along the shelf break and on the continental shelf in the western part of the mapping area. In the Management Plan, these areas are regarded as being especially ecologically important and vulnerable”. 

### Users
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>4a</strong></td>
<td><strong>User typology</strong></td>
<td>The main aim of MAREANO is to give users from the authorities, research, Industry and the general public direct access to reliable scientifically-based knowledge.</td>
</tr>
<tr>
<td><strong>5</strong></td>
<td><strong>Use of the system</strong></td>
<td></td>
</tr>
<tr>
<td><strong>5a</strong></td>
<td><strong>Accessibility</strong></td>
<td>Free access on-line to all information. Spatial data can be only visualized and not directly downloaded.</td>
</tr>
<tr>
<td><strong>5b</strong></td>
<td><strong>User-friendliness</strong></td>
<td>Highly user-friendly MAREANO is provided with customised interfaces that enables easy browsing and access to data. MAREANO is available both in Norwegian and English.</td>
</tr>
<tr>
<td><strong>5c</strong></td>
<td><strong>Interactiveness</strong></td>
<td>No specific e-participation tools are provided.</td>
</tr>
<tr>
<td><strong>5d</strong></td>
<td><strong>Data access</strong></td>
<td>A detailed metadata sheet - also identifying the relative data provider – can be visualised for all the layers contained in the MAREANO system. The MAREANO’s users of public sector users will be able to view or download data through Norway Digital, the national geo-referenced data infrastructure. Other users will be able to access data through the agencies responsible for the individual data sets, for example obtain sea depth data from the Norwegian Hydrographical Service, geological data from the Geological Survey of Norway and data on biology from the Institute of Marine Research.</td>
</tr>
<tr>
<td><strong>6</strong></td>
<td><strong>Technological characteristics</strong></td>
<td></td>
</tr>
<tr>
<td><strong>6a</strong></td>
<td><strong>Used technology</strong></td>
<td></td>
</tr>
<tr>
<td><strong>6b</strong></td>
<td><strong>Integration with other tools</strong></td>
<td>No specific integration with other tools</td>
</tr>
<tr>
<td><strong>6c</strong></td>
<td><strong>Integration with other CIS</strong></td>
<td>MAREANO is a Web-portal collecting and distributing data provided by various institutions and organisations. In particular the Web-GIS is linked via WMS to databases of the following governmental agencies (all participating to the MAREANO programme): - NGU: Geological Survey of Norway - IMR: Institute of Marine Research - NHS: Norwegian Hydrographic Service - DIRNAT: Norwegian directorate for mature Management - IBCAO: International Bathymetric Chart of the Arctic Ocean</td>
</tr>
<tr>
<td><strong>6d</strong></td>
<td><strong>Interoperability</strong></td>
<td>Most of the dataset included in the MAREANO system are available via WMS, ensuring high interoperability in data sharing.</td>
</tr>
<tr>
<td><strong>7</strong></td>
<td><strong>Cost/Resources</strong></td>
<td></td>
</tr>
<tr>
<td><strong>7a</strong></td>
<td><strong>Resources</strong></td>
<td>No specific information is available on resources needed to implement and manage the Web tool.</td>
</tr>
</tbody>
</table>
Information sources for the overview analysis of MAREANO:


Web-site consultation for the overview analysis of MAREANO:

- [http://www.statkart.no](http://www.statkart.no) last visit on 09/02/2011 at 15.15.
- [http://www.ngu.no](http://www.ngu.no) last visit on 09/02/2011 at 15.30.
- [http://www.sjokart.no/eng/Norwegian_Mapping_Authority/](http://www.sjokart.no/eng/Norwegian_Mapping_Authority/) (the Norwegian Mapping Authority) last visit on 02/09/2011 at 16.30.
CAMRA - UK Coastal and Marine Resource Atlas

<table>
<thead>
<tr>
<th></th>
<th>General Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>Name</td>
</tr>
<tr>
<td>1b</td>
<td>Description</td>
</tr>
<tr>
<td>1c</td>
<td>Operating entity</td>
</tr>
<tr>
<td>1d</td>
<td>Management structure</td>
</tr>
<tr>
<td>1d</td>
<td>Contacts</td>
</tr>
<tr>
<td>1e</td>
<td>Typology</td>
</tr>
</tbody>
</table>
## Operational context and information content

### 2a ICZM dimensions

The Coastal and Marine Resource Atlas focus include information related to three of the five considered ICZM dimensions: territory (e.g. 3 and 12 miles nautical limit, oil and gas infrastructure), environment (e.g. bathymetry, coastal habitats, sand dunes, salt marsh, locations of cetaceans and seals, seabirds nesting counts, bathing waters) and economy (locations of offshore windfarms, aquaculture sites, nuclear power station).

### 2b ICZM Sectors

Main sectors included in the Atlas are:
- Physical environment;
- Coastal habitats;
- Biology;
- Management;
- Conservation;
- Environmental Monitoring;
- Infrastructure in the sea;
- Natural resources;
- Fisheries, aquaculture and agriculture;
- Sensitivity to oil spills

### 2c Integration

CAMRA is specifically developed to support oil spill management that requires integration of different information typologies. In particular the Atlas includes maps identifying vulnerable areas to oil spills for sea bird populations and fish habitats.

### 2d Spatial scale

National – coastal area of Great Britain

The system can operate at different spatial scales, from the National to the Sub-national one.

### 2e Flexibility

The system has been developed in order to be applied specifically to the coastal zone of United Kingdom (presently it does not include Northern Ireland).

## ICZM functionalities

### 3a Knowledge related functionalities

CAMRA provides some of the knowledge related functionalities considered by the analysis; specifically:
- Examples of integration among different information sectors (see point 2c);
- Operation at the different spatial scale; some of the available spatial data can be re-scaled according to the considered spatial extent; thus enabling to visualize more details at a higher scales. This is for example the case of data on intertidal substrate characteristics;
- Multi-time data for a limited number of informative layers; this is specifically the case of maps of oil spill vulnerability for birds and fish.

### 3b Process related functionalities

The Atlas is not specifically related to an ICZM process. However it is strictly related to an operational use in coastal planning and management, in particular concerning oil spill vulnerability and
In this perspective, it is important to stress that the Atlas is directly used and managed by and operative organisation, i.e. the Maritime and Coastguard Agency.

### Users

#### 4a User typology

The digital atlas is primarily a tool aimed at supporting government agencies involved in environmental planning and in particular in oil spill contingency planning and response. The Atlas contains a wide and complete set of information on the coastal area; therefore as a secondary function it can be of use to experts working in the area of coastal and marine environmental management in the private, public and voluntary sectors.

### Use of the system

#### 5a Accessibility

Free access on-line to the entire Atlas (only visualisation).

#### 5b User-friendliness

Medium. The selection and visualisation of the data is not direct, but requires different steps (at least two). The system is available in English.

#### 5c Interactiveness

No specific e-participation tools are provided.

#### 5d Data access

Direct download is possible only for some layers, while others may be requested to the related data providers. Furthermore, static maps visualised through the web-GIS can be exported in pdf format. Complete metadata and link to the data provider’s website are available for each layer. The metadata comply the ISO 19115 standards.

### Technological characteristics

#### 6a Used technology

The data storage is in local system with a SQL Server and the interface is made with ESRI ArcSDE (licensed software).

#### 6b Integration with other tools

No specific integration with other tools.

#### 6c Integration with other CIS

The Coastal and Marine Resource Atlas is part of the Multi-Agency Geographic Information for the Countryside (MAGIC), that provide data related to the whole UK territory (not only coastal zones).

MAGIC - and the integrated CAMRA – is included in the European Atlas of the Seas. [http://ec.europa.eu/maritimeaffairs/atlas/index_en.htm](http://ec.europa.eu/maritimeaffairs/atlas/index_en.htm), together with the other following CISs:

- MAGIC (United Kingdom);
- De Kust Atlas (Belgium);
- De NoordZee Atlas (Netherlands);
- The Atlas of the Venice Lagoon (Italy);
### Interoperability

**High.**

MAGIC is part of a distributed network of geographic information systems called SPIRE - Shared Spatial Information Services. SPIRE is a Defra initiative aiming to improve the quality and accessibility of geographic information not only within Defra but also across its executive agencies and non-departmental public bodies.

SPIRE programme has implemented a central store for geographic information to facilitate data sharing within the Defra network of organisations. This allows data to be managed once for multiple uses. SPIRE programme has put in place various mechanisms to provide access to this data including a portal and web map service for Defra network desktop GIS users.

---

### Resources

The Atlas is the product of a project managed and collaboratively funded by: the Maritime and Coast Guard Agency (MCA), DEFRA (Department for Environment, Food and Rural Affairs), the Scottish Executive (SE), Scottish Natural Heritage (SNH), the Energy Institute (EI), JNCC, the Environment Agency (EA), English Nature (EN; now Natural England), the Department of Trade and Industry (DTI), the Hampshire County Council (HCC), Essex County Council (ECC), Kent County Council (KCC) and the British Geological Survey (BGS).

No specific information is available on cost and resources. Interactive maps included in the whole MAGIS are monthly updated. The web site reports the detailed description of any provided modification and update; as a very rough estimation about 20 MAGIC layers are monthly updated.

---

**Information sources for the overview analysis of CAMRA:**


**Web-site consultation for the overview analysis of CAMRA:**

- [http://magic.defra.gov.uk/projectsummary.htm](http://magic.defra.gov.uk/projectsummary.htm); last visit on 03/03/2011 at 12.00.
# MIDA - The Marine Irish Digital Atlas

<table>
<thead>
<tr>
<th></th>
<th>General Information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong></td>
<td><strong>1a</strong> Name</td>
</tr>
</tbody>
</table>
|   | **1b** Description | The Marine Irish Digital Atlas (MIDA) is a web tool built in a web-GIS environment, where people interested in coastal and marine information for Ireland can visualize and identify pertinent geospatial datasets and determine where to acquire them. The atlas, which is being constantly updated, currently displays more than 140 layers from over 35 coastal and marine organizations both within Ireland and abroad. It also features an “InfoPort” which is a repository of text, imagery, links to spatial data sources and additional reference material for a wide range of coastal and marine topics.

Specific objectives of the MIDA Atlas are to:
- Develop a web site for presentation of geo-referenced marine datasets of environmental importance;
- Provide greater accessibility to data and information in the form of a web enabled, customised GIS;
- Provide flexibility of use by providing a range of tools that allow users to select, overlay and compare geospatial layers;
- Enable users to identify sources of data, information and expertise on the marine environment;
- Encourage a greater appreciation of Ireland’s coastal regions by incorporating educational and informational materials based on multi-media technology.

The MIDA team has been active in the creation of the International Coastal Atlas Network (ICAN). |
|   | **1c** Operating entity | MIDA has been developed by the Coastal and Marine Research Centre (CMRC) of University College Cork, in partnership with the Centre for Coastal and Marine Research, University of Ulster, Coleraine, Northern Ireland.

Funders of the Atlas are:
- Ireland’s Higher Education Authority under the National Development Plan PRTLI III Programme (development funds);
- Environment and Heritage Service, Northern Ireland (Northern Ireland data and partnership);
- Coastal and Marine Research Centre, University College Cork. |
|   | **1d** Management structure | Coastal and Marine Research Centre, University College Cork |
|   | **1d** Contacts | Ned Dwyer, e-mail: n.dwyer@ucc.ie or mida@ucc.ie
Coastal and Marine Research Centre
University College Cork
Naval Base, Haulbowline
Cobh, County Cork, Ireland |
| 2a | ICZM dimensions | The Atlas mainly addresses four of the five considered information dimensions. The environment and the territory dimension are in depth developed. The economic information in the system is provided with a great variety of layers regarding tourism, recreation, fisheries, aquaculture, agriculture and coastal and marine industry. Governance information integrated in the system mainly refers to rural areas targeted for investment, current exploration authorizations and license blocks given by the Petroleum Affairs Division. |
| 2b | ICZM Sectors | Data/cartographic information included in MIDA are about the following topics: - Physical environment; - Coastal habitats; - Biology; - Management; - Human impact; - Conservation; - Environmental monitoring; - Infrastructure; - Industry; - Culture and heritage; - Natural resources; - Fisheries, aquaculture agriculture; - Tourism and recreation. |
| 2c | Integration | No specific integrated data among different information is directly provided within the system. However the system enables to quickly display thematic maps for pre-defined and selectable sub-regions, through a “Zoom to” tool, accessible from the homepage. These maps are good examples of integrated maps, showing in the same view all the layers available in MIDA related to the selected specific theme (e.g. tourism and recreation, fishing, climatology, etc.). |
| 2d | Spatial scale | National – Irish coasts. |
| 2e | Flexibility | The MIDA, together with the Oregon Coastal Atlas, served as a catalyst in the establishment of the International Coastal Atlas Network (ICAN). The partners involved in the development of the respective atlases organized and co-chaired the initial and subsequent ICAN workshops. The current operational version of the MIDA was launched at the first ICAN workshop held in Cork in July 2006 (O’Dea et al., 2007). MIDA was chosen as one of the atlases for the Semantic Interoperability Demonstrator. On-going enhancement |
and improvement of the Demonstrator keep MIDA at the forefront of technical development within ICAN. For example for the Tunisian Atlas it is suggested to use the “MIDA Engine” model.

### 3 ICZM functionalities

#### 3a Knowledge related functionalities

MIDA provides some of the knowledge related functionalities considered by the analysis; specifically:
- Integrated maps (see 2c);
- Inclusion of some ICZM indicators (coastal erosion, indication of areas of land and seas protected by statutory designations, sea level rise, pressure for marine and coastal recreations, quality of bathing waters);
- Availability of spatial data; some (about 85) of the 140 layers are downloadable in shape-files format. Others cannot be directly downloaded due to confidentiality reasons defined by owners generating the data;
- Inclusion of data on sea level rise and erosion trends in different coastal areas of Ireland, potentially useful for coastal vulnerability assessment to climate change impacts.

#### 3b Process related functionalities

MIDA’s structure is well articulated and complete, thus enabling users to easily find data and information and relate the same to specific issues. Thus MIDA is well-shaped for problem understanding and structuring, as well as coastal management and planning at the national level. Indeed, the user statistics that the atlas is constantly visited attesting to its relevance and usefulness (Dwyer et al., 2011).

Concerning stakeholder involvement and participation, MIDA is totally accessible on-line and moreover stimulates users to share their own data through the MIDA tool.

### 4 Users

#### 4a User typology

The broad nature of the atlas is intended for anyone who may be interested in Irish coastal and marine information. For this reason potential users are:
- Policy-makers;
- Decision-makers;
- Coastal planners and/or managers;
- Specialised and expert users.
- Representative of private sectors (e.g. industrial or energy companies);
- Civil society;
- Students.

### 5 Use of the system

#### 5a Accessibility

Free access on-line to all the MIDA Atlas contents and functionalities.

#### 5b User-friendliness

Highly user-friendly. The MIDA Atlas is built around an interactive map very easy to browse, which allows anyone to identify, visualize and query
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>5c</strong></td>
<td><strong>Interactivity</strong></td>
<td>those datasets relevant to their interest. Data search is also clearly supported by the articulated structure used to organise the same. The Info-Port services provide a tree-structure to quickly browse the available information. The system is available in English.</td>
</tr>
<tr>
<td><strong>5d</strong></td>
<td><strong>Data access</strong></td>
<td>MIDA enables, and actually invites, users to provide their own spatial data and make use of MIDA functionalities to share this information. Quality check is done before the data publication. Implementation of Web Map Service (WMS) and potentially Web Feature Service (WFS) / Web Coverage Service (WCS) to directly share information will be investigated in the possible further development of the MIDA Atlas; thus improving interactive functionalities of MIDA. The MIDA web-site highlights the importance of establishing a continuous confrontation with users and data providers, aiming to acquire input for both the development and management phase. In particular, efforts to receive input from a broad range of stakeholders have included meetings with key coastal and marine data holders and users (representative of the various user groups listed in point 4a). The direction of atlas development and data acquisition is influenced by feedback received at these meetings in order to develop a resource that is useful and interesting to everyone.</td>
</tr>
</tbody>
</table>
| **6** | **Technological characteristics** | Direct access to:  
- More than 50% (85 on 140) spatial layers, that are directly downloadable; others cannot be directly downloaded due to confidentiality reasons defined by owners generating the data;  
- Metadata for all MIDA layers. |
| **6a** | **Used technology** | The system uses Apache Web Server, UMN Map Sever, and PostgreS Database. Metadata is stored in database in order to optimize data management, permit efficient searching, and facilitate catalogue sharing. The Atlas is developed with Map Server technology (free and open source software). |
| **6b** | **Integration with other tools** | MIDA is not integrated with tools providing specific functionalities managed/operated by entities other than the Coastal and Marine Resources Centre of the Cork University. |
| **6c** | **Integration with other CIS** | MIDA atlas is a member of the International Coastal Atlas Network (ICAN). Moreover, It is a node of the Irish Spatial Data Exchange (ISDE, http://www.isde.ie) and shares metadata across its distributed network. MIDA is included in the European Atlas of the Seas (http://ec.europa.eu/maritimeaffairs/atlas/index_en.htm), together with the other following CISs:  
- MAGIC (United Kingdom);  
- De KustAtlas (Belgium); |
### 6d Interoperability

High.

In 2002 the Irish government began developing the Irish Spatial Data Infrastructure (ISDI; McCormack 2004). The development of the ISDI is closely involved with the larger INSPIRE initiative for developing a European Spatial Data Infrastructure. ISO 19115 is the core of the metadata standard of the ISDI and INSPIRE; therefore the approaches taken in this project are in line with these future infrastructures (McCormack 2003).

The ISO 19115 standard was chosen as the MIDA’s metadata standard because many key organisations handling spatial data in Ireland (e.g., Marine Institute, Environmental Protection Agency with the Water Framework Directive, The Department of the Environment with the ISDI) have adopted or are in the process to adopt it.

### 7 Cost/resources

| 7a Resources | This MIDA development project began in September 2002 and then it was funded for 3 years by the Higher Education Authority (HEA) under the National Development Plan’s PRTLI 3 programme. Additional funding is being received from the Environment and Heritage Service, Northern Ireland.

The management of MIDA currently involves one full time staff and four part time resources.

Ned Dwyer is the MIDA manager. Kathrin Kopke is the data manager; she is the coordinator of the acquisition and preparation of new layers as well as updating the atlas. The others provide technical support, contributing to the database design and programming and creating, editing and preparing various GIS layers as well as completing metadata records. |
Information sources for the overview analysis of MIDA:


Web-site consultation for the overview analysis of MIDA:

- [http://mida.ucc.ie/pages/atlas/atlas.php](http://mida.ucc.ie/pages/atlas/atlas.php); last visit on 08/02/2011 at 10.30
# Channel Coast Observatory Coastal Information System

<table>
<thead>
<tr>
<th>1</th>
<th>General Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>Name</td>
</tr>
<tr>
<td>1b</td>
<td>Description</td>
</tr>
<tr>
<td>1c</td>
<td>Operating entity</td>
</tr>
<tr>
<td>1d</td>
<td>Management structure</td>
</tr>
<tr>
<td>1e</td>
<td>Contacts</td>
</tr>
<tr>
<td>1f</td>
<td>Typology</td>
</tr>
</tbody>
</table>

## 2 Operational context and information content

<p>| 2a | ICZM dimensions | The CIS contains very detailed data related to territory and partly environment. No data are provided for economic, social and governance dimensions. |
| 2b | ICZM Sectors | Main spatial data included in the Channel Coast Observatory CIS are: - Remotely sensed data - Aerial photography - Colour Infrared aerial photography - Topographic and bathymetry data - LIDAR data - Hydrographic data - Sediment distribution data - Cliff line - Waves data - Waves and tides real-time data |</p>
<table>
<thead>
<tr>
<th>2c</th>
<th>Integration</th>
<th>No specific integration among information is directly provided</th>
</tr>
</thead>
<tbody>
<tr>
<td>2d</td>
<td>Spatial scale</td>
<td>Sub-National – Coastal area in southern England along the English Channel</td>
</tr>
<tr>
<td>2d</td>
<td>Flexibility</td>
<td>Channel Coast Observatory Coastal information System hasn’t been developed in order to apply to other coastal territory.</td>
</tr>
</tbody>
</table>

### 3 ICZM functionalities

#### 3a Knowledge related functionalities

CCO CIS strongly support the operation at different spatial scale. Available spatial data can be re-scaled according to the considered spatial extent, thus enabling to visualize more details at a higher scales. This is particularly evident for aerial photography and bathymetry data.

Other knowledge related functionalities include:

- Possibility to query and download a consistent sub-set of spatial information and other data typologies;
- Availability of multi-time data, such as in the case of waves and tidal historical data;
- Integrated data query; data can be queried according to both spatial and alphanumeric criteria in an integrated way.

Above functions can easily support extraction of data and their use by external users for sector analysis related to ICZM.

#### 3b Process related functionalities

Primary goal the Channel Coast Observatory CIS is to share and make easily available marine and coastal data. In this perspective, it is not directly linked to an ICZM process; it can provide information and data to be used in ICZM at the regional scale, such as for example for the assessment of coastal erosion problems.

### 4 Users

#### 4a User typology

The system is mainly dedicated to expert users. Information contained in the system is mainly scientific data and documentation that require a high level of expertise on hydrodynamic and morphological coastal processes.

### 5 Use of the system

#### 5a Accessibility

Free access on-line to the whole system. After a free registration, all data (numeric, spatial, maps and report) can be visualised. Great part of them can also be downloaded.

The introductive web-page includes a clear explanation of the conditions of use of the data.

#### 5b User-friendliness

High.

The system is very user friendly and the web interface includes an explanatory help file. The system is available in English.

#### 5c Interactiveness

No specific e-participation tools are provided. Users can provide feedbacks on usability of the system.

#### 5d Data access

The CIS provide functionalities for the free download of great part
of data and reports. A 300 Mb limit is set for one downloading section.
All data (numeric and spatial) are provided with metadata information (particularly detailed) that can be visualised and downloaded. The metadata formats comply with ISO standards.

<table>
<thead>
<tr>
<th>6</th>
<th>Technological characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>6a</td>
<td>Used technology</td>
</tr>
<tr>
<td>6b</td>
<td>Integration with other tools</td>
</tr>
<tr>
<td>6c</td>
<td>Integration with other CIS</td>
</tr>
<tr>
<td>6d</td>
<td>Interoperability</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>7</th>
<th>Cost/Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>7a</td>
<td>Resources</td>
</tr>
</tbody>
</table>

Information sources for the overview analysis of Channel Coast Observatory Coastal Information System:


Web-site consultation for the overview analysis of Channel Coast Observatory Coastal Information System:

<table>
<thead>
<tr>
<th></th>
<th>General Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Name</strong></td>
</tr>
</tbody>
</table>
|   | **Description** | Dorset Explorer is a web-GIS allowing users to visualize of layers related to the Dorset Region in the South of England. Spatial information is not only related to the coastal area, but more in general to the whole Dorset territory. The system is also particularly interesting since provides some innovative functionalities for data query and investigation, also enabling to re-call information related to local planning.

Dorset Explorer development is strictly related to the activities of the Dorset Coast Forum that has been at the forefront of Integrated Coastal Zone Management (ICZM) since 1995. The Dorset Coast Forum is an established Strategic Coastal Partnership made up of over 220 public, private and voluntary member organisations. The Dorset Coast Forum covers from Lyme Regis to Christchurch out to 12 nautical miles. Its primary objective is to encourage co-operation and dialogue between all the different stakeholders of the coast in the Dorset area.

C-SCOPE Interreg (Cross Border 2 Seas Programme) project, currently under going, is providing funds for the further evolution of the Dorset Explorer. This description is mainly related to the version of the Dorset Explorer available through the C-SCOPE web-site [http://www.cscope.eu/en/](http://www.cscope.eu/en/). However, the system is under evolution and will in particular include ICZM and sustainability indicators in order to fully support scientific-based decision making. Indicators to be implemented will be defined accordingly to the experience acquired by the ICZM Coordination Centre in Belgium (see Kust Atlas description), partner of the C-SCOPE project. The tool should be finalised by the end of 2011.

C-SCOPE will also develop a framework for integrating terrestrial and marine management planning, involving the development of a pilot Marine Spatial Plan for a selected area of the Dorset coast. This experience will contribute in supporting integration between ICZM and MSP policies and tools, hopefully to be transferred in the Web-GIS component as well.

Finally, C-SCOPE will provide a series of hi-tech interactive coastal information points (or Coastal explorer access points) to improve stakeholders’ engagement.

A detailed description of the new system that will be developed is contained in Chapter 5, under the section Dorset Coastal Explorer. |
| 1c | **Operating entity** | Dorset Coast Forum |
| 1d | **Management structure** | Dorset Coast Forum |
| 1e | **Contacts** | James Feaver; e-mail: j.feaver@dorsetcc.gov.uk |
1f Typology
Pre-operational; a consistent part of the system is under improvement

2 Operational context and information content

| 2a ICZM dimensions | The Dorset Explorer mainly addresses four of the five ICZM dimension providing a lot of related information. Considered dimensions are: territory (e.g. general geographic descriptors, marine natural area, landscape, area of outstanding natural beauty, and heritage coast natural areas), society (e.g. population data census, schools location, hospital locations, etc.), economy (e.g. mineral areas, waste and landfill site, land use policies, etc.) and governance (e.g. 2002 Adopted Local Plan, specific information on local planning, etc). The environmental dimension is also considered, even if it is relatively much less addressed by the Dorset Explorer |
| 2b ICZM Sectors | Dorset Explorer includes a complex and wide series of data, mainly related to:
- Base map (DTM and historical aerial photos);
- Dorset Digital Terrain Model (DTM);
- Aerial Photography
- Highways network;
- Traffic sensitivity;
- 2002 Adopted Local Plan, showing among the others: landscape and conservation, ancient monument, area of great landscape value (AGLV), area of outstanding natural beauty (AONB), nature conservation/reserve, parks and gardens of special historic interest, Sites of Nature Conservation Interest (SNCI), etc;
- Recreational activities
- Land Use Policies, including data on: car parking, community use, employment, environmental improvement, housing, main urban area, schools, etc.;
- Water protection (i.e. pollution control reed bed);
- Landscape, such as: registered common land, open access land, dedicated access land, heritage coast, character areas, natural areas, marine natural areas, green belt, world heritage site;
- Administrative boundaries;
- Population census;
- Community, including: libraries, ambulance station, police estates, fire stations, pharmacies, etc.
- Historic environment (monuments, protected wreck sites, war graves, conservation areas etc.). |
| 2c Integration | No specific integration among information is directly provided at the moment. The Dorset Coastal Explorer, is currently under development within the C-SCOPE project. |
### 2d Spatial scale
| Sub national scale – Dorset region and its coastal marine zone |

### 2d Flexibility
| The Dorset Explorer has been developed in order to be applied to the specific coastal territory of the Dorset region |

### 3 ICZM functionalities

#### 3a Knowledge related functionalities
| Dorset Explorer currently provides some of the knowledge related functionalities considered by the analysis; specifically: |
| - Operation at the different spatial scale; some of the available spatial data can be re-scaled according to the considered spatial extent; thus enabling to visualize more details at higher scales; |
| - Availability multi time data: The aerial photos are available for different periods (2002-2005-2009). |
| ICZM knowledge related functionalities will be significantly expanded in the new Dorset Coastal Explorer tool that will include ICZM and sustainability indicators to properly support scientifically-based decision making. |

#### 3b Process related functionalities
| Dorset Explorer development and future implementation is strictly related to the objectives and activities of the Dorset Coast Forum, whose principal aim is to encourage co-operation and dialogue within the ICZM process. Web-GIS and other web-tools can support this objective. |
| Dorset Explorer already supports and includes some ICZM process related functionalities (partly also innovative). In particular: |
| - The Local Plan Policy Report tool enables to re-call (through an hyperlink function) and visualise a report with all relevant policies, documents or other information about a selected area; |
| - It is possible to generate short reports describing the selected features (areas) of some layers, such as: natural area, marine natural areas, monuments or other important areas. Report is activated through an hyperlink function. These information may be useful in supporting some of the ICZM related aspects (such as for example communication and awareness raising). |
| ICZM process related functionalities will be relevantly improved by the C-SCOPE project, in particular through: |
| - A framework for integrating terrestrial and marine management planning, involving the development a pilot Marine Spatial Plan for a selected area of the Dorset coast. This experience will contribute in supporting integration between ICZM and MSP policies and tools; |
| - A series of hi-tech interactive coastal information points (or Coastal explorer access points) to improve stakeholders' engagement. These access point will permit to highlight features such as marinas, beaches and “Codes of Practice” for safe and sustainable use of the coast. |

### 4 Users

#### 4a User typology
| One of the main goal of Dorset Explorer is disseminating information and related services and makes them accessible to ensure data sharing. The system may be therefore useful for a wide range of users’ typology, i.e. all ICZM stakeholders. |
### 5 Use of the system

<table>
<thead>
<tr>
<th>5a</th>
<th>Accessibility</th>
<th>Free access on-line (access allowed to all users without password) to all the information and functionalities provided by the system</th>
</tr>
</thead>
<tbody>
<tr>
<td>5b</td>
<td>User-friendliness</td>
<td>Highly user-friendly. The system is very easy to use. It also provides clear explanation of all the functionalities included in the interactive screen through specific help pages. The system is available in English.</td>
</tr>
<tr>
<td>5c</td>
<td>Interactiveness</td>
<td>No specific e-participation tools are available. Dorset Explorer enables users to provide suggestions to improve the functionality of the system. This can be done through a specific feedback form. Also in this case, C-SCOPE will improve interactiveness. In particular a series of hi-tech interactive coastal information points (or Coastal explorer access points) to improve stakeholders’ engagement will be designed and realised.</td>
</tr>
<tr>
<td>5d</td>
<td>Data access</td>
<td>Dorset Explorer only provides the possibility to export customised maps in pdf format. Spatial data can not be downloaded. Few information is available on the viewable maps; in particular legends and metadata are not provided.</td>
</tr>
</tbody>
</table>

### 6 Technological characteristics

<table>
<thead>
<tr>
<th>6a</th>
<th>Used technology</th>
<th>Dorset Explorer 2.5 has been developed with MapInfo and MapXtreme technologies. A technological upgrade of the system is also under development towards a more flexible platform.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6b</td>
<td>Integration with other tools</td>
<td>The system is integrated with the web sites providing information to generate reports on local policies and descriptive information of the selected areas, through the tools described in 3b.</td>
</tr>
<tr>
<td>6c</td>
<td>Integration with other CIS</td>
<td>No specific integration with other CIS. The development of the Dorset Coastal Explorer is part of the C-SCOPE project that also foresees the further improvement of the Belgian Kust Atlas (involving the ICZM Coordination Centre of Belgium). However KustAtlas and Dorset Coastal Explorer are different tools, with different aims and different target users: the first one is mainly a communication tool designed as a portal site to wider audience; the second one is mainly a planning tool, designed for stakeholders and planners.</td>
</tr>
</tbody>
</table>

### 7 Cost/Resources

| 7a  | Resources | One person at Dorset coast Forum managing data and 5 persons for the tool development and maintenance, including base mapping data. |

Web-site consultation for the overview analysis of Dorset Explorer - Dorset Coastal Explorer:

- Web-site: [http://www.dorsetforyou.com](http://www.dorsetforyou.com) last visit on 17/02/2011 at 12.30
- Web-site: [http://195.49.180.76/dorsetexplorer/?version=edlp](http://195.49.180.76/dorsetexplorer/?version=edlp) last visit on 17/02/2011 at 12.30
- Web-site: [http://www.cscope.eu](http://www.cscope.eu) last visit on 17/02/2011 at 12.45.
## Cork Harbour Geographic Information System

<table>
<thead>
<tr>
<th></th>
<th>General Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>Name</td>
</tr>
</tbody>
</table>
| 1b | Description | The Cork Harbour Geographic Information System has been developed within the Interreg COREPOINT (COastal REsearch and POLicy INTEGRation) project (2004-2008).  
One of the main goals of the Corepoint project was to bridge the gap between research institutions and local authorities dealing with ICZM. The project intended to properly use scientific experience and resources to provide improved information for planners responsible for local coastal areas as part of an ICZM approach. The project selected Cork Harbour as one of the site for the development of GIS tools supporting the ICZM process.  
Cork Harbour initiative focused on coastal and vulnerability, habitat loss, tourism pressures and development options for the Brownfield area (Corepoint, 2005). Inside the COREPOINT activity, the final outcome of the Cork Harbour ICZM related initiative was the development and publication of an Integrated Management Strategy for Cork Harbour in 2008. The strategy was the result of a cooperative effort jointly done by local authorities and academic experts.  
Cork Harbour initiative also included the development of a GIS providing support to the above ICZM processes. In particular within this GIS, the Coastal and Marine Resources Centre (CMRC) of the Cork University developed a GIS section (called “Coastal Inventory”) providing a comprehensive database of shoreline features, aiming to support the monitoring, management, development and conservation of coastal, estuarine and riparian habitats. The Coastal Inventory enables to generate maps, reports and statistics that can be used by planners, managers, and regulators in decisions making on the coastal area.  
Cork Harbour and the related GIS were also analysed by the EU FP7 SPICOSA project (2009-2011) aiming in general to develop a self-evolving and operational research approach framework for the assessment of policy options for the sustainable management of coastal zone systems.  
At the moment funding for the support and the implementation of the Integrated Management Strategy and hence the development of the GIS, are allocated through a new INTERREG project called IMCORE. |
| 1c | Operating entity | The Planning Policy Unit (PPU) of Cork County Council and the Coastal and Marine Resources Centre (CMRC) of Cork University are the IMCORE project partners. They also operate the Secretariat function.  
One of the main functions of the Secretariat is to manage the stakeholder contact database for the Forum and maintain the [http://www.corkharbour.ie/](http://www.corkharbour.ie/) website, which will be a focal point for information on relevant activities. |
1d Management structure
The Coastal and Marine Resources Centre of the Cork University

1e Contacts
Cathal O’ Mahony, c.omahony@ucc.ie
Coastal Inventory Team
Coastal and Marine Resources Centre
University College Cork
Naval Base, Haulbowline
Cobh, County Cork, Ireland
web-site: http://cmrc.ucc.ie/CI/index.htm

1f Typology
Operational

2 Operational context and information content

2a ICZM dimensions
The GIS mainly addresses four of the five considered information dimensions: environmental (e.g. shoreline, river), territorial (land use manmade shoreline, roads) society (e.g. residential structures, marinas, water safety training, diving) and economic (industrial area, tourism activities).

2b ICZM Sectors
The Coastal Harbour GIS includes the following main spatial layers:
- Shoreline type (e.g. revetments, sea walls, beaches, docks, rocky shores);
- Shoreline features (e.g. jetties, piers, pontoon, steps, ladders);
- Shoreline vulnerability (e.g. state of repair, conditions, erosion);
- Land use (e.g. agriculture, industry, residential, amenity);
- Administrative boundaries;
- Population density;
- Tourism structures (marinas, diving, charter companies, sailings clubs).

2c Integration
Inside the Cork Harbour GIS there is a customized feature called "The Coastal Inventory". This is a comprehensive database of shoreline features, aiming to support the monitoring, management, development and conservation of coastal, estuarine and riparian habitats.

2d Spatial scale
Local - Cork Harbour area.
Cork Harbour area is a large natural harbour on the southern coast of Ireland. It is a complex estuarine coastal system with a water body surface area of approximately 100 km². Some parts of the area are also densely populated, indeed about 65% of County Cork’s population lives in close proximity to the coast.

2d Flexibility
The Cork Harbour GIS was created following the line of development set out in the report "Guidelines for Implementing Local Information Systems at the Coast" developed within the COREPOINT project (COREPOINT: Stojanovic et al., 2007). The Guidelines were developed on the basis of the experience on
<table>
<thead>
<tr>
<th>3</th>
<th>ICZM functionalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>3a</td>
<td>Knowledge related functionalities</td>
</tr>
<tr>
<td></td>
<td>Cork Harbour GIS provides some of the knowledge related functionalities considered by the analysis, specifically:</td>
</tr>
<tr>
<td></td>
<td>- Integrated maps (see 2c);</td>
</tr>
<tr>
<td></td>
<td>- Availability of multi-time data: multi-time data are for example available for the shoreline position.</td>
</tr>
<tr>
<td>3b</td>
<td>Process related functionalities</td>
</tr>
<tr>
<td></td>
<td>The Cork Harbour GIS was developed in order to specifically support the local ICZM experience. Within the COREPOINT project, the ICZM experience focused on the first three (of the five) steps identified for the Cork Harbour area: (i) Issue identification and assessment, (ii) Programme preparation, (iii) Formal adopting and funding. These activities finally led to the publication of an Integrated Management Strategy for Cork Harbour in 2008.</td>
</tr>
<tr>
<td></td>
<td>The process that underpinned the development of this Strategy document involved a leadership and facilitation role by the local COREPOINT project partners, communication with stakeholders through the Cork Harbour Forum, the organisation of two stakeholder workshops, and consultation with a Strategic Advisory Group (SAG, currently named Harbour Management Focus Group).</td>
</tr>
<tr>
<td></td>
<td>The implementation of the ICZM Strategy (forth step of the process) is currently on-progress and involve the design and publication of an ICZM Action Plan (2008-2011). The Action Plan is yearly delivered and subsequently reviewed taking into consideration the interactive nature of ICZM and the need to ensure a flexible process to deal with emerging and changing priorities.</td>
</tr>
<tr>
<td></td>
<td>The Cork Harbour GIS has therefore provided data and functionalities supporting various aspects of the ICZM experience, including: problem understanding and structuring, Assessment of alternatives in planning and management, monitoring and evaluation, adaptive planning and management. Furthermore, through the IMCORE project, specific research is undertaken to examine the use of scenarios to support the planning process for climate change and ultimately benefit local coastal communities.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4</th>
<th>Users</th>
</tr>
</thead>
<tbody>
<tr>
<td>4a</td>
<td>User typology</td>
</tr>
<tr>
<td></td>
<td>Users of the Cork Harbour GIS are mainly coastal planners, managers, and regulators (i.e. decision makers’ level).</td>
</tr>
<tr>
<td></td>
<td>Future activities foresee the development of web-GIS that will be made available to all potential users (see <a href="http://www.corkharbour.ie/pages/gis.htm">http://www.corkharbour.ie/pages/gis.htm</a>).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5</th>
<th>Use of the system</th>
</tr>
</thead>
<tbody>
<tr>
<td>5a</td>
<td>Accessibility</td>
</tr>
</tbody>
</table>
|   | At the moment, the access of the system is restricted only to off-
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5b</td>
<td>User-friendliness</td>
</tr>
<tr>
<td>5c</td>
<td>Interactivity</td>
</tr>
<tr>
<td></td>
<td>No specific e-participation tools are currently available within the Cork Harbour GIS. However the GIS has been used in supporting the wide participatory approach and activities underpinning the ICZM process (i.e. Cork Harbour Forum, Harbour Management Focus Group, Cork Harbour News, thematic workshops, Working Groups, etc.). Next steps foresee the development of a web-GIS tool that will further enhance interactivity.</td>
</tr>
<tr>
<td>5d</td>
<td>Data access</td>
</tr>
<tr>
<td></td>
<td>No data and metadata are directly accessible online at the moment. The web-GIS development will enable direct access to part of the GIS information.</td>
</tr>
</tbody>
</table>

### 6 Technological characteristics

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>6a</td>
<td>Used technology</td>
</tr>
<tr>
<td></td>
<td>The GIS is developed with ESRI software technology (licensed software).</td>
</tr>
<tr>
<td>6b</td>
<td>Integration with other tools</td>
</tr>
<tr>
<td></td>
<td>The GIS includes the “Coastal Inventory” (developed and operated by CMRC), a comprehensive database of shoreline features, aiming to support the monitoring, management, development and conservation of coastal, estuarine and riparian habitats.</td>
</tr>
<tr>
<td>6c</td>
<td>Integration with other CIS</td>
</tr>
<tr>
<td></td>
<td>No integration with other CIS.</td>
</tr>
<tr>
<td>6d</td>
<td>Interoperability</td>
</tr>
</tbody>
</table>

### 7 Cost/Resources

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>7a</td>
<td>Resources</td>
</tr>
<tr>
<td></td>
<td>Initial funding to develop the system was provided by the Interreg IIIB COREPOINT project. The Interreg IVB IMCORE project has provided funding for the further implementation phase.</td>
</tr>
</tbody>
</table>
Information sources for the overview analysis of the Cork Harbour Geographic Information System:


Web-site consultation for the overview analysis of the Cork Harbour Geographic Information System:

- http://www.corkharbour.ie/; last visit on 24/02/2011 at 15.00.
- http://imcore.eu/; last visit on 04/03/2011 time 16.50.
- http://corepoint.ucc.ie/; last visit on 04/03/2011 time 17.50.
## General Information

<table>
<thead>
<tr>
<th>1</th>
<th>Name</th>
<th>GEOIDD-Litto</th>
</tr>
</thead>
</table>

### Description

GEOIDD-Litto (Geographie et indicateurs du développement durable sur le littoral – geography and indicators related to coastal sustainable development) is a web cartographical tool that allows to access a high number of geographic and statistical information, both for land and sea, along the French coast and overseas departments (Guadeloupe, Martinique, Guyane, Reunion).

GEOIDD-Litto responds to one of the main objectives of the French Observatoire du Littoral, in particular related to:

- Organise and share information and data on the coastal system;
- Improve the vertical and horizontal information flow among different administrations dealing with coastal management issues;
- Contribute to the discussion on the standardization of protocols for collecting, processing and sharing data.

The system consists of two separated main tools, with two different web-interfaces:

- A statistical data tool, related to social, economic and environmental statistic indicators. The tool also allows to map the selected data (up to two indicators can be jointly mapped) at the municipality level. The same tool enables to download selected data.
- A geographic data tool, enabling the visualisation of various land and marine spatial information.

GEOIDD-Litto allows users to print maps, to extract statistical data, to build images in different formats (jpeg, png, pdf), to build “portrait of territories” (summary reports with tables and charts), to map own statistical data and to map geographical data from other tools (trough web-service protocol like WMS - Web Map Service).

### Operating entity

The operating entity is the Observatoire du Littoral (French coastal observatory)

The Observatoire du Littoral includes, as part of an agreement: the Ministry of Ecology, Sustainable Development, Transportations and Housing; the Inter-ministerial Delegation for Territorial Planning; and the General Secretariat of the Sea.

### Contacts

Sébastien Colas; e-mail: sebastien.colas@developpement-durable.gouv.fr

Observatoire du littoral Ministère de l’Ecologie, du Développement durable, des Transports et du Logement

Web site of GEOIDD Litto:
## Operational context and information content

### 2a ICZM dimensions
The CIS addresses all the ICZM dimensions considered by the analysis: territory (e.g. for general geographic descriptors, land and sea uses, marine protected areas), environment (specifically related to nature and biodiversity), economy (e.g. employment, tourism, use of the sea), society (e.g. housing), governance (e.g. urban planning in coastal areas).

### 2b ICZM Sectors
Information content is structured in the following thematic issues, for each of them the availability of geographical data and/or statistical data interface is indicated:
- land use - geographical and statistical data tool;
- water - geographical and statistical data tool;
- nature and biodiversity - geographical and statistical data tool;
- administrative boundaries - geographical data tool;
- transports routes - geographical data tool;
- zoning and uses of the sea - geographical data tool;
- coastal morphology - geographical data tool;
- natural risks – statistical data tool;
- agriculture – statistical data tool;
- tourism – statistical data tool;
- population housing – statistical data tool;
- employing – statistical data tool;
- urban planning – statistical data tool.

### 2c Integration
The statistical data tool enables to generate maps combining the visualisation of two indicators, thus providing partially integrated information.

### 2d Spatial scale
National scale – France and overseas departments.
The system can operate at different scales: from the national to the local one.

### 2d Flexibility
GEOIDD-Litto has been specifically developed for the French coastal area

## ICZM functionalities

### 3a Knowledge related functionalities
Several knowledge functionalities, supporting ICZM process are available:
- Integration among different information sectors (see point 2c); this is provide by the statistical data tool, although limited to the combined visualisation of two indicators;
- The CIS allows interactive mapping, but proper GIS data are not downloadable;
- Operation at the different spatial scale; some of the available spatial data can be re-scaled according to the considered spatial extent; thus enabling to visualize more details at a higher scales. This functionality is supported by the geographical data tool;
- For some layers, mainly for socio-economic and territorial data, multi-time information is available (e.g. land use, unemployment rate);
- The CIS include some ICZM indicators, such as for example area of built up land, protected areas, land take by intensive agriculture, sectoral employment. A specific tools is provided to deal with indicators related functionalities (statistical data tool).

<table>
<thead>
<tr>
<th>3b</th>
<th>Process related functionalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOIDD-Litto provides a high variety of data related to different ICZM sectors and dimensions and therefore can properly support the problem understanding process. Information is provided by the two tools in different formats maps and/or indicators. The statistical data tool is particularly relevant to support problem understanding and decision making in general. Indeed, it allows not only to map and download data and metadata related to selected statistics, but also to generate customized “portraits” on a specific spatial selection. “Portraits” are short report including summary tables and charts.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4</th>
<th>Users</th>
</tr>
</thead>
<tbody>
<tr>
<td>4a</td>
<td>User typology</td>
</tr>
<tr>
<td>Taking in to account the Observatoire mission and the information content of the CIS, the target users can be mainly identified as:</td>
<td></td>
</tr>
</tbody>
</table>
- Decision makers, in particular since summary information are provided by the system (e.g. indicators and statistics);
- Coastal planners and/or managers, for the information related to territory (use of land and sea) and coastal plans;
- Civil society, interested in being informed on and/or participating in ICZM: the geo-information typology provided by the system are easily understandable from non expert users |

<table>
<thead>
<tr>
<th>5</th>
<th>Use of the system</th>
</tr>
</thead>
<tbody>
<tr>
<td>5a</td>
<td>Accessibility</td>
</tr>
<tr>
<td>Free access on-line without password to the complete CIS</td>
<td></td>
</tr>
<tr>
<td>5b</td>
<td>User-friendliness</td>
</tr>
<tr>
<td>Highly user-friendly</td>
<td></td>
</tr>
<tr>
<td>Intuitive operation of the system, for both available tools (geographical data tool and statistical data tool). Animated tutorial are available to help the user. The system in available only in French.</td>
<td></td>
</tr>
<tr>
<td>5c</td>
<td>Interactiveness</td>
</tr>
<tr>
<td>No specific e-participation tools appear to be available. However, the system is totally accessible on-line.</td>
<td></td>
</tr>
<tr>
<td>5d</td>
<td>Data access</td>
</tr>
<tr>
<td>Data can be downloaded from the statistical data tool, in excel format. Spatial data (GIS layer) can not be downloaded from the geographic data tool.</td>
<td></td>
</tr>
<tr>
<td>Maps can be displayed and printed and the project can be saved in a specific url. Finally, GEOIDD-Litto allows the easy access to detailed and clear metadata (metadata sheets) for all the available layers.</td>
<td></td>
</tr>
</tbody>
</table>
### Technological characteristics

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>6a</strong></td>
<td>Used technology</td>
</tr>
<tr>
<td></td>
<td>Flash technology; database working with PHP and MySQL technologies</td>
</tr>
<tr>
<td><strong>6b</strong></td>
<td>Integration with other tools</td>
</tr>
<tr>
<td></td>
<td>No specific integration between the GEOIDD-Litto system and other tools. The website of the Observatoire du littoral enables to access a specific thematic section containing structured information (graphs, factsheets, excel data) on several statistical indicators useful for the sustainable development of the coast. The system collects most of the statistical and geographical data available in France. Integration with other tools is provided in the “useful links” page, where several links area available, including:</td>
</tr>
<tr>
<td></td>
<td>- Geolittoral, an additional tool managed by the CETE Normandy Centre Directorate General of Planning, Housing and Nature that provides large scale data including free coastal orthoimagery;</td>
</tr>
<tr>
<td></td>
<td>- Bosco webpage, observation base for coastal monitoring implemented jointly by the BRGM (French geological survey) and CETMEF (Maritime and River Technical Studies Centre), containing shoreline metadata from different sources.</td>
</tr>
<tr>
<td></td>
<td>- Territorial observatory, governmental web site providing interactive mapping and download of hundreds of environmental, social and economic data.</td>
</tr>
<tr>
<td></td>
<td>Observatory of the Aquitaine coast, decision support tool for the management and development of the Aquitaine coast.</td>
</tr>
<tr>
<td><strong>6c</strong></td>
<td>Integration with other CIS</td>
</tr>
<tr>
<td></td>
<td>In the case of GEOIDD-Litto this issue is strictly connected with and therefore addressed in point 6b.</td>
</tr>
<tr>
<td><strong>6d</strong></td>
<td>Interoperability</td>
</tr>
<tr>
<td></td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>The system has been developed following the INSPIRE and MOTTIVE standards, guaranteeing high interoperability. The geographical data tool provides full interoperability with other data providers’ spatial information through OGC - WMS application.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>7</strong></th>
<th>Cost/Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>7a</strong></td>
<td>Resources</td>
</tr>
<tr>
<td></td>
<td>About € 45,000 for the first version of GEOIDD-Litto, (2006). Additional cost of about € 50,000 for the tool currently online (2009).</td>
</tr>
</tbody>
</table>

Web-site consultation for the overview analysis of GEOIDD-Litto:

- [http://www.littoral.ifen.fr/Cartographie.6.0.html](http://www.littoral.ifen.fr/Cartographie.6.0.html); last visit on 03/24/2011 at 12.30.
### General Information

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>Name</td>
</tr>
</tbody>
</table>

GÉOBretagne is an Internet platform (Spatial Data Infrastructure – SDI) for the exchange and consultation of geographical information, born from the desire of sharing and publishing geographical information useful for the knowledge and the development of the territory of Bretagne. The GÉOBretagne web-site includes a Web-GIS with spatial data referring to the whole Bretagne Region, also including its coast. In particular the Web-GIS, among many others, contain data specifically related to the Breton littorals.

GÉOBretagne has been developed within a project part of the Contract-Project State-Region (CPER) 2007-2013 in Bretagne, signed in April 12, 2007, aiming at strengthening the competitiveness of Bretagne region by improving data accessibility. GÉOBretagne also aims to disseminate information for the public in compliance with the INSPIRE Directive. GÉOBretagne initiative involves a wide partnership of public bodies that are interested in sharing and exchanging data, and wish to undertake a process of sharing and pooling of data and transparency to the citizen.

Partnership includes: state departments, local authorities, public institutions, planning agencies, etc.

GÉOBretagne organisation is articulated in the following main structures:

- A steering committee coordinated by the Bretagne Region and Prefecture of the Bretagne Region;
- A technical committee led by the secretariat GÉOBretagne;
- Thematic groups: repositories of base data (cadastral data, road and addressing, aerial orthophotos and digital elevation model);
- Cataloguing
- Energy
- Littoral
- Hiking and nature activities,
- Telecoms
- Urbanism.

The GÉOBretagne web interface provides two main tools to access, view and use the geographical information:

- A map viewer (Web-GIS), to display data and customise own maps, also through Web Map Service (WMS). Pre-defined maps can also be directly visualised by the users through the Cartographie function.

- A data catalogue, to search and download data and metadata on the Bretagne Region. The catalogue is used to share and make available spatial data and metadata related to the Bretagne Region. Search can be done through key words and/or a map viewer enabling to select an area of interest. For the selected information: (i)Metadata are showed thought an
extended and detailed metadata sheet (ii) data can be downloaded (for some of them), (iii) spatial data can be visualised through the map viewer or Google. GÉOBretagne also provides a functionality to search for documents.

| 1c | Operating entity | GÉOBretagne secretary – Operation and management involves all the various committees (with different roles) of the GÉOBretagne initiative |
| 1d | Management structure | GÉOBretagne secretary – Operation and management involves all the various committees (with different roles) of the GÉOBretagne initiative |
| 1e | Contacts | E-mail contacts; fabrice.phung@development-durable.gouv.fr; lydie.vinsonneau@ergion-bretagne.fr; GÉOBretagne web-site: http://www.geobretagne.fr/ |
| 1f | Typology | Operational |

## 2 Operational context and information content

### 2a ICZM dimensions

The more developed ICZM dimensions are those related to territory (e.g. land use and natural parks/protected areas) and the socio-economic (e.g. transports, school, economic activities) issues. The other two dimensions – i.e. governance (e.g. natural park planning). and environment (e.g. bathing water quality) – are partly covered.

| 2b | ICZM Sectors | Spatial data accessible through the map viewer can be selected and visualise by the Geo-catalogue tool. This in particular enables to organise spatial data according to different structures, including the one related to the INSPIRE Directive. According to the default structure data are organised in the following themes:  - Economic activities  - Agriculture  - Water  - School  - Cadastral data  - Housing  - Transport  - Administrative boundaries  - Littoral  - Architectonic, cultural and urban heritage  - Natural Park planning  - Natural, technological and sanitary risks  - Urbanism  - Digital economy  - Energy  - Public facilities  All theme are split in specific layers; the Littoral thematic includes a high number of spatial data concerning coastal issues (e.g. marine parks, natural reserves, landing points, hotels/camping, coastal land use, access to the sea). Other data can be visualised on the map viewer through the OGC service enabling to select one of the pre-define WMS connection (e.g. BRGM – geology or BRGM – risk) or specifying an url |

---

21807-REL-T006.2
Annex 1 – page 95
Examples of integrated information are maps related to the assessment of the natural and technological risks for the addressed territory.

The system has been developed in order to be applied specifically to the Bretagne territory.

GÉOBretagne provides some of the knowledge related functionalities considered by the analysis; specifically:
- Integration among different information sectors (see point 2c), including some integrated maps related to natural and technological risks;
- Availability of spatial data; GÉOBretagne actually aims to support data sharing and dissemination to public users. Data (including geographical ones) and metadata are shared through the Catalogue functionality;
- Support experiences and best practices exchange in relation to data management and geographic information in general

GÉOBretagne provides a high variety of data related to different information sectors and dimensions and therefore can properly support problem understanding. Spatial data are organised according to an articulated structure (various possible structures are proposed) that can support user in the elaboration of conceptual models of the territory.

Data exchange with public stakeholders of the region is one of the main objective of GÉOBretagne. Public stakeholders are therefore the main target user typology for GÉOBretagne.

Coastal professionals and experts can be more interest in the use of the Catalogue tool that makes available spatial data and metadata.

Civil society is also a target user, since one of the specific GÉOBretagne aim is to diffuse information and data to citizens.

Free access on-line to great part of the system. GÉOBretagne partners have the possibility to access further information and functionalities through login and password.

Use of the map viewer is easy and intuitive. Use of the catalogue requires more expertise and is less simply, mainly addressing expert users. Help user guides are also available. The web site and the documentation resource are in French language only.

No specific e-participation tools are provided by GÉOBretagne
### 5d Data access

A great part of spatial data can be downloaded through the Catalogue functionality that also provides a detailed description of metadata. Public bodies of the Britain Region that are members of the GÉOBretagne partnership have access to wider information and can download all spatial data. Map viewer does not enable the user to directly download data. Maps can be however printed from this interface. Map viewer provides detailed metadata for all available spatial layers. Users can also customise maps provided importing spatial data through Web Map Service (WMS). WMS service also provides the possibility to visualise and use data share by GÉOBretagne from a client application, for example using the freely available GAIA software.

### 6 Technological characteristics

<table>
<thead>
<tr>
<th>6a Used technology</th>
<th>GÉOBretagne map viewer was developed using the GeOrchestra open source software. The Geoportal is based on the Open Source application “GeoNetwork” and is strictly related to standards and requirements of the INSPIRE Directive.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6b Integration with other tools</td>
<td>The Map-viewer and the catalogue are directly interrelated. Spatial layers included in the catalogue can be for example selected and viewed through the map-viewer.</td>
</tr>
<tr>
<td>6c Integration with other CIS</td>
<td>The map viewer (Web-GIS) enables to display data and customise own maps through Web Map Service (WMS), thus establishing a dynamic connection to any geographic dataset accessible through WMS.</td>
</tr>
</tbody>
</table>
| 6d Interoperability | High. GÉOBretagne is equipped to meet the regulatory requirements of the INSPIRE Directive:  
- It is compliant with metadata standards ISO 19115 and ISO 19139;  
- it uses a server architecture OGC WMS, thus properly supporting data exchange and interoperability;  
- Spatial data are organised according to INSPIRE structure. |

### 7 Costs/Resources

| 7a Resources | GÉOBretagne project received a total funding of 3 M € for 2007-2013 |

Information sources for the overview analysis of GÉOBretagne:

Web-site consultation for the overview analysis of GÉOBretagne:
# General Information

1a **Name**

Observatoire de la Côte Aquitaine Coastal Information System (OCA-CIS) – (Aquitaine Coast Observatory Coastal Information System)

1b **Description**

The Aquitaine Coast Observatory is a regional partnership whose main aim is to provide coastal stakeholders with information, expertise and tools supporting decision making and management, within the ICZM context. The partnership, initiated in 2000, involves: the European Union; the French State; the Aquitaine Region; the Departmental Councils of the Gironde, Landes and Pyrénées-Atlantiques; the Inter-communal Syndicate of the Arcachon Basin, the Geological and Mining Research Bureau, and the National Forestry Office. The Aquitaine Coast Observatory is the first European experiment to manage coastal erosion on a regional scale.

The OCA-CIS is one of the main initiatives implemented by the Observatory; this GIS-based tool archive, standardize and disseminate data and metadata related to integrate coastal zone management. The CIS also includes a Web-GIS component, making available a sub-set of the whole CIS data.

The main actors of the Aquitaine Coast Observatory, the Aquitaine Region has developed other ICZM related tools, such as:

- A tool for regional governance and general coastal management; the Aquitaine Coast Public Interest Group, which involves all of Aquitaine's coastal management industry and aims to establish a sustainable development plan for 2007-2020;

- A pluri-disciplinary network of knowledge; the Réseau de Recherche Littoral Aquitaine (RRLA), (Aquitaine Coastline Research Network), associating multiple scientific organizations working in the coastal management sector.

The Aquitaine Region is also involved in ICZM related projects, such as the Atlantic Region’s Coastal Pollution Control (ARCOPOL – aiming to create a Regional network to combat pollution from coastal navigation) and the Atlantic Network for Coastal Risk Management (ANCORIM – aiming to create an operational network uniting European experts in coastal risk management).

1c **Operating entity**

Aquitaine Coast Observatory (Observatoire de la Côte Aquitaine)

1d **Management structure**

Aquitaine Coast Observatory (Observatoire de la Côte Aquitaine)

1e **Contacts**

Bérengère Papion; e-mail: webmaster@littoral.aquitaine.fr

Web-site of the Aquitaine Coast Observatory: http://littoral.aquitaine.fr/

1f **Typology**

Operational
## Operational context and information content

### 2a ICZM dimensions
OCA-CIS address three ICZM dimensions: territory, environment (e.g. flora, fauna and environmental quality) and society (e.g. population).

### 2b ICZM Sectors
OCA-CIS data are related to the following major topics:
- Coastline, aerial photos and satellite images;
- Coastal hazards;
- Coastal facilities;
- Fauna and flora;
- Geodesy, geology, geomorphology, hydrogeology;
- Monitoring instrumentation;
- Oceanography;
- Environmental quality;
- Protected areas;
- Beach nourishment interventions;
- Corine land cover;
- Population density.

Only some of the data included in the OCA-CIS are made available by the Web-GIS.

### 2c Integration
The OCA-CIS provide some examples of integrated analysis, including information on: coastal hazards and vulnerability of the coast to erosion. These information are currently not available through the Web-GIS component.

### 2d Spatial scale
Sub-National scale – Coast of the Aquitaine Region.
The Atlantic shoreline of Aquitania Region stretches over more than 270 kilometres from the mouth of the Gironde Estuary to that of La Bidassoa in the south.

### 2d Flexibility
Specifically focusing on the Aquitaine Region coastal area.

## 3 ICZM functionalities

### 3a Knowledge related functionalities
OCA-CIS provides some of the knowledge related functionalities considered by the analysis, specifically:
- Integration among different information, such in the case of coastal hazards and vulnerability of the coast to the erosion;
- Operation at the different spatial scale; some of the spatial data available in the Web-GIS can be re-scaled according to the considered spatial extent; thus enabling to visualize more details at a higher scales;
- Availability of multi-time data; for example coastline layers are available for about 8 years (1938-2009), thus enabling to assess coastline evolution in time.

### 3b Process related functionalities
The system does not specifically include ICZM process related functionalities; however it aims to support the Aquitaine Coast Observatory activity in providing coastal stakeholders with information, expertise and tools for decision making and
management, within the ICZM context.

<table>
<thead>
<tr>
<th>4</th>
<th>Users</th>
</tr>
</thead>
</table>
| 4a | User typology | Potential users mainly those addressed by the Aquitaine Coast Observatory, i.e.:
- Decision makers, in particular at the regional level;
- Coastal planners and managers, both at the regional and local level. |

<table>
<thead>
<tr>
<th>5</th>
<th>Use of the system</th>
</tr>
</thead>
<tbody>
<tr>
<td>5a</td>
<td>Accessibility</td>
</tr>
<tr>
<td>5b</td>
<td>User-friendliness</td>
</tr>
<tr>
<td>5c</td>
<td>Interactivity</td>
</tr>
<tr>
<td>5d</td>
<td>Data access</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6</th>
<th>Technological characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>6a</td>
<td>Used technology</td>
</tr>
<tr>
<td>6b</td>
<td>Integration with other tools</td>
</tr>
<tr>
<td>6c</td>
<td>Integration with other CIS</td>
</tr>
<tr>
<td>6d</td>
<td>Interoperability</td>
</tr>
<tr>
<td></td>
<td>Cost/Resources</td>
</tr>
<tr>
<td>---</td>
<td>----------------</td>
</tr>
<tr>
<td>7</td>
<td>Resources</td>
</tr>
<tr>
<td>7a</td>
<td>The Aquitaine Coast Observatory is co-financed by the European Union.</td>
</tr>
</tbody>
</table>

Information sources for the overview analysis of Aquitaine Coast Observatory Coastal Information System:

- Florence BOUTEAU, 2009. Data and Indicators in relation with coastal zones in Aquitaine. Presentation shown at “A day for cartographic system to manage coastal zone: Coastal and maritime data: a common heritage, a capital to be shared, a challenge for innovation in Europe”, Bruxells, 10/12/2009.

Web-site consultation for the overview analysis of Aquitaine Coast Observatory Coastal Information System:

## RIA FORMOSA Coastal Information System

<table>
<thead>
<tr>
<th></th>
<th>General Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>Name</td>
</tr>
<tr>
<td>1b</td>
<td>Description</td>
</tr>
<tr>
<td>1c</td>
<td>Operating entity</td>
</tr>
<tr>
<td>1d</td>
<td>Management structure</td>
</tr>
</tbody>
</table>
| 1d | Contacts | Pedro Duarte, e-mail: pduarte@ufp.pt
University Fernando Pessoa |
| 1e | Typology | Operational |
## Operational context and information content

<table>
<thead>
<tr>
<th>2a</th>
<th>ICZM dimensions</th>
<th>In the CIS all the five ICZM dimensions are addressed: territory, environment, economy, society and governance.</th>
</tr>
</thead>
</table>
| 2b | ICZM Sectors | The main information topics included in the CIS are summarised as follow:  
- Physical environment: elevation and bathymetry, oceanography, physical geology, landscape, land-use, hydrogeology, hydrography, geology, types and use of soils, forest fires;  
- Coastal management: Natura 2000 network, ecologic national reserve, administrative boundary, protected areas, management of the territory, vulnerable zones dune re-qualification;  
- Biological features: bird census, flora and fauna;  
- Socio-economical activities: demography, farming occupation, cultural values, building and accommodation, agriculture, cycle ways, clam farms, fish farm, harbour and nautical activities, recreational activities, salt extraction, waste treatment plants;  
- Planning: municipal plans, POOC - Plan of the management of the seashore |
| 2c | Integration | The Ria Formosa CIS appears to include a wide variety of information, including some examples of integration among different data typologies, such information related to vulnerable zones and coastal risks. |
| 2d | Spatial scale | Local – Ria Formosa Lagoon and river network draining into the Ria Formosa Lagoon.  
Ria Formosa is a shallow meso-tidal lagoon located in the south of Portugal in the Algarve Coast. The lagoon has several channels and a large intertidal area, which corresponds roughly to 50% of the total area (about 105 km²), mostly covered by sand, muddy sand-flats and salt marshes. Indeed the lagoon system is over-nourished by the sea and river sediments. |
| 2e | Flexibility | The methodological approach used to implement the Ria Formosa CIS was also used in the case of other two case studies of the Ditty project; the Thau Lagoon (France) and the Gera Gulf area (Greece). Ria Formosa CIS can be therefore considered as party flexible and exportable to other similar areas, with the necessary customisation. |

## ICZM functionalities

<table>
<thead>
<tr>
<th>3a</th>
<th>Knowledge related functionalities</th>
<th>Little information is available to properly describe this specific field. Ria Formosa CIS is specifically developed to support the integrated assessment of different information typologies related to all the five considered dimensions. The tool also provides some example of integrated layers, such as those related to coastal vulnerability and risk.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3b</td>
<td>Process related functionalities</td>
<td>The CIS provides high variety of data related to many typologies and therefore may properly support the problem understanding and</td>
</tr>
</tbody>
</table>
The CIS is made of a GIS component and a two integrated mathematical models. The soil and water assessment tool enables to simulate land drainage to the coastal ecosystem, providing forcing conditions to the second model, EcoDynamo that simulates hydrodynamic and biogeochemical processes. Furthermore, within the Ditty project the models were coupled with a Decision Support System (DSS); the whole set of tools was therefore used to assess various management options of the Ria Formosa area. In particular, the considered scenarios included various dredging operations and changes in bivalve cultivation practices. A key aspect of the approach was the proper inclusion of the economic aspects of the various options, including for example the economic revenue of shellfish estimated yield. Rio Formosa CIS therefore provides functionalities related to: scenario development and assessment of alternatives, considering both environmental and economic aspects.

The CIS seems to not include specific functionalities related to stakeholder involvement and participation. However, its development and implementation foresaw the early involvement of the end-user (RNFP) and the organisation of special information events (e.g. international workshops).

<table>
<thead>
<tr>
<th>4 Users</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4a User typology</td>
<td>The system is specifically designed to support the scientifically-based management of the Ria Formosa area, also including advanced modelling tools. Indeed, main users are expert users, coastal planners and coastal managers. In particular the final “end-user” of the CIS is the Ria Formosa Natural Park Authority.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5 Use of the system</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5a Accessibility</td>
<td>Off-line access.</td>
</tr>
<tr>
<td>5b User-friendliness</td>
<td></td>
</tr>
<tr>
<td>5c Interactiveness</td>
<td>No specific e-participation tools appear to be available.</td>
</tr>
<tr>
<td>5d Data access</td>
<td>No data and metadata are directly accessible on line at the moment.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6 Technological characteristics</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>6a Used technology</td>
<td>The GIS is developed with ESRI (ArcGis 8.3) technology (licensed software).</td>
</tr>
<tr>
<td>6b Integration with other tools</td>
<td>Besides the GIS component, the CIS also includes two integrated mathematical models. The soil and water assessment tool enables to simulate land drainage to the coastal ecosystem, providing forcing conditions to the second model, EcoDynamo that simulates hydrodynamic and biogeochemical processes. Furthermore, within the Ditty project the models were coupled with a Decision Support System (DSS), in particularly used for scenario building and assessment of management alternatives.</td>
</tr>
<tr>
<td>6c Integration with other CIS</td>
<td>No integration with other CIS</td>
</tr>
<tr>
<td>6d</td>
<td>Interoperability</td>
</tr>
<tr>
<td>----</td>
<td>-----------------</td>
</tr>
<tr>
<td>7</td>
<td>Cost/Resources</td>
</tr>
<tr>
<td>7a</td>
<td>Resources</td>
</tr>
</tbody>
</table>

The budget allocated to the Portuguese partners involved in the Ditty project was about € 247,000. There were approximately 10 researchers working in the development of the tools over a period of three years. No specific data are available for operation costs.

Information sources for the overview analysis of Ria Formosa CIS:


Web-site consultation for the overview analysis of Ria Formosa CIS:

- [http://ec.europa.eu/ourcoast/index.cfm?menuID=9&amp;articleID=125](http://ec.europa.eu/ourcoast/index.cfm?menuID=9&amp;articleID=125); last visit on 18/02/2011 at 14.00.


- [http://www2.ufp.pt/~pduarte/](http://www2.ufp.pt/~pduarte/); last visit on 14/03/2011 at 11.00.
### General Information

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1a</strong> Name</td>
<td>MEGASIG – Monitoring and Environmental management of the Guardiana Estuary Salt Marshes</td>
</tr>
<tr>
<td><strong>1b</strong> Description</td>
<td>MEGASIG is an European INTERREG IIIA project that was developed under the framework of the cross-border cooperation between the Centre of Marine and Environmental Research (CIMA) of the University of Algarve-Portugal (proponent institution), the Department of Geology of the University of Huelva- Spain and the Institute of Natural Resources and Agrobiology of Seville-Spain. Guardiana River is one of the most important rivers in the Iberian peninsula, with a total length of 730 km; 200 km are the natural southern border between Spain and Portugal. The Guadiana estuary area is managed by 5 municipalities (2 Portuguese and 3 Spanish ones) and two Authorities (one Spanish and one Portuguese) dealing with the management of two natural protected areas. Part of the estuary zone – not included in the protected areas - supports economic activities such as salt production, aquaculture, fishing, and tourism. The area is also very important for its ecological value. MEGASIG project enabled to develop a GIS and a web-GIS application for the environmental monitoring and sustainable management of the Guardiana estuary. The project gave also much importance to improve public awareness to the area’s value.</td>
</tr>
<tr>
<td><strong>1c</strong> Operating entity</td>
<td>Centre of Marine and Environment Research of the University of Algarve</td>
</tr>
<tr>
<td><strong>1d</strong> Management structure</td>
<td>Centre of Marine and Environment Research of the University of Algarve</td>
</tr>
<tr>
<td><strong>1e</strong> Contacts</td>
<td>Carlos Loureiro; e-mail: <a href="mailto:cloureiro@ualg.pt">cloureiro@ualg.pt</a> Centre of Marine and Environment Research of the University of Algarve Campus de Gambelas, 8005-139 Faro</td>
</tr>
<tr>
<td><strong>1f</strong> Typology</td>
<td>Operational The system is not on-line anymore at the original site <a href="http://www.megasig.org">www.megasig.org</a></td>
</tr>
</tbody>
</table>

### Operational context and information content

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2a</strong> ICZM dimensions</td>
<td>Environmental and the territorial information are well-developed in the CIS. The territory is also exhaustively explored with a large collection of historical maps, surveys and satellite imagery photographs. Very few information are available for the other dimensions, such as those related to communication networks.</td>
</tr>
</tbody>
</table>
| 2b | ICZM Sectors | Main spatial data included in MEGASIG are:  
- Geographical and administrative boundaries  
- Topography and bathymetry  
- Geology and geomorphology  
- Present and palaeo digital terrain model  
- Coastline evolution  
- Historical mapping  
- Aerial photography and Satellite imagery  
- Land use  
- Agriculture and forestry  
- Climate parameters  
- Bio-monitoring  
- Water chemical quality  
- Sediment quality  
- Sampling sites  
- Vegetation and habitat mapping  
- Nature 2000 sites  
- Communication networks |
| 2c | Integration | No specific integration among information is directly provided. |
| 2d | Spatial scale | Local – Estuary of the Guadiana River |
| 2d | Flexibility | The system has been developed in order to be applied specifically to Guadiana Estuary. |
| 3 | ICZM functionalities |  |
| 3a | Knowledge related functionalities | No specific ICZM knowledge related functionalities are directly provided. However, the CIS includes a rich set of environmental and physical information that may properly support integrated analysis for the management of the estuary, in particular in relation to geomorphologic aspects.  
Furthermore, many information sectors include multi-time data. Time series are for example available for historical maps, coastline evolution, aerial photography and satellite imagery, thus enabling comparative analysis and interpretation of historical geomorphologic and biological phenomena. |
| 3b | Process related functionalities | MEGASIG supports problem understanding, in particular relation to the geomorphologic and biological evolution of the Guardiana rivers estuary.  
Among the considered ICZM process related functionalities, MEGASIG gave importance to tools for on-line participation. Multimedia informative and didactical application for environmental education were designed and developed. These presented three qualitative levels of information according to the knowledge level of the potential user. Tools were mainly customized for schools and NGO’s and were available in three languages (Spanish, Portuguese and English). As for the CIS, |
### 4 Users

<table>
<thead>
<tr>
<th>4a</th>
<th>User typology</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEGASIG project identified the following target user of the CIS:</td>
<td></td>
</tr>
<tr>
<td>- Local municipalities</td>
<td></td>
</tr>
<tr>
<td>- Administrative Authorities of two natural protected areas</td>
<td></td>
</tr>
<tr>
<td>- Regional authorities</td>
<td></td>
</tr>
<tr>
<td>- Environmental NGO’S</td>
<td></td>
</tr>
<tr>
<td>- School and civil society.</td>
<td></td>
</tr>
</tbody>
</table>

### 5 Use of the system

<table>
<thead>
<tr>
<th>5a</th>
<th>Accessibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEGASIG included an important Web-GIS component and other on-line education and communication tools. However, these are not on-line anymore at the original web-site <a href="http://www.megasig.org">www.megasig.org</a></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5b</th>
<th>User-friendliness</th>
</tr>
</thead>
<tbody>
<tr>
<td>The system is not on-line anymore, thus user-friendliness can not be evaluated. The system is available in Portuguese, Spanish and English.</td>
<td></td>
</tr>
</tbody>
</table>

### 6 Technological characteristics

<table>
<thead>
<tr>
<th>6a</th>
<th>Used technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>The GIS application was developed with the ESRI ArcGIS (licensed) software. Web-GIS component was developed using the ESRI ArcIMS software</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6b</th>
<th>Integration with other tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>The original design of the CIS foresaw the integration of the off-line GIS with a Web-GIS component and multimedia informative and didactical application</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6c</th>
<th>Integration with other CIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>No specific integration with other CIS</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6d</th>
<th>Interoperability</th>
</tr>
</thead>
<tbody>
<tr>
<td>High.</td>
<td></td>
</tr>
<tr>
<td>The system was developed respecting EU INSPIRE initiative guidelines for a spatial information infrastructure (see document downloadable at <a href="http://www.gisig.it/eco-imagine/esri_questionari/04-Nice/Carlos_esri.pdf">www.gisig.it/eco-imagine/esri_questionari/04-Nice/Carlos_esri.pdf</a>)</td>
<td></td>
</tr>
</tbody>
</table>

### 7 Cost/Resources

<table>
<thead>
<tr>
<th>7a</th>
<th>Resources</th>
</tr>
</thead>
</table>

Information sources for the overview analysis of MEGASIG:


Web-site consultation for the overview analysis of MEGASIG:

- [http://www.gisig.it/eco-imagine/abstract/Borsisti/Posters_Nice/Loureiro.htm](http://www.gisig.it/eco-imagine/abstract/Borsisti/Posters_Nice/Loureiro.htm); last visit on 08/02/2011 at 16.00.
- [www.gisig.it/eco-imagine/esri_questionari/04-Nice/Carlos_esri.pdf](http://www.gisig.it/eco-imagine/esri_questionari/04-Nice/Carlos_esri.pdf); last visit on 08/02/2011 at 17.00.
# REDIAM - Environmental Information Network of Andalusia

<table>
<thead>
<tr>
<th>1</th>
<th>General Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>Name</td>
</tr>
</tbody>
</table>
| 1b | Description | REDIAM is a web-oriented system designed for the integration of the information on the Andalusia environment generated by all types of producers of environmental information centres in the Autonomous Community. The system is composed by integrated different subsystems. These major subsystems refer to topics whose importance and interest deserve special attention:  
- Biodiversity  
- Geodiversity  
- Climate  
- Waters  
- Wetlands  
- Urban environment  
- Coastal and marine environment  
REDIAM is explicitly designed for information, communication and participation purposes, and is also used as tool for ICZM (in particular the subsystem on coastal and marine environment) by the technicians and decision-makers of the Andalucía Government. |
| 1c | Operating entity | Andalusian Autonomous Government (Junta de Andalucía), Ministry of the Environment of Andalusia (Consejería de Medio Ambiente - CMA) |
| 1d | Management structure | Ministry of the Environment of Andalusia (Consejería de Medio Ambiente - CMA). Technical management is commissioned to Egmasa, in-house company of CMA. |
| 1e | Contacts | Address for information requests  
A/A Directora General de Desarrollo Sostenible e Información Ambiental, Consejería de Medio Ambiente, Dirección General de Desarrollo Sostenible e Información Ambiental, Avda Manuel Siurot, nº 50, 41013 – Sevilla.  
E-mail for questions and suggestions: rediam.cma@juntadeandalucia.es  
E-mail for information and data requests: dgdsia.cma@juntadeandalucia.es  
Specific contact: José Enrique Frieyro at Egmasa (email: jfrieyro@egmasa.es), in charge of technical development and management of the Coastal and marine environment subsystem.  
REDIAM Web-site http://www.juntadeandalucia.es/medioambiente/site/web/rediamic/ |
| 1f | Typology | Operational |
## Operational context and information content

### 2a ICZM dimensions

REDIAM addresses all the five ICZM dimension considered by the analysis. The environment dimension is particularly developed. REDIAM also includes information related to territory, economic and social aspects. The governance information is partly covered, in particular in relation to environmental planning features.

### 2b ICZM Sectors

REDIAM Catalog is composed by the following main information typologies:

- Territory characterisation (topographic information, ortho-photos and ortho-imagery);
- Geographical references (reference systems, geographical grids, toponyms);
- Administrative units;
- Natural resources (biodiversity, geodiversity, climate, water, landscape);
- Environmental quality (atmosphere, water, soil, waste, forest ecosystems);
- Risk (natural hazards, accidents and natural disasters);
- Natural heritage (protected natural areas, public forests, trails, public facilities);
- Areas of special interest (urban environment, coastal and marine environment);
- Environmental planning (natural areas planning, forest plans, water plans);
- Land use (land use, forest resources, mineral resources, water resources, transport and mobility, hunting, etc.);
- Environmental protection facilities;
- Demography and health.

### 2c Integration

REDIAM is designed as an easy and flexible data provider that allows any user to make further data elaboration, but also provides thematic map viewers integrating different layers and tools, thematic map web services and downloadable static maps. Examples of integrated information provided by REDIAM are those related to natural and technological risks, such as: fire, flooding, erosion and desertification risks.

### 2d Spatial scale

Sub-national – whole Andalusia territory, including Andalusia coastal area

### 2e Flexibility

The system has been developed in order to be applied specifically to the Andalusian territory.

## ICZM functionalities

### 3a Knowledge related functionalities

The Coastal and marine environment subsystem, explicitly aimed to support the Andalusian ICZM, is composed of information gathered by the SIGLA project and several other specific studies, such as diagnostics of Coastal sustainability plan developed by the Ministry of Environment, the information on Management plans for natural resources of the coastal parks, maps by the Spanish Institute of Oceanography (ESPACE project), and other results of
<table>
<thead>
<tr>
<th>3b</th>
<th>Process related functionalities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>projects related to the costs developed by various research centres. This information is gradually expanding and complementing the existing basic information (coastal physiography, characterization of the coastline, bathymetry, land use, sea level, waves, winds, streams, reservoirs, water quality, fisheries, artificial reefs, etc.).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3b</th>
<th>Process related functionalities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>REDIAM provides functionalities supporting problem understanding (such as the coastal vulnerability index), and functionalities for stakeholders involvement and participation. At present a new specific web GIS tool for ICZM is going to be integrated in the REDIAM, strongly enhancing process related functionalities, by means of:</td>
</tr>
<tr>
<td></td>
<td>- 2D, hybrid and 3D map viewer integrating territorial information and dedicated coastal analysis and characterization, that will facilitate problem understanding;</td>
</tr>
<tr>
<td></td>
<td>- flooding areas simulator based on defined sea level rise, useful for vision building, scenario development and adaptive planning;</td>
</tr>
<tr>
<td></td>
<td>- tools to analyse and compare multi-time data, supporting coastal evolution monitoring and evaluation.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4</th>
<th>Users</th>
</tr>
</thead>
<tbody>
<tr>
<td>4a</td>
<td>User typology</td>
</tr>
<tr>
<td></td>
<td>REDIAM represents a further step from the Ministry of the Environment of Andalusia towards environmental data standardisation and sharing, aiming to make available to all stakeholders involved in the production and use of environmental information (technician management, members, general public) a web tool of information allowing interaction and participation in the creation and enhancement of environmental information about Andalusia. Centres or institutions can become members of the REDIAM network through collaboration agreements, sharing common environmental data bases, technical criteria for information gathering and classification, software to manage such information.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5</th>
<th>Use of the system</th>
</tr>
</thead>
<tbody>
<tr>
<td>5a</td>
<td>Accessibility</td>
</tr>
<tr>
<td></td>
<td>Free access on-line (from the home page) to the environmental data catalog, thematic information packages, web map services, general and thematic map viewers and information request services. Personnel of Andalusian Autonomous Government can access REDIAM information also via intranet with different user types privileges (basically normal user and technical manager)</td>
</tr>
</tbody>
</table>

| 5b | User-friendliness |
|     | Highly user-friendly. The web page structure allows a very easy and flexible information search and download. Map viewers use common and intuitive web GIS functionalities and icons. REDIAM is available in Spanish and English. |

| 5c | Interactiveness |
|     | E-mail for questions and suggestions and additional information and data request services (like the “Citizen’s post-box”, on-line request forms with digital sign, direct e-mail to system managers) |
5d Data access

From REDIAM web page these main services are available:
- environmental data catalog
- thematic information packages (including *.pdf documents with detailed description, spatial information in shapefile and GML format, metadata in *.xml format)
- web map services (WMS and Google format)
- general and thematic map viewers
- additional information and data request services

6 Technological characteristics

6a Used technology

The system has been developed using the following software technology:
- ESRI (for Geo-DB and spatial data standardising)
- Oracle (for alphanumeric and metadata storage)
- MapServer (for web-GIS development)
- OGC (for spatial data services)

6b Integration with other tools

REDIAM makes up the Regional Focal Point of Andalucía for the European Information and Observation Network about the Environment (EIONET) and is the specialized node in Environmental Information within the Spatial Data Infrastructures of Andalusia (Infraestructura de Datos Espaciales de Andalucía - IDEAndalucia).

Map viewers can link WMS maps provided by other entities.

6c Integration with other CIS

The information gathered by SIGLA project has been integrated in the subsystem “Coastal and marine environment” of REDIAM.

6d Interoperability

High

The use of standard protocols for data management (INSPIRE Directive for spatial data, EUROSTAT standards for statistics, SEIS for methodologies) and downloadable data formats that don’t need license (in particular OGC) guarantees a high interoperability of the system.

7 Cost/Resources

7a Resources

Number of involved persons: about 50 in Egmasa and about 10 in CMA.
Information sources for the overview analysis of REDIAM:


Web-site consultation for the overview analysis of REDIAM:


- [http://ec.europa.eu/ourcoast/index.cfm?menuID=6&articleID=1](http://ec.europa.eu/ourcoast/index.cfm?menuID=6&articleID=1); last visit on 7/02/2011 at 15.15.
## Spatial Data Infrastructure of Balearic Islands

### 1 General Information

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>Name</td>
</tr>
<tr>
<td>1b</td>
<td>Description</td>
</tr>
<tr>
<td>1c</td>
<td>Operating entity</td>
</tr>
<tr>
<td>1d</td>
<td>Management structure</td>
</tr>
<tr>
<td>1d</td>
<td>Contacts</td>
</tr>
<tr>
<td>1e</td>
<td>Typology</td>
</tr>
</tbody>
</table>

### 2 Operational context and information content

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2a</td>
<td>ICZM dimensions</td>
</tr>
<tr>
<td>2b</td>
<td>ICZM Sectors</td>
</tr>
</tbody>
</table>
- Topographic maps in different years (2008, 2006, 2002, 1995);
- DEM (2002, 2006);
- Cadastre and propriety;
- Administrative boundary (e.g. municipalities, census section etc.);
- Limits and administrative management for the spatial planning (e.g. Mallorca Territorial Plan, Menorca Equipment Territorial Plan, Menorca Reconversion Territorial Plan, Menorca Risks Territorial Plan, Waste Sector Master Plan, Quarries Sector Master Plan, Industrial Area, etc.);
- Limits and administrative management for the environment (e.g. Paraje Natural Sierra, special nature reserve, Sierra Nature Reserve, protected natural spaces, Natura 2000, place of scientific interest, marine reserves, controlled hunting, wildlife refuges etc.);
- Geology and land use (e.g. Corine Land cover in different years - 1990, 2000, 2002, 2006, geology, etc.);
- Mobility and street (e.g. road network, rail network and metro, seaports, airports, transport infrastructure, transport network etc.);
- Hydrography (e.g. water sources, hydrographic network, geo-morphological flood plans, riparian forests, control surface water, etc.);
- Atmosphere and weather (pluviometric zones);
- Biological aspect (e.g. bionomic, habitat, etc); this section also includes the Bioatlas. This is a free on-line catalog of fauna and flora species of Balearic islands;
- Economy (e.g. tourist establishments, facilities in beach, zone of tourist interest, tourist information offices);
- Health (e.g. sectors sanitary inspections, pharmacies, health centres etc.);
- Infrastructure (e.g. energy, conventional energy centres, pipelines, cogeneration-wind farms, photovoltaic panels, waste facilities, drainage and water treatment, water supply etc.);
- Bathymetry;
- Nautical charts;
- Historic heritage (e.g. monuments, assets of cultural interest, environment assets of cultural interest, oil-mills, flour windmills, water extraction windmills, regulated anchorage, territorial waters, zone with submarine prohibition etc.).

A specific search function allows the user to find the data through the use of key words.

<table>
<thead>
<tr>
<th>2c</th>
<th>Integration</th>
<th>No specific integration among information is directly provided.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2d</td>
<td>Spatial scale</td>
<td>Local scale - Balearic Islands in the Mediterranean Sea.</td>
</tr>
</tbody>
</table>
### 2e Flexibility

IDEIB and its map-viewer have been developed in order to be applied specifically to the zone of Balearic Island.

### 3 ICZM functionalities

#### 3a Knowledge related functionalities

IDEIB catalogue and map-viewer provide some of the knowledge related functionalities considered by the analysis; specifically:
- Availability of spatial data; the system is designed to share some of the geographic data through Web Map Service (WMS), in particular through the Catalogue functionality.
- Operation at the different spatial scale is not fully developed; however the map-viewer provides bathymetric layers with different spatial resolution (1:50.000, 1:100.000, 1:200.000);
- Availability of multi-time data, such as in the case orthophotos and topographic maps enabling to evaluate the evolution of the coastal system.

#### 3b Process related functionalities

The system does not specifically include ICZM process related functionalities. However, users are invited to provides their own data, thus enabling their participation in the construction IDEIB.

### 4 Users

#### 4a User typology

Main target users can be identified in:
- Coastal planners and managers; the map-viewer provides a high number of spatial data and the possibility to generate simple customised maps;
- Experts, likely more interest in the Catalogue functionality, enabling to search for metadata and url for WMS connection;
- Citizens, thanks to the intuitive use of the map-viewer.

The complete development of the SDI system will also improve the likely target users.

### 5 Use of the system

#### 5a Accessibility

The Map-viewer and the metadata catalogue are completely accessible on-line

#### 5b User-friendliness

High/Medium

The map-viewer of the IDEIB is built around an interactive map very easy to browse, which allows anyone to identify and visualize those datasets relevant to their interest. Map-viewer is available in 4 languages (Spanish, Catalan, English and German).

Current version of the web-site, likely due to the fact that it is under evolution, is not totally user-friendly.
| 5c | Interactiveness | No specific e-participation tools are available. The IDEIB and its map-viewer enable users to provide suggestions to improve the functionality of the system. This can be done through a specific feedback form. |
| 5d | Data access | The system is designed to share some of the spatial data through Web Map Service (WMS); this can for example visualised thought the freely acquirable GAIA software. Spatial data can not however be downloaded. The Catalogue is used to manage metadata through specific sheet also including url for the WMS connection. |

### 6 Technological characteristics

| 6a | Used technology | Map-Viewer has been developed with licensed ESRI software. |
| 6b | Integration with other tools | No specific integration with other tools. |
| 6c | Integration with other CIS | There is no proper integration with other CIS. However, the IDEIB web-site allows connection to external web-site and external web-GIS projects, such as:  
- New web-site mapping of the Council of Minorca. This web-site provides different thematic web-GIS interfaces, such as those concerning: the insular territorial plan, the waste and quarries sector master plan and environmental planning.  
- A web-site mapping of the Council of Mallorca. This web-site provides some thematic web-GIS interfaces, specifically related to the Territorial Plan of Mallorca and a generic map viewer of geographic information of the islands. |
| 6d | Interoperability | High  
The system is compliant with International standard for metadata (ISO 19115).  
The information content is structured according to the specifications of the European Directive INSPIRE.  
Indeed the whole SDI development aims to fully meet INSPIRE Directive and the Spanish IDEE requirements. |

### 7 Cost/resources

| 7a | Resources | Web-site consultation for the overview analysis of IDEIB:  
- [http://ideib.caib.es/visualitzador/visor.jsp](http://ideib.caib.es/visualitzador/visor.jsp); last visit on 15/04/2011 at 12.30.  
# IDEC-LITORAL

<table>
<thead>
<tr>
<th>1</th>
<th>General Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>Name</td>
</tr>
<tr>
<td>1b</td>
<td>Description</td>
</tr>
<tr>
<td>1c</td>
<td>Operating entity</td>
</tr>
<tr>
<td>1d</td>
<td>Management structure</td>
</tr>
<tr>
<td>1d</td>
<td>Contacts</td>
</tr>
<tr>
<td>Typology</td>
<td>Operational</td>
</tr>
<tr>
<td>---------------</td>
<td>-------------</td>
</tr>
</tbody>
</table>

## 2 Operational context and information content

### 2a ICZM dimensions

IDEC-LITORAL addresses four of the five ICZM dimension: territory (e.g. for general geographic descriptors, land use, marine protected areas), environment (e.g. biology related spatial data), economy (e.g. energy consumption, fishery) and society (e.g. employed population, tourism).

### 2b ICZM Sectors

Data/cartographic information included in the Web-GIS of the IDEC-LITORAL are structured in 5 groups:
- Administrative boundaries;
- Cadastre;
- Coastal Observatory, including for example marine protected area, land protected area, coastal birds, generated waste, average daily water consumption, power consumption, etc.;
- Fishery, including for example: bathymetry, map of sea-grass, coastline, artificial reef, lithology, prohibited areas for fishing, suitable areas for fishing, etc.
- Corine land use in different years.

The IDEC catalog provides a much wider set of spatial data, not specifically referred to the coastal system. Each layer is described through a metadata sheet. A great part of the layers are accessible to the generic user, while for some of them the access is restricted to the authorised users.

### 2c Integration

The IDEC-LITORAL Web-GIS does not specifically include integrated information.

### 2d Spatial scale

Sub-National – Catalonian coast in Spain.

### 2e Flexibility

IDEC-LITORAL been developed in order to be applied to the specific coastal territory of Catalonian coast.

## 3 ICZM functionalities

### 3a Knowledge related functionalities

IDEC-LITORAL provides some of the knowledge related functionalities considered by the analysis; specifically:
- Availability of spatial data; A great part of the spatial layer included in the IDEC SDI can be directly accessed (through downloading or WMS) by general users. Authorised users can fully benefit of the IDEC SDI and the related web-site to share and exchange spatial data on a high number of themes;
- Support experiences and best practices exchange in relation to data management and geographic information in general.

### 3b Process related functionalities

IDEC-LITORAL does not directly provides ICZM process related functionality. More in general IDEC SDI aiming to share and
### Users

<table>
<thead>
<tr>
<th>4</th>
<th>User typology</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>4a</strong></td>
<td>The final users of the IDEC-LITORAL mainly are:</td>
</tr>
<tr>
<td></td>
<td>- Public Administrations, such as the Catalonia Government, the Spanish Government, local entities;</td>
</tr>
<tr>
<td></td>
<td>- Other public and private institutions of Catalonia</td>
</tr>
<tr>
<td></td>
<td>In general users are identified as all public bodies, actors and services working on public Geographic Information in the Catalanian Region. In march 2010, IDEC involved about 118 registered organizations.</td>
</tr>
</tbody>
</table>

### Use of the system

<table>
<thead>
<tr>
<th>5</th>
<th>Accessibility</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>5a</strong></td>
<td>Full access to all data (including data sharing and exchange) is provided to members of the IDEC network. IDEC system is in general accessible by every user that can utilise the on-line Catalogue to search for and access to spatial data. IDEC-LITORAL Web-GIS is freely accessible on-line, also enabling map customisation.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5b</th>
<th>User-friendliness</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Highly/Medium user-friendly.</strong></td>
<td></td>
</tr>
<tr>
<td><strong>The Web-GIS is built around an interactive map very easy to browse, which allows anyone to identify and visualize those datasets relevant to their interest. The spatial data catalogue is less easy and intuitive to use, also due to the great number of contained information. The use is however supported by filtering and searching functionalities.</strong></td>
<td></td>
</tr>
<tr>
<td><strong>The system is available in Spanish and English.</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5c</th>
<th>Interactiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stakeholder involvement and participation is a specific aim of the IDEC SDI that provides the Platform Resources of Geo-information – to authorised users - to create a strong mutualisation of decisions related to data and information sharing and exchange.</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5d</th>
<th>Data access</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>For the IDEC SDI in general:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- All spatial data can be accessed by authorised users through the Platform Resources of Geo-information;</td>
</tr>
<tr>
<td></td>
<td>- More than 35% (15000 on 38000) spatial layers can be directly downloadable by general users through the Catalogue; another consistent part can be visualise through WMS. Other spatial data can not be directly accessed due to confidentiality reasons defined by data producers;</td>
</tr>
<tr>
<td></td>
<td>- Metadata complying with ISO 19155 are available for all the IDEC layers.</td>
</tr>
<tr>
<td></td>
<td><strong>All IDEC-LITORAL spatial data, including those visualised in the Web-GIS, are part of IDEC SDI</strong></td>
</tr>
</tbody>
</table>
### Technological characteristics

<table>
<thead>
<tr>
<th>6</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>6a</td>
<td>Used technology</td>
</tr>
<tr>
<td>6b</td>
<td>Integration with other tools</td>
</tr>
<tr>
<td>6c</td>
<td>Integration with other CIS</td>
</tr>
<tr>
<td>6d</td>
<td>Interoperability</td>
</tr>
</tbody>
</table>

### Cost/resources

<table>
<thead>
<tr>
<th>7</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>7a</td>
<td>Resources</td>
</tr>
</tbody>
</table>

Information sources for the overview analysis of IDEC-LITORAL:


Web-site consultation for the overview analysis of IDEC-LITORAL:

- [http://www.geoportal-idec.net/idecostes/index.jsp?pag=home&lang=ca](http://www.geoportal-idec.net/idecostes/index.jsp?pag=home&lang=ca); last visit on 13/04/2011 at 12.30
### Thau Lagoon Coastal Information System

<table>
<thead>
<tr>
<th>1</th>
<th>General Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>Name</td>
</tr>
</tbody>
</table>
| 1b | Description | The Thau Lagoon CIS is an off-line GIS managed by the “Observatoire du Syndicat Mixte du Bassin de Thau” (Thau Lagoon Observatory). The Syndicat Mixte du Bassin de Thau (SMBT) is a management body created in 2005 and involving two Etablissements Publics de Coopération Intercommunale (EPCI):
- La Communauté d'Agglomération du Bassin de Thau (CABT);
- La Communauté de Communes du Nord du Bassin de Thau (CCNB).
In order to achieve the implementation of integrated management of the lagoon and its watershed, SMBT created the Thau Lagoon Observatory, whose main aim is to collect, managed and share information (data, statistics, indicators, maps, etc.) and tools (such as database and GIS) related to this territory. The Observatory also monitors the evolution and sustainable development of the territory, by means of long term indicators, particularly focusing on Integrated Coastal Zone Management (ICZM).
The Thau lagoon situated is situate along the French Mediterranean coast and has a surface of 75 km² and an average depth of 4 m (max depth: 10 m). The population on the watershed was about 130,000 inhabitants in 2005 with a density of 465 inhabitants for km² and with a very strong growing rate.
The Thau Lagoon is one of the sites analysed within the DITTY project that produced new management tools for this coastal and contributed to establish links or to strengthen the existing ones between administrative bodies, scientific institutions, universities and technical agencies. |
| 1c | Operating entity | Syndicat Mixte du Basin de Thau |
| 1d | Management structure | Thau Lagoon Observatory of the Syndicat Mixte du Basin de Thau |
| 1d | Contacts | Jean Jacques Taillade, e-mail jj.taillade@smbt.fr Syndicat Mixte du Bassin de Thau 328, Quai des Moulins 34200 Sète Web-site: [http://smbt.teledetection.fr/](http://smbt.teledetection.fr/) |
| 1e | Typology | Operational |
## Operational context and information content

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2a</strong></td>
<td><strong>ICZM dimensions</strong></td>
</tr>
<tr>
<td></td>
<td>The Thau Lagoon CIS addresses all the five considered information dimensions, although through simple but very communicative modalities (see section 2b), i.e. static maps contained in the Cartothèque section.</td>
</tr>
</tbody>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2b</strong></td>
<td><strong>ICZM Sectors</strong></td>
</tr>
<tr>
<td></td>
<td>The web-site of the Syndicat Mixte du Basin de Thau includes a specific section (Cartothèque) providing a great number of static maps related to the following main sectors:</td>
</tr>
<tr>
<td></td>
<td>- Territorial information;</td>
</tr>
<tr>
<td></td>
<td>- Planning and management; i.e. maps related to the “Schéma de COhérence Territoriale (SCOT)” and the “Schéma d’Aménagement et de Gestion des Eaux (SAGE)”</td>
</tr>
<tr>
<td></td>
<td>- ICZM; i.e. simple maps on competence related to ICZM implementation;</td>
</tr>
<tr>
<td></td>
<td>- Population, in particular including maps of the historical evolution of the population;</td>
</tr>
<tr>
<td></td>
<td>- Mobility, mainly related to workers travels;</td>
</tr>
<tr>
<td></td>
<td>- Economy; e.g. maps related to marinas, port activities, agriculture, maritime transportation, etc.</td>
</tr>
<tr>
<td></td>
<td>- Architectonic heritage;</td>
</tr>
<tr>
<td></td>
<td>- Natural heritage; such as for example natural protected areas, plans for the wetlands management, high-values areas, etc.;</td>
</tr>
<tr>
<td></td>
<td>- Sanitation; mainly waste water treatment plants;</td>
</tr>
<tr>
<td></td>
<td>- Drinking water resources;</td>
</tr>
<tr>
<td></td>
<td>- Monitoring of water quality of rivers of drainage basin;</td>
</tr>
<tr>
<td></td>
<td>- Monitoring of quality of bathing water;</td>
</tr>
<tr>
<td></td>
<td>- Monitoring of eutrophication in the lagoon;</td>
</tr>
<tr>
<td></td>
<td>- <em>Escherichia coli</em> surveillance.</td>
</tr>
<tr>
<td></td>
<td>Above maps are mainly addressing communication purposes and are therefore presented in simple a very clear modalities. The off-line GIS archives and manage data used to derive these maps, also including basic layers and others such as:</td>
</tr>
<tr>
<td></td>
<td>- Orthophotos database;</td>
</tr>
<tr>
<td></td>
<td>- Digital Elevation Model;</td>
</tr>
<tr>
<td></td>
<td>- Bathymetry;</td>
</tr>
<tr>
<td></td>
<td>- Topography;</td>
</tr>
<tr>
<td></td>
<td>- Cadastral maps.</td>
</tr>
<tr>
<td></td>
<td>- Corine Land Cover;</td>
</tr>
<tr>
<td></td>
<td>- Urban development, including scenario simulation for 2020.</td>
</tr>
</tbody>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2c</strong></td>
<td><strong>Integration</strong></td>
</tr>
<tr>
<td></td>
<td>Main objectives of maps made available by the <a href="http://smbt.teledetection.fr">http://smbt.teledetection.fr</a> site in the Cartothèque section appears to be communication and awareness rising. In this perspective for some of the main topics, the web-site provides synthetic maps that integrates different data, such as for example the map of the economic activities or the map of areas with high environmental values.</td>
</tr>
</tbody>
</table>
### 2d Spatial scale
Local – Thau Lagoon and the related drainage basin.

### 2e Flexibility
The system has been developed in order to be applied specifically to the territory of the Thau Lagoon Hydrographic basin.

### 3 ICZM functionalities

#### 3a Knowledge related functionalities
Thau Lagoon CIS provides some of the knowledge related functionalities considered by the analysis, specifically:
- Integration among dimensions and/or sectors (see 2c), mainly related to communication aspects;
- Multi-time data and information: the system collects different temporal and environmental variables supporting a multi-level temporal analysis. This is particularly evident for population data and the territorial evolution (orthophotos).
- The Thau Lagoon Observatory has developed a set of 126 indicators (structured in 8 principal themes) for sustainable development and management of the Thau Lagoon in an ICZM perspective. In particular, SMBT, in partnership with the University of Montpellier I, Cepralmar, and the Ecole Normale Superieur de Cachan, formed in 2007-2008 a working group on "indicators" to identify and prioritize sustainable development indicators for the territory of Thau Lagoon. The related report (December 2007) is available on-line. However, at the moment, the indicators are not directly integrated in the web-site.

### 3b Process related functionalities
Maps included in the web-site appear to properly support communication and awareness raising aspects of the ICZM process. In this perspective it is also important to stress that indicators were developed.

### 4 Users

#### 4a User typology
Main users of on-line maps appear to be the civil society in general and whoever can be interested in communication of the integrated management of the lagoon.
The off-line GIS is presumably targeted to expert users.

### 5 Use of the system

#### 5a Accessibility
The CIS is not on-line, but all the maps and the documents with the elaboration are freely downloadable.

#### 5b User-friendliness

#### 5c Interactiveness
The CIS is an off-line system. The web-site freely provides access to static maps to any users

#### 5d Data access
All static maps and some documents are downloadable from the web-site (mainly in pdf format). Proper metadata are not available on-line; however map contents are illustrated by summary
### Technological characteristics

<table>
<thead>
<tr>
<th>6a</th>
<th>Used technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>6b</td>
<td>Integration with other tools</td>
</tr>
<tr>
<td>6c</td>
<td>Integration with other CIS</td>
</tr>
<tr>
<td>6d</td>
<td>Interoperability</td>
</tr>
</tbody>
</table>

Interoperability analysis is not fully applicable to the web-site that does not directly provide data. Interoperability of the off-line system cannot be assessed. As report in [this link](http://smbt.teledetection.fr/index.php?option=com_content&task=view&id=68&Itemid=201), the Observatory will use the on-line catalogue tool called “MDWEB”. MDWEB is a generic tool, open source based on international metadata standards (ISO 19115) and communication (OGC).

### Cost/resources

| 7a | Resources |

Information sources for the overview analysis of Thau Lagoon Coastal Information System:


Web-site consultation for the overview analysis of Thau Lagoon Coastal Information System:

- [this link](http://smbt.teledetection.fr); last visit on 31/03/2011 time 16.00
- [this link](http://www.ifremer.fr/syscolag/index2.htm); last visit on 31/03/2011 at 17.00.
- [this link](http://www.ifremer.fr/lerlr/surveillance/atlas/thau.htm); last visit 31/03/2011 at 9.10
- [this link](http://ec.europa.eu/ourcoast/index.cfm?menuID=9&articleID=254); last visit 07/04/2011 at 12.10.
# CRIGE PACA Spatial Data Infrastructure

<table>
<thead>
<tr>
<th></th>
<th>General Information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong></td>
<td><strong>Name</strong></td>
</tr>
</tbody>
</table>
| **1a** | **Description** | CRIGE-PACA SDI is a framework of spatial data, metadata, users and tools that are interactively connected in order to use spatial data in an efficient and flexible way. The SDI is operated and managed by CRIGE-PACA the “Regional Centre for Geographic Information in Provence-Alpes-Cote d'Azur”. The on-line platform of the CRIGE-PACA SDI is the web-site [http://www.crige-paca.org/](http://www.crige-paca.org/). This is currently under further development and will be configured and named as Regional Geoportal. CRIGE-PACA is a non-profit making organization created in 2002, led by national and regional authorities through a seven-year financial plans (2000-2006 and 2007-2013). CRIGE-PACA main mission is to promote, facilitate, support and spread geographical information to public administrations and when possible, to general public and stakeholders. The above overall aim includes the following specific objectives:  
- Provide geographic referenced data (digital data-sets) via the existing CRIGE-PACA web-site and its future evolution in the Regional Geoportal; the on-line participative and data-sharing platform (for public administrations) of the CRIGE-PACA SDI;  
- Provide technical support to users, including: help-line for assistances, production of technical and requirements guides, editing specifications, technical meetings, on-line resources;  
- Support the Regional Geomatic Network, through: promotion of cooperation between local users and data providers, support local communities of interests, management of thematic clusters, experiences and best practices exchange, acting as a resource centre on GIS concepts;  
- Act as a coordination centre for the implementation of the INSPIRE directive at the regional level. CRIGE-PACA is the coordinator of the Regional Geomatic Network involving thematic clusters (Pôles metiers). These clusters are structured around local animators and a certain number of working groups, bringing together regional organisations interests in thematic datasets issues. One of these twelve cluster deals with Sea and Coast (Mer & Littoral) bringing together the coastal stakeholders of the PACA region. CRIGE PACA received in 2009 an “eSDI NET+ Best Practice Award” for its innovative organisational and institutional aspects in terms of cooperation, subsidiary and sustainability. CRIGE-PACA SDI and its web-site are constantly updated and innovated; in particular a new version of the web-site (the Regional Geoportal) will be available soon, including new applications to facilitate query and sharing of the data. |
### 2a ICZM dimensions

The CRIGE-PACA SDI addresses all the five ICZM dimensions, attempting to include the information relevant for the thematic clusters being part of the Regional Geomatic Network:

- Environment;
- Water;
- Agriculture;
- Forest;
- Sea and Coast;
- Risks;
- Urbanism;
- Employment;
- Telecom;
- Health;
- Economy;
- Fire
- Roads and transportation.

### 2b ICZM Sectors

Data/cartographic information included in CRIGE-PACA SDI and accessible through the CRIGE-PACA data catalogue are structured in the following groups of spatial layers (some of them are downloadable):

- **Geographic information**: including for example topography, bathymetry, road, vegetation features, cadastral map, Euro Global Map, etc.;
- **Thematic layers**: this section contains about 85 layers/documents such as for example: administrative boundary, land cover, flooding zones, rainfall, mean annual temperature, biological reserves, natural areas, noise exposure, forest zones, identification of potential areas of radon emanations, posidonia monitoring network, soil classification, altitudinal vegetation, etc.). This group also contains some information related to the governance dimension, such as layers and documents related to: Plans de Développement de Massif (PDM), Plans Simples de...
| 2c Integration | Examples of integrated information are maps from Cartopas 2010, related to the assessment of the natural and technological risks for the addressed territory. The “Natural risk” section for example includes maps related to flooding, seismic and landslide. |
| Gestion (PSG), Schémas d'Aménagement et de Gestion des Eaux (SAGE) en région PACA etc. | - *Aerial Ortho photos*; including for example: orthophotos with high resolution (20 cm), historical aerial photographs of the coast (several years), etc.  
- *Satellite images*: including false colour image of the Region PACA (1999-2006) and false colour image of the Mediterranean 2006.  
The CRIGE-PACA web-site also provides the “Cartopas 2010” functionality enabling the users to browse and visualise (in pdf format) maps related to the following themes:  
- The territory and its evolution (e.g. land use, land use from 1990 to 2006, population density from 1996 to 2006 etc.);  
- Management and planning (e.g. in French “Schémas de cohérence territoriale (SCoT) et schémas directeurs (SD)” and Local Plans (PLU), communal cards (CC), land use plans (POS), etc.);  
- Air and climate (e.g. temperature, precipitation, state of air pollution by ozone, state of air pollution by suspended solids, etc.);  
- Land polices for sustainable development (e.g. in French “Etat d’avancement des Schémas d’Aménagement et de Gestion des Eaux (SAGE)”, the local Agenda 21 site and the map of the local plans energy environment (PLEE));  
- Nature and biodiversity (e.g. natural reserve, natural areas of ecological interest for fauna and flora, site NATURA 2000 etc.);  
- Landscapes and sites (e.g. map of regional synthesis of classified sites and sites registered under the Act of May 2, 1930 in the PACA region and Operations Great Sites, typology of regional landscapes, etc.);  
- Data on water quality (e.g. aquifers and piezometric network, biological quality of the rivers, etc.);  
- Water policy (e.g. principal water drainage, targets according to the Water Framework Directive (WFD), ecological and chemical status of rivers and coastal water, vulnerable and sensible zones for the nitrate, urban waste water treatment unit, annual volume of water used by geographical department, etc.);  
- Energy (e.g. electricity transmission network, wind energy development, wind speed, wind power and potentially energy, development status of photo voltaic power projects, etc.);  
- Housing (e.g. Status of the Local Housing Programs (PLH), percentage of social housing, etc.);  
- Transport (e.g. road, traffic in major roads, etc.);  
- Natural, technological and mining risk (e.g. flooding risk, atlas of the flooding zones, seismic risk, climatic occurrence of heavy rainfall, industrial risk, etc.). |
Addressed technological risks include for example maps of: risk related to large dams, industrial risk and risk related to mining and quarrying. Several integrated maps are available also in the data catalogue (e.g. Atlas of flooding zones).

### 2d Spatial scale
- Sub-National scale - PACA (Provence – Alpes - Cote d'Azur) Region, also including the related coastal zone.

### 2e Flexibility
- The system has been developed in order to be applied specifically to PACA region territory.
- CRIGA-PACA is in contact with various local authorities to whom it offers the possibility of mutualising data by creating a task force for the management of coastal data.

### 3 ICZM functionalities

#### 3a Knowledge related functionalities
- CRIGE-PACA SDI provides some of the knowledge related functionalities considered by the analysis; specifically:
  - Integration among different information sectors (see point 2c), including some integrated maps related to natural and technological risks;
  - Availability of spatial data; authorised users (mainly public administrations) can benefit of the CRIGE-PACA SDI and the related web-site to share and exchange spatial data on a high number of themes;
  - Support experiences and best practices exchange in relation to data management and geographic information in general.

#### 3b Process related functionalities
- CRIGE-PACA SDI provides a high variety of data related to different information sectors and dimensions and therefore can properly support problem understanding. Spatial data are organised according to an articulated structure that can support user in the elaboration of conceptual models of the territory.
- Stakeholder involvement and participation is a specific aim of the CRIGE-PACA SDI that provides a platform to create a strong mutualisation of decisions related to data and information sharing and exchange.

### 4 Users

#### 4a User typology
- The final users of the Spatial Data Infrastructure developed and managed by the CRIGE-PACA are:
  - Government agencies;
  - Local governments as municipalities, Provinces, Region;
  - Thematic public chambers;
  - No profit making organizations;
  - Universities and research laboratories.
- In general users are identified as all public bodies, actors and services working on public Geographic Information in the PACA Region.
- The Regional Geomatic Network currently involves about 3170 persons belongings to more than 1500 organizations.
## Use of the system

| 5a | Accessibility | Full access to all data (including data sharing and exchange) is provided to public bodies of the PACA Region that are members of the Regional Geomatic Network. Every public entity can become member of the Network through an on-line application form available in the Geoportal. CRIGE-PACA verifies if the applicant entities are really a public bodies and therefore may become Networks members. The system is in general accessible by every user that can visualise a great number of spatial layers (some of them can be also downloaded) and pre-defined maps in pdf format (through the “Cartopas 2010” functionality). |
| 5b | User-friendliness | Medium user friendly. Current version on-line is not totally intuitive. “Cartopas 2010” provide an easy-to-use tool for query and browsing maps available in the system. The new development of the web-site into the Regional Geoportal will significantly improve the intuitive and easy use of the system. Currently, the system in only in French. |
| 5c | Interactiveness | Stakeholder involvement and participation is a specific aim of the CRIGE-PACA SDI that provides a platform to create a strong mutualisation of decisions related to data and information sharing and exchange. |
| 5d | Data access | Public bodies of the PACA Region that are members of the Regional Geomatic Network have access to all information and can download all spatial data. Other users can download some of the spatial layers available in the CRIGE-PACA web-site. Metadata are provided for all data of the CRIGE-PACA web-site. For the data accessible through “Cartopas 2010” functionality brief metadata descriptions are made available. |

## Technological characteristics

| 6a | Used technology | Open sources technologies are adopted for the development of the new version of the Regional Geoportal CRIGE-PAC, including: MAPSERVER, Geosource, PostGIS, MySQL, etc. |
| 6b | Integration with other tools | Specific function of the CRIGE-PACA SDI is integration of data and information provided by the various members of the Regional Geomatic Network, i.e. public bodies. The SDI is therefore integrated with several database managed by various data providers (see the list at [http://www.crige-paca.org/frontblocks/print/print_LOT_CARTES.asp](http://www.crige-paca.org/frontblocks/print/print_LOT_CARTES.asp)) |
| 6c | Integration with other CIS | In the case of CRIGE-PACA-SDI this issue is strictly connected with and therefore addressed in point 6b. |
| 6d | Interoperability | High. The CRIGE-PACA regional Geoportal is compliant with Open Geospatial Consortium standards and implement the existing |
specifications of the INSPIRE directive. The CRIGE-PACA regional Geoportal is one of the first French regional web sites totally interoperable with national and European data management standards.

7 Cost/resources

7a Resources

CRIGE-PACA is responsible for the management of the CRIGE-PACA SDI and the related Regional Geoportal. CRIGE-PACA involves a team composed by 8 full-time persons. The budget for the SDI management from 2009 to 2011 was about 620,000 €/year.

Information sources for the overview analysis of CRIGE-PACA SDI:


Web-site consultation for the overview analysis of CRIGE-PACA SDI:

- http://www.crige-paca.org/; last visit on 22/02/2011 time 12.00.

**SICoast Information System**

<table>
<thead>
<tr>
<th>1</th>
<th>General Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>Name</td>
</tr>
</tbody>
</table>
| 1b | Description | The SICoast Information system (SICoast-IS) was realized by the Spatial Planning Department of the Liguria Region. SICoast-IS consists of various cartographic interfaces (Web-GISs), each one related to a specific thematic (e.g. geomorphology, nature, landscape, public domain, administrative, regulatory etc.). These are actually pre-defined maps (each one with its own interface), that can be however customised by the user through Web Map Service (WMS). Data included in SICoast-IS have been collected and provided by various regional structures and related to numerous studies and research activities. Data contained in the information systems are those useful in supporting integrated coastal zone planning and management of the Liguria coast. In particular the system and data were used to support the elaboration of the “Territorial Plan of Coordination of the coast” (Piano Territoriale di Coordinamento della Costa). SICoast-IS is regularly updated and integrated with new levels of information, in order to provide a suitable tool to the most recent European policies on maritime spatial planning. Besides the Internet component, SICoast-IS also includes an Intranet Web-GIS, containing other spatial data and functionalities. This description mainly refers to the information system freely available in Internet. The Liguria Region Authority has developed other Web-GIS tools related to sector themes that can be relevant for ICZM. Data included in these tools can be easily integrated in SICoast-IS through the WSM functionality. Two Web-GISs are particularly relevant in this perspective:  
  - SiSea – Information System on the quality marine-coastal waters;  
  - Web-GIS of the Water Conservation Plan (“Piano di Tutela delle Acque”), with information related to each water body;  
  - Sirip – Information System on nourishment interventions (under development). |
| 1c | Operating entity | Spatial Planning Department of the Liguria Regional |
| 1d | Management structure | Spatial Planning Department of the Liguria Region Information Systems Service |
| 1d | Contacts | Corinna Artom, e-mail: corinna.artom@regione.liguria.it  
Dipartimento Pianificazione Territoriale, Urbanistica  
Ufficio Aree Demaniali marittime Regione Liguria  
Regione Liguria  
via Fieschi 15 - piano S2  
16121 - Genova |
| 2a | ICZM dimensions | SICoast-IS mainly addresses three of the five considered information dimensions. The environment and the territory dimension are both well developed. Some governance information are integrated in the system, in particular referring to the Plan of use of the public coastal areas (PUD = “Progetto Utilizzo Demanio Marittimo”). |
| 2b | ICZM Sectors | The SICoast-IS consists of different web-GIS applications, each on related to one of the following topics:  
- Administrative boundary of the coastal municipalities;  
- Coastal topography;  
- Catalogue of photos of the coast (2006-2008-2010);  
- Historical photos of the coast;  
- Shoreline evolution from 1944 to 2003;  
- Coastal defence;  
- Beaches and high coasts;  
- Bathymetry;  
- Land and marine Natura 2000 sites;  
- Atlas of the Marine Habitat;  
- Fishing farming plants, aquaculture and barriers for the fish restocking;  
- Marine Natural Protected Areas;  
- Plan of use of the public coastal areas (PUD = “Progetto Utilizzo Demanio Marittimo”) including the actual use and the future planned one.  
These are actually pre-defined maps (each one with its own interface), that can be however customised by the user through Web Map Service (WMS), thus enabling to visualise a higher number of spatial data. The Intranet component (not addressed in this description) includes other spatial data. |
| 2c | Integration | No specific integration among different information is directly provided within the system. |
| 2d | Spatial scale | Sub-National – Coast of the Liguria Region on the Tyrrhenian Sea. |
| 2e | Flexibility | The SICoast-IS has been developed in order to be applied specifically to the coastal zone of Liguria Region. |
### ICZM functionalities

<table>
<thead>
<tr>
<th>3a</th>
<th>Knowledge related functionalities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SICoast-IS provides some of the knowledge related functionalities considered by the analysis, specifically:&lt;br&gt;- Operation at the different spatial scale; some of the available spatial data can be re-scaled according to the considered spatial extent; thus enabling to visualize more details at a higher scales, e.g. the aerial photos, bathymetry etc..&lt;br&gt;- Availability of multi-time data; multi-time spatial data are for example provided for the shoreline evolution (1944-1973-1983-1993-2003). SICoast-IS also includes an historical collection of photos of the coast. Both dataset can be useful to evaluate the morphological evolution of the coastline.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3b</th>
<th>Process related functionalities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The various customizable Web-GIS interfaces of SICoast-IS can provide a good support to problem understanding. The online component does not currently and directly provides other ICZM process related functionalities. It is anyhow important to highlight that data contained in the information systems are useful in supporting integrated coastal zone planning and management of the Liguria coast. In particular the system and data were used to support the elaboration of the “Territorial Plan of Coordination of the coast (Piano Territoriale di Coordinamento della Costa).</td>
</tr>
</tbody>
</table>

### Users

<table>
<thead>
<tr>
<th>4a</th>
<th>User typology</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The web-GIS is freely accessible to all the interested users. Target users can be in particular identified in:&lt;br&gt;- Decision-makers;&lt;br&gt;- Coastal planners and/or managers;&lt;br&gt;- Specialized and expert users&lt;br&gt;The latter two can benefit of the WMS service, for example integrating the Liguria Region spatial data with data provided by other sources. &lt;br&gt;The Intranet component of the system is accessible by the staff of the Spatial Planning Department and by other authorised users (likely other regional public offices).</td>
</tr>
</tbody>
</table>

### Use of the system

<table>
<thead>
<tr>
<th>5a</th>
<th>Accessibility</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Internet versions of SICoast-IS is freely accessible. Users can also customise maps provided by the different Web-GIS through a Web Map Service (WMS). This in particular enable to potentially visualise SICoast-IS any spatial data, including in particular those provided by the Liguria Region through the Cartographic Service: <a href="http://www.cartografia.regione.liguria.it">http://www.cartografia.regione.liguria.it</a>.&lt;br&gt;WMS service also provides the possibility to visualise and use data from a client application, for example using the freely available GAIA software.&lt;br&gt;Access to the Intranet version is restricted only to authorised users.</td>
</tr>
<tr>
<td>5b</td>
<td>User-friendliness</td>
</tr>
<tr>
<td>----</td>
<td>-------------------</td>
</tr>
<tr>
<td>5c</td>
<td>Interactiveness</td>
</tr>
<tr>
<td>5d</td>
<td>Data access</td>
</tr>
</tbody>
</table>

### 6 Technological characteristics

<table>
<thead>
<tr>
<th>6a</th>
<th>Used technology</th>
<th>The system uses MapServer (4.10.3), (open source software).</th>
</tr>
</thead>
<tbody>
<tr>
<td>6b</td>
<td>Integration with other tools</td>
<td>No specific integration with other tools.</td>
</tr>
<tr>
<td>6c</td>
<td>Integration with other CIS</td>
<td>SICoast-IS is structured as a set of thematic Web-GIS. All pre-defined interfaces can be highly customised by the users through the WMS functionality. This provides a dynamic integration with other information systems supporting WMS, in particular those provided by the same Liguria Region (see description of some of them in 1b). SICoast-IS is included in the BEACHMED-e (Strategic management of beach protection for sustainable development of Mediterranean coastal zones) project web-site. The other web-GIS connected inside the BeachMed-e project are - Emilia Romagna Region Web-GIS; - Lazio Region web-GIS; - Toscana Region Web-GIS; - Catalunya Web-GIS.</td>
</tr>
<tr>
<td>6d</td>
<td>Interoperability</td>
<td>High. SICoast utilises Open Geospatial Consortium compliant Web Map Services (WMS). Metadata are structured and described according to the standard ISO 19115, being therefore meeting the INSPIRE Directive requirements.</td>
</tr>
</tbody>
</table>

### 7 Cost/resources

| 7a | Resources | |
|----|-----------|
Information sources for the overview analysis of SICoast:


Web-site consultation for the overview analysis of SICoast:


- [http://www.cartografiarl.regione.liguria.it/SiraWebGis/IndiceCarte_PT.asp?idCanale=SICOST](http://www.cartografiarl.regione.liguria.it/SiraWebGis/IndiceCarte_PT.asp?idCanale=SICOST); last visit on 21/03/2011 at 12.45.
# CMGIZC Web-GIS

<table>
<thead>
<tr>
<th></th>
<th>General Information</th>
</tr>
</thead>
</table>
| 1a | Name                | CMGIZC Web-GIS  
Web-GIS of the “Centro di Monitoraggio per la Gestione Integrata della Zona Costiera della Regione Lazio” (Web-GIS of the Monitoring Centre for Integrated Coastal Zone Management of the Lazio Region) |
| 1b | Description         | CMGIZC Web-GIS was developed by the Monitoring Centre for Integrated Coastal Zone Management of the Lazio Region. The Web-GIS covers the coastal and marine area of the Lazio Region.  
Main goals of this application are:  
- Make a large number of information relevant for the management of the coastal zone available;  
- Collect in the same information system data provided by various sources  
- Improve accessibility to the information on the coastal zone.  
The Web-GIS is accessible through the web-site of the Monitoring Centre for ICZM of the Lazio Region that provides further information on ICZM in this area. The same site also includes an interactive “forum on the coast” aiming to involve citizens and stakeholders to provide opinions on the coastal management and in particular in indicating particular meteo-marine and erosive events along the Lazio coastline. |
| 1c | Operating entity    | Direzione Regionale Ambiente - Gestione Aree Marine Protette (Regional Environment Department – Management of Marine Protected Areas) of the Lazio Regional Authority |
| 1d | Management structure| Centro di Monitoraggio per la Gestione Integrata della Zona Costiera (Monitoring Centre for Integrated Coastal Zone Management)  
Direzione Regionale Ambiente - Gestione Aree Marine Protette (Regional Environment Department – Management of Marine Protected Areas) |
| 1d | Contacts            | Paolo Lupino; e-mail: paolo.lupino@tiscali.it;  
Silvia Bellacicco; e-mail: sbellacicco@regione.lazio.it  
Monitoring Centre for Integrated Coastal Zone Management  
Regional Environment Department – Management of Marine Protected Areas  
Lazio Region  
Web-GIS: [http://80.94.113.69/cmg_segnalazioni/](http://80.94.113.69/cmg_segnalazioni/)  
CMGIZC Web-Site: [http://www.cmgicz.info/](http://www.cmgicz.info/) |
| 1e | Typology            | Operational |
## 2 Operational context and information content

<table>
<thead>
<tr>
<th>2a</th>
<th>ICZM dimensions</th>
<th>CMGIZC Web-GIS mainly addresses two of the five considered information dimensions. The environment and the territory dimensions are in depth developed.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2b</td>
<td>ICZM Sectors</td>
<td>Data/cartographic information included in web-GIS CMGICZ are related to the main following topics:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Basic cartographic maps;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Topography;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Bathymetry;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Rivers, canals, lakes, and other hydrologic layers;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Use of the coast (2004-2005);</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Administrative boundary;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Marine habitat (such as nursery areas and seagrass meadows)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Coastal and marine protected coastal area;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Underwater cables;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Limitation of the sea use (e.g. military zones and no fishing areas);</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Typology of marine sediments, including potential mining areas;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Coastal defence interventions;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Orthophotos;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Digital Elevation Model.</td>
</tr>
<tr>
<td>2c</td>
<td>Integration</td>
<td>No specific integration among information is directly provided.</td>
</tr>
<tr>
<td>2d</td>
<td>Spatial scale</td>
<td>Sub-National – Coast of Lazio Region along the Italian Tyrrhenian coast.</td>
</tr>
<tr>
<td>2e</td>
<td>Flexibility</td>
<td>The web-GIS was developed in order to be applied to the specific coastal territory of Lazio Region.</td>
</tr>
</tbody>
</table>

## 3 ICZM functionalities

<table>
<thead>
<tr>
<th>3a</th>
<th>Knowledge related functionalities</th>
<th>CMGIZC Web-GIS provides some of the knowledge related functionalities considered by the analysis, specifically:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>- Availability of spatial data; the system is designed to share some of the geographic data through Web Map Service (WMS). To support data sharing, the Web-GIS provides a direct link for the download of the GAIA software; this is a free software that can be easily used to visualise spatial data through WMS (and other similar protocols) from a client desktop. The Web-GIS also provides a clear help supporting the use of GAIA;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Operation at the different spatial scale; some of the available spatial data can be re-scaled according to the</td>
</tr>
</tbody>
</table>
considered spatial extent; thus enabling to visualize more
details at a higher scales (e.g. coastline and bathymetric
line);
- Availability of multi-time data, such as in the case of
coastline in nine different years (from 1944 to 2005)
enabling to evaluate the evolution of the coastal system.

<table>
<thead>
<tr>
<th>3b</th>
<th>Process related functionalities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CMGIZC web-GIS provides some of the process related functionalities considered by the analysis, specifically:</td>
</tr>
<tr>
<td></td>
<td>- Problem understanding and structuring; CMGIZC Web-GIS's structure is well articulated and complete, thus enabling users to easily find data and information and relate the same to specific issues. Thus CMGIZC Web-GIS is well-shaped for problem understanding and structuring, as well as coastal management and planning at the sub-national level.</td>
</tr>
<tr>
<td></td>
<td>Furthermore, a new function called “Calcolo della linea di costa” (Calculation of the coastline) has been recently implemented in the web-GIS. This new tool enables the user (including no-expert ones) to calculate the morphological evolution of the coastline within a specific period a for selected coastal area. As results, the tool generates a graph representing the loss or the acquired volume (sedimentation/erosion budget) for the selected zone and period. The user can also export the linear evolution of the coast in a couple of format.</td>
</tr>
<tr>
<td></td>
<td>- Stakeholder involvement and participation; the web-GIS. Includes a specific tool (recently implemented) allowing the user to enter georeferred observations, for example concerning the erosion problem. The design and implementation of the new tool has been funded and by the MedLab European Project. The final aim is to involve citizens and stakeholders who can report relevant erosion, weather, marine and environmental events along the coastline.</td>
</tr>
<tr>
<td></td>
<td>The web-site hosting the CMGICZ includes also web coastal forum aiming to involve citizens and stakeholders to provide opinions on the coastal management and in particular in indicating particular meteo-marine and erosive events along the Lazio coastline.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4</th>
<th>Users</th>
</tr>
</thead>
<tbody>
<tr>
<td>4a</td>
<td>User typology</td>
</tr>
<tr>
<td></td>
<td>The broad nature of this web-GIS is intended for anyone who may be interested in the Lazio region coastal and marine information. For this reason potential users are:</td>
</tr>
<tr>
<td></td>
<td>- Policy-makers;</td>
</tr>
<tr>
<td></td>
<td>- Decision-makers;</td>
</tr>
<tr>
<td></td>
<td>- Coastal planners and/or managers;</td>
</tr>
<tr>
<td></td>
<td>- Specialised and expert users.</td>
</tr>
<tr>
<td></td>
<td>- Civil society.</td>
</tr>
</tbody>
</table>
## 5 Use of the system

| 5a  | Accessibility | Free access on-line to the complete web-GIS and related tools |
| 5b  | User-friendly  | Highly user-friendly. This web-GIS is built around an interactive map very easy to browse, which allows anyone to identify, visualize those datasets relevant to their interest. The new implemented tool for the calculation of the morphological evolution is easy and friendly to use (based on a Wizard solution). The system is only in Italian. |
| 5c  | Interactiveness | The web-GIS and the related web-site of the “Monitoring Centre for Integrated Coastal Zone Management” include two tools specifically aiming to enhance stakeholder involvement and interaction. The first one (recently implemented) allows the user to enter georeferred observations, for example concerning erosion, weather, marine and environmental problems and events occurring along the coastline. The second tool is a web coastal forum aiming to involve citizens and stakeholders in providing and discussing opinions on integrated coastal management, in particular in relation to the main relevant problems for the Lazio Region (such as erosion). |
| 5d  | Data access | The system is designed to share some of the spatial data through Web Map Service (WMS); this can for example visualised thought the freely acquirable GAIA software. Spatial data can not however be downloaded. A specific functionality enables the user to create customised maps, that can exported in pdf format. At the moment the access at the metadata information is not allowed because the metadata description is under construction. |

## 6 Technological characteristics

| 6a  | Used technology | The web-GIS is developed with MapGuide. MapGuide is an Open Source web-based platform that enables users to develop and deploy web mapping applications and geospatial web services. |
| 6b  | Integration with other tools | No specific integration with other tools. |
| 6c  | Integration with other CIS | The web-site of the Monitoring Centre for Integrated Coastal Zone Management provides the link to other two small web-GIS specifically focusing on two naturalistically and tourism relevant islands of the Lazio Region: Ponza and Ventotene. The web-GIS Lazio Region is included in the BEACHMED-e (Strategic management of beach protection for sustainable development of Mediterranean coastal zones) project web-site. The other web-GIS connected inside the BeachMed-e project |
Information sources for the overview analysis of CMGiZC Web-GIS:


Web-site consultation : for the overview analysis of CMGiZC Web-GIS:

- [http://www.beachmed.it/](http://www.beachmed.it/): last visit on 23/02/2011 at 15.00.
- [http://www.cmgiczc.info/](http://www.cmgiczc.info/): last visit on 06/04/2011 at 15.00.
- [http://80.94.113.69/cmg_segnalazioni/](http://80.94.113.69/cmg_segnalazioni/): last visit on 06/04/2011 at 18.00.
# Web GIS Coast of the Campania Region

<table>
<thead>
<tr>
<th></th>
<th>General Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>Name</td>
</tr>
<tr>
<td>1b</td>
<td>Description</td>
</tr>
<tr>
<td>1c</td>
<td>Operating entity</td>
</tr>
<tr>
<td>1d</td>
<td>Management structure</td>
</tr>
</tbody>
</table>
| 1e | Contacts           | info mail: difesa.suolo@regione.campania.it  
Difesa del Suolo  
Regione Campania  
Via De Gasperi n 28 - 80133 Napoli  
Web-GIS: http://www.difesa.suolo.regione.campania.it/content/view/20/36/ |
| 1f | Typology           | Operational |

## 2 Operational context and information content

| 2a | ICZM dimensions | The Web-GIS mainly focuses on problems regarding coastal morphology and related coastal protection. Therefore, the Web-GIS considers two of the five analysed ICZM dimensions: territory and environment. |
| 2b | ICZM Sectors    | Spatial data are structured in the following main groups:  
Cartographic basic information:  
- Digital Elevation Model  
- Administrative boundaries  
- Coastline evolution |
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2c</strong></td>
<td>Integration</td>
<td>No specific integrated information among different data is directly provided within the system</td>
</tr>
<tr>
<td><strong>2d</strong></td>
<td>Spatial scale</td>
<td>Sub-national scale – Coastal area of the Campania Region</td>
</tr>
<tr>
<td><strong>2d</strong></td>
<td>Flexibility</td>
<td>The Web-GIS was designed and developed on the basis of the conceptual and procedural model used by Emilia Romagna Region to implement its own CIS. Knowledge transfer has been one of the activity of the A.G.I.R.E. POR project. In particular, main objective of this project was the transfer of a procedural model for the development of an Information System of the Coast in support of management and planning of coastal areas.</td>
</tr>
<tr>
<td><strong>3</strong></td>
<td>ICZM functionalities</td>
<td>The Web-GIS provides only some of the considered ICZM knowledge related functionalities:</td>
</tr>
<tr>
<td><strong>3a</strong></td>
<td>Knowledge related functionalities</td>
<td>- Availability of spatial data; the system is designed to share geographic data through Web Map Service (WMS);</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Operation at the different spatial scale; some of the available spatial data can be re-scaled according to the considered spatial extent; thus enabling to visualize more details at a higher scales;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Some multi-time data and information are available, e.g. for the coastline evolution, land use and orthophotos at different years. These information provides useful data to monitor the coastal evolution process and related problems.</td>
</tr>
<tr>
<td><strong>3b</strong></td>
<td>Process related functionalities</td>
<td>The Web-GIS does not contain ICZM process related functionalities. Its data can properly support the problem understating and planning of relative solutions in relation to coastal erosion and other problems affecting coastal morphology.</td>
</tr>
<tr>
<td><strong>4</strong></td>
<td>Users</td>
<td>Since one of the main objectives of the CIS is to support coastal planning activities, in particular in relation to coastal erosion, the main target users are coastal planners and managers. General users, interested in being informed on coastal protection and evolution are also included as target users; easy understandable and accessible spatial layers are in fact available through the CIS.</td>
</tr>
<tr>
<td><strong>5</strong></td>
<td>Use of the system</td>
<td>Free access on-line without password to the complete Web-GIS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td><strong>5b</strong></td>
<td>User-friendliness</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Highly user-friendly. The use of the web-GIS on-line is simple and intuitive, also due to the present simple structure and limited contents of the system. Only Italian language is available.</td>
<td></td>
</tr>
<tr>
<td><strong>5c</strong></td>
<td>Interactiveness</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No specific e-participation tools are available for interactiveness</td>
<td></td>
</tr>
<tr>
<td><strong>5d</strong></td>
<td>Data access</td>
<td></td>
</tr>
<tr>
<td></td>
<td>From the Web-GIS, maps can be printed and exported in pdf format; however the same tool does not enable to download spatial data. The system is designed to share spatial data through Web Map Service (WMS); this can for example visualised through the freely acquirable GAIA software. Very simple metadata are provided for each layer.</td>
<td></td>
</tr>
<tr>
<td><strong>6</strong></td>
<td>Technological characteristics</td>
<td></td>
</tr>
<tr>
<td><strong>6a</strong></td>
<td>Used technology</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Used technology is MapServer, an Open Source platform for publishing spatial data and interactive mapping applications to the web.</td>
<td></td>
</tr>
<tr>
<td><strong>6b</strong></td>
<td>Integration with other tools</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The Web-GIS includes data of the IFFI Project (Inventory of landslide phenomena) for the Campania Region, displaying landslide areas within 1km from the coast.</td>
<td></td>
</tr>
<tr>
<td><strong>6c</strong></td>
<td>Integration with other CIS</td>
<td></td>
</tr>
</tbody>
</table>
|   | No direct integration with other CIS is provided. The Soil Protection Department of the Campania Region has developed other Web-GIS that however are not directly to the Web-GIS coast. These for example includes:  
  - Web-GIS on interventions for soil protection;  
  - Web-GIS on geological and geomorphological characteristics;  
  - Web-GIS on the Regional Territory Plan. |
| **6d** | Interoperability |
|   | Medium  
Spatial data can be share and visualised through Web Map Service. This guarantees a high interoperability of the system in relation to data sharing. However, currently only very simple metadata (not meeting INSPIRE protocols) are provided |
| **7** | Costs/Resources |
| **7a** | Resources |

Web-site consultation for the overview analysis of the Web GIS Coast of the Campania Region:  
- [http://www.difesa.suolo.regione.campania.it/content/view/71/86/](http://www.difesa.suolo.regione.campania.it/content/view/71/86/) Last visit on 24/02/2011 at 12.30.
Coastal and marine information system of Emilia Romagna Region

<table>
<thead>
<tr>
<th></th>
<th>General Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>Name</td>
</tr>
</tbody>
</table>
| 1b | Description | Since 2002 the Emilia-Romagna Region has been involved in ICZM and quickly grasped the need for a tool that would facilitate the management of data and enable an increased knowledge of coastal issues.  

The Coastal and marine information system of Emilia Romagna Region has been implemented within the EU CADSEALAND (Land-sea interaction: coastal state and evolution in CADSES) (2004-2006) project and it has been designed following the guidelines issued by European Commission within the EUROSION programme (EU commission, 2004). After the CADSEALAND project, Emilia Romagna Region was involved in the EU funded PlanCoast project (2006-2008). Within the activities of that project, the CIS of Emilia Romagna was updated to further support coastal and marine spatial planning, too. PlanCoast also foresaw the use of the CIS of Emilia Romagna to define a conceptual framework for the Ferrara coastal area (included in the Emilia Romagna Region) in order to identify and evaluate coastal vulnerability and to define criteria and objectives for territorial programming and planning.  

The CIS contains data collected by different institutions during the last 100 years and several GIS products (maps) resulting from survey activities and from studies recently carried out by the Geological, Seismic and Soil Survey of the Emilia Romagna Region. This CIS refers to the whole Emilia-Romagna coastal zone. This CIS is continuously updated and represents a fundamental support for decision makers and coastal planners dealing with ICZM.  

Actually the CIS of Emilia Romagna is undergoing further implementation and upgrades within the EU project MICORE (Morphological Impacts and Coastal Risks induced by Extreme storms events – 2008 – 2011). The general aim of this project is to develop and test online tools for reliable predictions of the morphological impact of marine storm events in support to civil protection mitigation strategies.  

This CIS also includes a Web-GIS component, enabling the on-line publication of part of the spatial data contained in the off-line GIS. The Web-GIS will in particular support diffusion and share of data among the peripheral structures of the Emilia Romagna Region. |
| 1c | Operating entity | Servizio Geologico, Sismico e dei Suoli (SGSS) - Emilia Romagna (Geological, Seismic and Soil Survey – Emilia Romagna Region) |
| 1d | Management structure | Geological, Seismic and Soil Survey of Emilia Romagna Region |
| 1e | Contacts | Luisa Perini, e-mail: lperini@regione.emilia-romagna.it  
Geological, Seismic and Soil Survey |
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Regione Emilia-Romagna</strong>&lt;br&gt;Viale della fiera&lt;br&gt;840127 Bologna, Italy&lt;br&gt;Web-GIS: <a href="http://geo.regione.emilia-romagna.it/costa/viewer.htm">http://geo.regione.emilia-romagna.it/costa/viewer.htm</a>&lt;br&gt;Web-site of the site of Geological, Seismic and Soil Survey: <a href="http://www.regione.emilia-romagna.it/wcm/geologia_en/index.htm">http://www.regione.emilia-romagna.it/wcm/geologia_en/index.htm</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>1f</strong> Typology</td>
<td>Operational</td>
<td></td>
</tr>
<tr>
<td><strong>2</strong> Operational context and information content</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>2a</strong> ICZM dimensions</td>
<td>This CIS addresses four of the five ICZM dimension: territory, environment, economy and society. The environment and the territory dimensions are in-depth developed. The economic dimension mainly refers to information related to tourism and fishing activities. Few social information are available in the CIS; i.e. density population.</td>
<td></td>
</tr>
<tr>
<td><strong>2b</strong> ICZM Sectors</td>
<td>This CIS has been designed following the guidelines issued by EC within the EUROSION programme (EU commission, 2004). Consequently, the CIS is organized according to these ten thematic topics:&lt;br&gt;- Topography (e.g. orthophotos, DEM, bathymetry);&lt;br&gt;- Geomorphology, geology and sedimentology;&lt;br&gt;- Hydrodynamics (e.g. waves, tides, current);&lt;br&gt;- Land cover;&lt;br&gt;- Administrative boundaries (provincial and municipal boundaries);&lt;br&gt;- Demography (e.g. population density and touristic fluxes);&lt;br&gt;- Heritage and protected Areas (e.g. Natura 2000 sites);&lt;br&gt;- Economic information (e.g. tourism infrastructure, fishing license);&lt;br&gt;- Coastal defences; i.e. database containing the works of coastal defences;&lt;br&gt;- Sea Uses (e.g. pipelines, offshore plants, area for sand extraction).&lt;br&gt;The Web-GIS component currently includes a sub-set of all data available in the off-line version.</td>
<td></td>
</tr>
<tr>
<td><strong>2c</strong> Integration</td>
<td>This CIS is mainly developed like an operative tool. The aim is to collect and organize the data of the coastal environment. In addition, a large amount of data available makes it possible to define the state of the coastal vulnerability and the coastal risk management through integration of different layers or comparative analysis of the available data.&lt;br&gt;In particular, the CIS is currently supporting MICORE project, dealing with integrated analysis of data to evaluate morphological impacts of marine storm events in support to civil protection mitigation strategies. The project is specifically targeted to contribute to the development of probabilistic mapping of the morphological impacts of marine storm and the production of early warning and information systems to support long-term disaster reduction.</td>
<td></td>
</tr>
</tbody>
</table>
2d Spatial scale

Sub-National scale – Coast of the Emilia Romagna Region.
This CIS covers the whole coast of the Emilia-Romagna region; a 130 km coastline along the Adriatic Sea, from the Goro Po mouth to the Gabicce village. The distinctive element of this coast is the beach, produced by the interaction, over a long period of time, between sediment carried to the sea by rivers, redistribution and deposition by the waves and marine currents and the modelling action of the wind.

2e Flexibility

This CIS has not been developed in order to be specifically applied to other coastal territories. However, its conceptual and procedural model has been used to support the design of the Campania Region CIS, within the twinning project A.G.I.R.E. POR.

3 ICZM functionalities

3a Knowledge related functionalities

This CIS provides some of the ICZM knowledge related functionalities considered by the analysis, specifically:
- Integration among different information sectors. CIS of Emilia Romagna Region for example includes maps of coastal vulnerability to erosion, integrating information related to three main aspects: geomorphology, coastal evolution and human impact. Coastal vulnerability issue is further studied in the MICORE project (see 2c);
- Availability of spatial data. Currently the Web-GIS component still does not allow spatial data downloading; this functionality will be implemented in the near future;
- Operation at the different spatial scale; some of the available spatial data can be re-scaled according to the considered spatial extent; thus enabling to visualize more details at a higher scales;
- Availability of multi-time data: multi-time data are for example available for the shoreline position (six years within the 1953 – 2006 period) for data related to storm events.
- This CIS does not specifically address coastal vulnerability to climate change, at the moment. MICORE project could determine also improvement related to this point.

3b Process related functionalities

This CIS provides some of the processes related functionalities considered by the analysis, specifically:
- Problem understanding and structuring. This CIS was used within the CADSEALAND project to generate an integrated model of the Emilia Romagna coastal zone, related to: geomorphology, infrastructure, bathymetry, waves and currents. These model and related results enabled to reconstruct the historical evolution of coastal morphology. Indeed, erosion and morphological process in general are key topics for the coastal management of the Emilia Romagna Region. Furthermore, the CIS includes a GIS tool, called DSAS - Digital Shoreline Analysis System (developed by the USGS) used to generate 3D morphological models of the shoreline and assess the 3D evolution in different time period.
- Monitoring and evaluation, adaptive planning and management. This CIS includes a database of coastal defence interventions and measures. This Database contains technical
data about coastal defence infrastructure and data related to the assessment of the effects (or the impacts) induced on the coastal morphology. This Database, integrated with the CIS spatial data, supports the evaluation of coastal defence strategy and the relative adaptive planning and management.

<table>
<thead>
<tr>
<th>4</th>
<th>Users</th>
</tr>
</thead>
<tbody>
<tr>
<td>4a</td>
<td>User typology</td>
</tr>
</tbody>
</table>
| The complete version of this CIS is specifically dedicated to the staff of the Geological and Seismic Service of the Soil that has the credits to access to the system.  
The web-GIS is freely accessible to all the citizens.  
The on-going activities of the MICORE projects and the related results (data and tool) are also targeted to the Italian Civil Protection, for the management and mitigation of coastal risks. |

<table>
<thead>
<tr>
<th>5</th>
<th>Use of the system</th>
</tr>
</thead>
<tbody>
<tr>
<td>5a</td>
<td>Accessibility</td>
</tr>
</tbody>
</table>
| This CIS is completely accessible only to the staff of the Geological and Seismic Service by an Intranet connection.  
The web-GIS component is freely accessible on line and makes available part of the information included in the off-line CIS. |
| 5b | User-friendliness |
| The Web-GIS is highly user-friendly.  
Use of off-line system is technically demanding and specifically addressed to expert users. Web-GIS is only in Italian, all related documentation are also in English. |
| 5c | Interactivity |
| The system includes a Web-GIS component, accessible to all on-line users. However, no other specific e-participation tools are included in the Web-GIS.  
Future implementation should develop and activate an interface to collect and exchange data with web users. |
| 5d | Data access |
| Currently, the Web-GIS does not allow spatial data downloading. Static maps in pdf format can be created and exported. Future development also includes the implementation of data downloading functions.  
Metadata are provided in the Web-GIS. Indeed the same can be used to query the available layers and visualise those corresponding to the defined selecting criteria. |

<table>
<thead>
<tr>
<th>6</th>
<th>Technological characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>6a</td>
<td>Used technology</td>
</tr>
</tbody>
</table>
| This CIS is developed with ESRI GIS software. All data are stored and managed by Oracle; ArcSDE technology links the Oracle database with ESRI GIS software.  
The present hardware solution is quite simple. It is based on two servers: an internal server for processing, updating and validating data and another WEB server for data publication. |
| 6b | Integration with other tools |
| This CIS is an integrated with the following tools:  
- The SGSS Centralized Information System, making available raster and vectorial data for the GIS;  
- DB-Sea-storm; database of historical data on storminess and |
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>related meteorological data;</td>
<td>- Some operational models like SWAN and ROMS, used to provide information regarding the forecast and hindcast of sea state and circulation;</td>
</tr>
<tr>
<td></td>
<td>- Xbeach model (DELFt Hydraulics) for the sea-storm events modelling. Xbeach is a two-dimensional model for wave propagation, long waves and mean flow, sediment transport and morphological changes of the near shore area, beaches, dunes and back barrier during storms</td>
</tr>
<tr>
<td>Some specific tools are implemented by this CIS, including:</td>
<td>- the Repository Manager; tool for the management of the Metadata collected respecting the ISO 19115;</td>
</tr>
<tr>
<td></td>
<td>- Database of the coastal defences measures and interventions (such as nourishment).</td>
</tr>
<tr>
<td>6c Integration with other CIS</td>
<td>No specific integration with other CIS</td>
</tr>
<tr>
<td>6d Interoperability</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>The use of standard protocols (according to the Inspire Directive) for data management guarantees a high interoperability of the system. The data acquired were georeferred according to the WGS84 system (or ETRS98) as outlined in EU directives (INSPIRE) and subsequently converted to the regional georeference system.</td>
</tr>
<tr>
<td>7 Cost/Resources</td>
<td></td>
</tr>
<tr>
<td>7a Resources</td>
<td>10 persons are involved in the CIS of Emilia Romagna Region and related hardware and software management. 5 of them are specifically dedicated to CIS operation and 5 others to technological support (likely serving also other services).</td>
</tr>
</tbody>
</table>
Information sources for the overview analysis of CIS of Emilia Romagna Region:


Web-site consultation for the overview analysis of CIS of Emilia Romagna Region:

- [http://geo.regione.emilia-romagna.it/costa/viewer.htm](http://geo.regione.emilia-romagna.it/costa/viewer.htm); last visit on 07/02/2011 at 16.30.

- [http://www.regione.emilia-romagna.it/wcm/geologia/canali/cartografia/sito_cartografia/web_gis_costa.htm](http://www.regione.emilia-romagna.it/wcm/geologia/canali/cartografia/sito_cartografia/web_gis_costa.htm); last visit on 07/02/2011 at 13.30.
CISs of Venice Lagoon

Venice Lagoon is a complex and multi-functional coastal system that has been widely studied and monitored for the great majority of its natural and anthropogenic components. The high number of researches, studies and projects have generated an incredible amount of data and information. These are organised in various information systems, only partially integrated among each other, operated and managed by a variety of public and private subjects. In relation to the objectives of the “Options for coastal information system” project, two principal CISs have been considered, being these the more completed and structured ones as well as those strictly related to a concrete use within coastal zone planning and management. The two systems are:

- The GIS tools of the Information Service of the Venice Water Authority (SINFO CIS);

The two systems have different scopes and uses, that actually integrate each others’ ones. The Information Service was set up in February 1984, implementing the first convention signed between the Venice Water Authority and the Consorzio Venezia Nuova (in the context of the first Special Law no. 171/1973 which established the principle that safeguarding of Venice was a matter of "priority national interest"). Main tasks of the Information Service were and still are to generate, collect, classify and archive data and information on the lagoon environment and the related human activities. These data and information are used to support other bodies operating in the Venice Lagoon (mainly the Venice Water Authority) in dealing with the assessment of the state of the system and the causes of the environmental and morphological deterioration, as well as with the definition of safeguard plans of interventions (defence from high waters, defence from sea storms and environmental protection) and its monitoring.

The Atlas of the Venice Lagoon was initially (2006) created by the Venice Municipality as a collection of maps produced by other bodies. Subsequently the Atlas evolved in an on-line Web-GIS, mainly to provide free access – to any user – to data and information generated by various data producers, including the same Venice Water Authority and the related Information Service. The two main Atlas objectives are to provide support to the Venice Municipality in dealing with the Venice Lagoon management and to share and diffuse spatial data to interested users, including other public institutions, citizens and professionals. The Atlas gives also much relevance to the INSPIRE Directive, aiming to meet related requirements.
**General Information**

<table>
<thead>
<tr>
<th>1a</th>
<th>Name</th>
<th>GIS tools of the Information Service of the Venice Water Authority (SINFO CIS).</th>
</tr>
</thead>
</table>
| 1b | Description | SINFO CIS refers to a set of GIS-based and related (database, models, decision support systems) tools developed by the “Servizio Informativo” (Information Service) of the Venice Magistrato alle Acque di Venezia (Venice Water Authority - MAV), in order to support the management and safeguarding activities of the Venice Lagoon implemented by the same MAV through it concessionary Consorzio Venezia Nuova. Main purpose of the MAV Information Service is the organization of data and their integrated analysis in order to provide scientific-based information to support the management and safeguarding of the Venice Lagoon. Specifics objectives can be summarized as follows:  
- provide the knowledge base to define the state of the system, identify the causes of degradation and plan actions to safeguard and related monitoring;  
- Organise and make easily accessible and understandable the wide and complex set of data and information available on the Venice Lagoon and its territory,  
- Standardize the used observation and measurement methodology;  
- Facilitate the technical collaboration among different institutions.  
The activities of the MAV Information Service started in 1984. First period of activity mainly focused on collection and quality check of available documentation and creation of the Geographic Information System of the Venice Lagoon territory. The second period (started approximately in 1990) started addressing Venice Lagoon problems. This implied the further development of the GIS tools as well as of other integrated tools, including models, specific software and various decision support systems. The third period (relative to recent years) is characterized by an operational dimension, directly serving institutions, where the activities are part of the production processes. The results of these activities were complementary and mutually reinforced by those reached by MAV through its concessionary the “Consorzio Venezia Nuova”. Several institutions have collaborated with the MAV Information Service in the acquisition of data included in the SINFO CIS; e.g.  
- Veneto Regional Authority;  
- Provincial and municipal Authorities of the Veneto Region;  
- Universities of the Veneto Region;  
- The Italian National Research Council (CNR);  
- The National Institute of Statistics (ISTAT) |
| 1c | Operating entity | Information Service of the Venice Water Authority |
| 1d | Management | Information Service of the Venice Water Authority |
1d **Contacts**

Roberto Rosselli, e-mail: roberto.rosselli@magisacque.it  
San Marco, 2949  
Campo Santo Stefano  
Venezia  
Web-site: [http://www.salve.it/it/sezioni/sin/home.htm](http://www.salve.it/it/sezioni/sin/home.htm)

1e **Typology**  
Operational

2 **Operational context and information content**

<table>
<thead>
<tr>
<th>2a</th>
<th>ICZM dimensions</th>
<th>The SINFO CIS mainly addresses four of the five considered information dimensions. The environment and the territory dimensions are in depth addressed. The economic (e.g. data on the industrial area of Porto Marghera, close to the Venice Lagoon) and the social dimension (e.g. population density, urban structure) are considered, too.</th>
</tr>
</thead>
</table>
| 2b | ICZM Sectors | Information contained in the SINFO CIS are structured in the following main topics:  
- Base maps  
  - historic maps, remote sensed data, including a wide collection of satellite images and aerial photographs;  
  - Physical and morphological environment of the Venice Lagoon (canals, tidal flats, mudflats, salt marshes) and its drainage basin;  
  - Administrative boundaries.  
- Morphology (Bathymetry and Digital Elevation Model, channels, elevation of salt marshes, surface of shallow water, salt marshes and tidal flats, evolution of lagoon morphology, granulometry of sediments, geotechnical characteristics, subsidence, Pedology of the drainage basin, Morphological interventions in the Venice Lagoon)  
- Hydrodynamic (current, tide, waves, meteorological data, discharge, flows, Hydrographic network and drainage basins, Database of flooding events and flooding risk for lagoon urban systems)  
- Biology and biodiversity (Macroalgae and Seagrass distribution and ecological characteristics, and more in general lagoon vegetation, zoobenthos, birds)  
- quality (water and sediments quality, drainage basin, residence time)  
- Socio-economy (water traffic, hunting, Fish and Fish farming, Land use, Road infrastructure population density, industrial activities; archaeology, sewerage discharges in Venice lagoon). |
| 2c | Integration | Data and information contained in the set of GIS tools of the MAV Information System have been used, also through models, to |
support many integrated analysis related to the Venice Lagoon management. Results of these analysis have been often included in the SINFO CIS, e.g.:
- database of flooding events and of urban area affected by flooding risk;
- pollution loads (and relative budget) from the drainage basin;
- maps of the morphological evolution of the Venice Lagoon, also including areas subjected to sedimentation or erosion;
- map of the archaeological risk.
Above ones are just some examples of integrated analysis results included in the SINFO CIS. Data and information are also used to produce software and systems directly aiming to support decision making, such as the CRUP system, providing integrated information supporting the MAV in licensing discharges into lagoon generated by production activities- Other are illustrated in section 6b.

<table>
<thead>
<tr>
<th>2d</th>
<th>Spatial scale</th>
<th>Local scale – Venice Lagoon and its drainage basin</th>
</tr>
</thead>
<tbody>
<tr>
<td>2e</td>
<td>Flexibility</td>
<td>SINFO CIS is developed to address specificities of the Venice Lagoon, with particular concern for planning, management and safeguarding scopes.</td>
</tr>
</tbody>
</table>

### 3 ICZM functionalities

| 3a | Knowledge related functionalities | SINFO CIS provides some of the knowledge related functionalities considered by the analysis, specifically:

- Integration among different information sectors (see point 2c); this functionality is widely developed;
- Operation at the different spatial scale; great part of the available spatial data can be re-scaled according to the considered spatial extent; thus enabling to visualize more details at a higher scales.
- The data and information collected at the local level allows a more general inclusion in a larger scale, thus providing an adequate cooperation between different levels;
- Many layers and data present multi-time information. A very interesting example is the exhaustive and comprehensive set of historical maps and survey of the Venice Lagoon morphology, enabling to evaluate the long term evolution of the system. Important time series are also available for environmental quality data for various matrixes (those data are contained in a specific database, called BDMA). |

| 3b | Process related functionalities | SINFO CIS, and related tools of the Information Service (models, decision support systems, databases), specifically aims to provide scientifically-base information to local decision makers, planners and managers (Venice Water Authority and its concessionary Consorzio Venezia Nuova) dealing with the sustainable management of the Venice Lagoon.

Use of the system is therefore strictly connected to plans (e.g. the morphological plan of intervention), interventions and monitoring in the Venice Lagoon system, in the perspective of the ICZM process. Actually it is possible to say that SINFO CIS, and all the integrated
tools, fully support various phases of the integrated management of the Venice Lagoon (starting from problem understanding and structuring and ending with evaluating and adaptive planning).

Furthermore, developed decision support systems, directly or indirectly integrated with GIS information and tools, enable to generate thematic scenarios and assess related alternatives.

SINFO CIS (the GIS tools) does not provide specific participation tools; actually the GIS systems are currently not available on-line. However, many summary data and information are diffused through the “Puntolaguna” initiative. Puntolaguna is a multimedia information point on activities to safeguard Venice and its lagoon delegated to the Italian State and undertaken by the Venice Water Authority through the “Consorzio Venezia Nuova”. A vast and diverse range of informative tools is available for visitors to consult the material in a multi languages support.

Puntolaguna information point offers presentations and visits in the lagoon, educational workshops for schools, training courses for technicians of government.

<table>
<thead>
<tr>
<th>4</th>
<th>Users</th>
</tr>
</thead>
<tbody>
<tr>
<td>4a</td>
<td>User typology</td>
</tr>
</tbody>
</table>
| | Due to the operative orientation of the SINFO CIS, target users mainly include the following ones:  
- Policy-makers;  
- Decision-makers;  
- Coastal planners and coastal managers;  
- Internal experts and specialised and expert users;  
- Representative of private sectors |
| | Data and information contained in GIS and database are useful for everybody that may require them to the MAV and Information Service. Other target users are represented by citizens, including teachers and students, in particular in relation to the Puntolaguna initiative. |

<table>
<thead>
<tr>
<th>5</th>
<th>Use of the system</th>
</tr>
</thead>
<tbody>
<tr>
<td>5a</td>
<td>Accessibility</td>
</tr>
<tr>
<td></td>
<td>The system is currently available only for the Intranet users of the Information Service of the Water Venice Authority.</td>
</tr>
<tr>
<td>5b</td>
<td>User-friendliness</td>
</tr>
<tr>
<td></td>
<td>The SINFO-CIS is mainly addressing expert users and user-friendliness does not represent a relevant requirement. The system is in Italian.</td>
</tr>
<tr>
<td>5c</td>
<td>Interactiveness</td>
</tr>
<tr>
<td></td>
<td>SINFO CIS (the GIS tools) does not provide specific participation tools; actually the GIS systems are currently not available on-line. However, many summary data and information are diffused through the “Puntolaguna” initiative. Puntolaguna is a multimedia information point on activities related to the safeguard of Venice and its lagoon. A vast and diverse range of informative tools is available for visitors to consult the material in a multi languages support.</td>
</tr>
<tr>
<td>5d</td>
<td>Data access</td>
</tr>
<tr>
<td></td>
<td>Off-line access and restricted access Intranet to part of the system for Venice Water Authority and Consorzio Venezia Nuova. All users can consult the data at the Information Service and require</td>
</tr>
</tbody>
</table>
them to MAV and the same Information Service. After the authorization from MAV, the Information Service provides the required data, maps, GIS layer, and meta-data to users.

<table>
<thead>
<tr>
<th>6</th>
<th>Technological characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>6a</td>
<td>Used technology</td>
</tr>
</tbody>
</table>
| 6b | Integration with other tools | SINFO CIS is directly or indirectly (for example providing data and acquiring outcome) integrated with a relevant number of other tools (database, models and decision support systems), including for example:  
- BDMA; Oracle database for the collection, management and diffusion (currently thought Intranet) of environmental data and document on the Venice Lagoon  
- SAMANET; a specific software for the acquisition and management of data (water chemical and physical parameters) continuously measured by fixed monitoring stations;  
- CRUP; decision support system, providing integrated information for licensing discharges into lagoon generated by production activities. CRUO is integrated with a dispersive mathematical model able to evaluate the effects of pollutants discharged into the lagoon;  
- Specific systems used to manage large dataset, such as: GESCOM supporting licensing for private water uses of the lagoon; SITAR related to archaeological sites in the Venice lagoon; COSS supporting quick visualisation of documents and reports related to studies; MODEL supporting the use of various hydrodynamic models of the Venice Lagoon;  
Actually other tools and systems can be mentioned. For a full description please refer to Datei and Monsutti (2010). |
| 6c | Integration with other CIS | SINFO-CIS is integrated with the CIS of the Veneto Region coast (SIT della Fascia Costiera Veneta), realized by the Information Service of the Water Authority and the Veneto Region in order to collect all the data and information produced and made available by these two entities about the Veneto coastal system (from Bibione in the North to Scardovari in the South). |
| 6d | Interoperability | Medium. The SINFO CIS is designed in full agreement and compliance with standards UNI EN ISO 9001:2000. The main themes (e.g. elevation type and attribute, transport, channel, administrative boundary) provide complete interoperability in full compliance with the INSPIRE directive. This is going to be extended to all spatial data. |

<table>
<thead>
<tr>
<th>7</th>
<th>Cost/resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>7a</td>
<td>Resources</td>
</tr>
</tbody>
</table>
Information sources for the overview analysis of SINFO CIS:


Web-site consultation for the overview analysis of SINFO CIS:

- [http://www.salve.it/it/sezioni/sin/home.htm](http://www.salve.it/it/sezioni/sin/home.htm); visited on 18/03/2011 at 10.30.
<table>
<thead>
<tr>
<th></th>
<th>General Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>Name</td>
</tr>
<tr>
<td>1b</td>
<td>Description</td>
</tr>
<tr>
<td>1c</td>
<td>Operating entity</td>
</tr>
<tr>
<td>1d</td>
<td>Management structure</td>
</tr>
</tbody>
</table>
| 1e | Contacts            | e-mail: osservatorio.naturalistico@comune.venezia.it
Osservatorio della Laguna e del Territorio
Environment and Safety Directorate of Land
Municipality of Venice
Campo Manin, San Marco 4023
30124 Venezia
Venice Municipality Web-site: [http://www.comune.venezia.it/ambiente](http://www.comune.venezia.it/ambiente) |
## Operational context and information content

### 2a ICZM dimensions

The Atlas mainly addresses four of the five considered information dimensions. The environment and the territory dimension are in depth developed. Social related information is provided with some layers, including for example naturalistic and historic tourist route, military fortification, transport lines. Some governance information is also included.

### 2b ICZM Sectors

Data/cartographic information included in Atlas are structured in the following principal groups:

- **Base Maps**, e.g.: main morphological elements, imageries from several years, national and regional topography;
- **Biosphere**, e.g.: habitat of the lagoon, coastal vegetation and habitats, distribution of seagrass in the Venice Lagoon, fish farms, survey of ecological status of small islands, diffusion of invasive macroalgae;
- **Atmosphere climate**, e.g.: maps of air temperature, rainfall and winds in the lagoon and its catchment areas;
- **Hydrosphere**, e.g.: tides and waves; water temperature, salinity of the Venice Lagoon;
- **Lithosphere**, e.g. depth of the lagoon in different years, sedimentology;
- **Protected areas**, e.g. Natura 2000 sites, RAMSAR area, boat speed limits defined in protected areas;
- **Anthroposphere**, e.g.: naturalistic and historic tourist route, historical military fortifications, public transport lines in the lagoon; pollutant emissions from major industrial plants;
- **Special projects**, including: georeferred photographs taken by astronauts from the International Space Station; maps of biogenic reefs in Venice coastal water the coast of Venice; maps on the morphological evolution of the Lagoon.

### 2c Integration

The Web version of the Atlas currently does not include layers providing an integrated analysis of sector data. Printed version of the Atlas contains a specific section dedicated to the Integrated Analysis, including for the example the following maps: sustainability indicators, cumulative impacts on the Venice Lagoon, conflict among lagoon uses, environmental risk due to heavy metal, salt-marshes functions, etc.

### 2d Spatial scale

Local scale – Venice Lagoon

Venice Lagoon is the specific area of interest of the Atlas; however the Atlas also includes environmental data related to the drainage basin and coastal waters.

### 2e Flexibility

The Atlas has been developed in order to be applied specifically to Venice Lagoon system.

## 3 ICZM functionalities

### 3a Knowledge

The Atlas provides some of the knowledge related functionalities
related functionalities

considered by the analysis; specifically:
- Integration among different information; the printed version of the atlas includes a significant number of maps related to integrated analysis. These are not currently accessible by the Web-GIS;
- Availability of spatial data; some layers are shared via Web Map Server facilities;
- Operation at the different spatial scale; some of the available spatial data can be re-scaled according to the considered spatial extent; thus enabling to visualize more details at a higher scales;
- Availability of multi-time data, such as in the case of morphological maps available for various time steps included in the period 1881 - 2003.

3b Process related functionalities

All data are freely shared by the Web-GIS component of the Atlas and made available to users. Indeed users can through the Atlas generate customised maps that can be used to support problem understanding. Furthermore, the information of Atlas is clearly structured in homogenous groups, thus providing a general conceptual modelling of the Venice Lagoon system.

The main goal of the Atlas is to collect and share data on the Venice Lagoon, rather than supporting a specific planning or managing activity. In this perspective the totally accessible Atlas represents a participation tool, providing the possibility to use all available data. Moreover, through a specific functionality (using a lagoon map interface) users can enter georeferred naturalistic observations (such as evidence of bird presence, invasive species indication, etc.). In association to the indication of the observation, users can provide video, photos or descriptions thought a proper sheet. Currently this tool is being tested.

4 Users

4a User typology

The Atlas offers a series of customizable maps that may results in being useful for various users:
- Coastal planners and/or managers;
- Specialised and expert users;
- Teachers and students;
- Citizens and citizens’ associations.

5 Use of the system

5a Accessibility

Free access on-line (access allowed to all users with or without password) to the complete Atlas.

5b User-friendliness

Highly user-friendly

The system is very easy to use. It is very user-friendly and it offers a clear explanation of all the functionalities that can be activated by the interactive screen. The Web Atlas is available both in Italian and English.

5c Interactiveness

The Atlas development is based on a cooperative conceptual approach, implying that anyone can share its own data and maps
The Atlas enables data producers to share its own spatial data through WMS in a unique Web-GIS environment. Data are stored physically in the data producer’s servers. The WMS service allows to publish data in the Web-GIS component of the Atlas and visualize them in combination with data provided by other producers. Data providers have the responsibility to: update and quality check the data, provide relative metadata description (through a metadata sheet), specify the legend of the spatial data. This sharing modality is currently used by a limited number of data producers. Interactiveness is also provided through a specific functionality (using a lagoon map interface) enabling users to provide georeferred naturalistic observation (see 3b).

5d Data access

The Atlas enables to:
- Generate customised maps and export them in pdf format;
- Access and directly visualise on his own computer some layers through the Web Map Service functionality;
- Visualise a comprehensive and explanatory metadata sheet for all available layers.

6 Technological characteristics

6a Used technology

All the web-portal of the Atlas of the Venice is developed using open source technologies:
- Web-GIS: Pmapper
- Database: PostgreSQL, PostGIS;
- Server: Ubuntu, Apache, Tomcat; Map engines: Mapserver, Geoserver.

6b Integration with other tools

Integration with other tools is particularly developed, since the Atlas mainly visualise and share data provided by various institutions. In particular:
- The Atlas enables data producers to share its own spatial data through WMS in a unique Web-GIS environment (see 5c). This sharing modality is currently used by a limited number of data producers (basically the Institute of Marine Sciences of the Italian National Research Council);
- The Atlas is connected to the Web Map Service of the National Cartographic portal;
- The Atlas integrates output of models of temperature and salinity in the Venice Lagoon, operated the Institute of Marine Sciences of the Italian National Research Council (CNR-ISMAR), based in Venice.;
- The Atlas is connected to the European Pollutant Release and Transfer Register (E-PRTR). This catalog is the new Europe-wide register that provides easily accessible key environmental data from industrial facilities in European Union Member States.

6c Integration with other CIS

The Atlas is not directly integrated with other CIS. However, as previously described, the Atlas includes maps provided by a wide variety of institutions. In particular, many data are provided by the Information Service (SINFO CIS) of the Venice Water Authority.
The Atlas provides complete interoperability of spatial data between the various European levels and sectors of Public Administration in full compliance with the INSPIRE directive.

<table>
<thead>
<tr>
<th>6d</th>
<th>Interoperability</th>
</tr>
</thead>
<tbody>
<tr>
<td>The management of the Atlas of the Venice Lagoon involves two staff persons (half-time) of the Observatory of the Lagoon and its Territory of the Venice Municipality. Internal effort is supported by external resources. Two consultants provide their service in relation to computer and technical GIS aspects; their commitment on the Atlas management is estimated to be about 20% of the comprehensive working time of each consultant.</td>
<td></td>
</tr>
</tbody>
</table>

### 7 Cost/Resources

<table>
<thead>
<tr>
<th>7a</th>
<th>Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>The information sources for the overview analysis of Atlas of the Venice Lagoon:</td>
<td></td>
</tr>
</tbody>
</table>


Web-site consultation for the overview analysis of Atlas of the Venice Lagoon:

- [http://www.silvenezia.it/index.php; last visit on 19/03/2011 at 15.00](http://www.silvenezia.it/index.php)
## Gulf of Gera Coastal Information System

<table>
<thead>
<tr>
<th></th>
<th><strong>General Information</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td><strong>Name</strong></td>
</tr>
<tr>
<td>1b</td>
<td><strong>Description</strong></td>
</tr>
<tr>
<td>1c</td>
<td><strong>Operating entity</strong></td>
</tr>
<tr>
<td>1d</td>
<td><strong>Management structure</strong></td>
</tr>
<tr>
<td>1d</td>
<td><strong>Contacts</strong></td>
</tr>
<tr>
<td>1e</td>
<td><strong>Typology</strong></td>
</tr>
<tr>
<td>2</td>
<td>Operational context and information content</td>
</tr>
<tr>
<td>---</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>2a</td>
<td>ICZM dimensions</td>
</tr>
</tbody>
</table>
| 2b | ICZM Sectors | Spatial data included in Gulf of Gera CIS are structured in the following principal groups:  
- Physical environment (river, shoreline, hydrological network);  
- Environmental monitoring (monitoring stations in marine and coastal zones);  
- Meteorological historical data (rain, temperature);  
- Infrastructure (road network);  
- Land and marine uses;  
- Fisheries, aquaculture and agriculture;  
- Tourism and recreation;  
- Human impact (urban areas with population density, administrative boundaries). |
| 2c | Integration |  |
| 2d | Spatial scale | Local Scale – Gulf of Gera. The gulf of Gera is a semi-enclosed water body located in the island of Lesvos, Greece in the Aegean archipelago. The watershed of the gulf, of approximately 200 Km², can be divided into two parts with differences in geomorphology and land use. The western part of 170 Km², is characterized by a rather smooth terrain cultivated mainly with olive trees, the location of five villages with a total population of 7000 people and a rich hydrographic network of small rivers flowing mainly during winter. The surface area of the gulf is approximately 43 Km², and the mean depth of about 10 m. The gulf is connected to the open sea through a channel, having a width of 200-800 m, length of 6.5 Km and depth ranging from 10 to 30 m. |
| 2e | Flexibility | The methodological approach used to implement the Gulf of Gera CIS was also used in the case of other two case studies of the Ditty project; the Thau Lagoon (France) and the Ria Formosa (Portugal). Gulf of Gera CIS can be therefore considered as party flexible and exportable to other similar areas, with the necessary customisation. |
| 3 | ICZM functionalities |  |
| 3a | Knowledge related functionalities | Gulf of Gera CIS provides only partly ICZM knowledge related functionalities considered by the analysis, specifically:  
- Multi-time data and information for some layers, e.g. environmental and meteorological (such as nutrient |
### 3b Process related functionalities

The CIS was used in combination with the DSS prototype to generate scenarios to assess the effectiveness of alternative measures in achieving good quality status of water and a suitable use of resources. ICZM process related functionalities supported by the CIS therefore include:
- Scenario development;
- Assessment of management alternatives.

The CIS appears to not include specific functionalities related to stakeholder involvement and participation. However, the generation of scenarios involved stakeholders.

### 4 Users

4a User typology

The system is specifically designed to support the scientifically-based management of the Gulf of Gera area, also including modelling and DSS tools. Indeed, main users are expert users, coastal planners and coastal managers. In particular the final "end-user" of the CIS is the Municipality of Gera.

### 5 Use of the system

5a Accessibility

Off-line access. A DVD with all the data, the GIS and the report regarding the Ditty project may be requested by the web-site of the Municipality of Gera.

5b User-friendliness

5c Interactivenss

No specific e-participation tools are provided

5d Data access

No data and metadata are directly accessible on line. Data and metadata can be requested on DVD support (see 5a)

### 6 Technological characteristics

6a Used technology

The CIS was developed with ESRI (ArcIMS) software. Spatial Analyst and 3D Analyst toolboxes were also used for specific elaborations.

6b Integration with other tools

Gulf of Gera CIS is integrated with other tools:
- Database with the meteorological data;
- Hydrodynamic model developed with the Princeton Ocean Model and coupled with an ecological model for the nutrient transport;

Within the Ditty project activities, a Decision Support System was...
also developed, to simulate different management.

<table>
<thead>
<tr>
<th></th>
<th>Integration with other CIS</th>
<th>No integration with other CIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>6c</td>
<td>Interoperability</td>
<td></td>
</tr>
</tbody>
</table>

**7 Cost/resources**

| 7a | Resources                  |                             |

Information sources for the overview analysis of Gulf of Gera CIS:


Web-site consultation for the overview analysis of Gulf of Gera CIS:

- [http://www.env.aegean.gr/](http://www.env.aegean.gr/); last visit on 14/03/2011 at 11.30
- [http://www.mar.aegean.gr/english/defaulteng.htm](http://www.mar.aegean.gr/english/defaulteng.htm); last visit on 14/03/2011 at 11.50
- [http://www.gera.gr/index.html](http://www.gera.gr/index.html); last visit 14/03/2011 at 11.30
### General Information

<table>
<thead>
<tr>
<th>1a</th>
<th>Name</th>
<th>Bulgarian Black Sea Coastal Atlas (BCA)</th>
</tr>
</thead>
</table>
| 1b | Description | The geographical area covered by the Bulgarian Black Sea Coastal Atlas (BCA) includes the Bulgarian Black Sea catchment area, the coastline, internal waters, territorial waters, contiguous zone and exclusive economic zone. The main BCA objectives are:  
- share and use of geographically-linked spatial information on marine and coastal features along the Bulgarian part of the Black Sea coastal zone;  
- provide coastal and marine data available to the general users;  
- improve public access to coastal information to help and support different authorities, institutions and stakeholders in coastal zone management.  

The idea for the development of the BCA emerged as part of a Bulgarian Oceanographic Data Centre (BGODC) initiative and it has been developed with the financial support of the SIBEMA project (Scientific and Institutional Capacity Building for Implementing European Marine Policy in the Black Sea Region). Only a few data have been published in Internet until now through the GIS Server of BGODC. However, there are many other GIS-layers available in the IO-BAS (Bulgarian Institute of Oceanology within the Bulgarian Academy of Science) geo-database, related to various coastal and marine topics, to be still published in the BCA. Other bodies could contribute in providing useful data to the BCA, including: Water Basin Directorate (Ministry of Ecology), Cadestre Agency – Ministry of Regional Development and Public Works, Navy Hydrographic Service, National Institute of Meteorology and Hydrology – BAS, Institute of Fishery and Aquaculture – Varna. The whole system is still not available on-line, but it was presented in 2009 at the 4th ICAN workshop (Trieste, November 2009). In his presentation, Stanchev (2009) highlighted the “lack of funding sources for web-atlas development and maintenance. It also tresses the lack of common spatial data standards and harmonised data management between different institutions, lack of common agreement for sharing spatial data between institution involved in data gathering and lack suitably qualified staff”...“The main challenge is to getting the Atlas development under way”. |
| 1c | Operating entity | Bulgarian Institute of Oceanology within the Bulgarian Academy of Sciences (IO-BAS) and Bulgarian Oceanographic Data Centre (BGODC) |
| 1d | Management structure | Bulgarian Institute of Oceanology within the Bulgarian Academy of Sciences (IO-BAS) and Bulgarian Oceanographic Data Centre (BGODC) |
| 1d | Contacts | Hristo Stanchev; e-mail stanchev@io-bas.bg  
Institute of Oceanology – Varna  
Bulgarian Oceanographic Data Centre (BGODC)  
| 1e | Typology | Pre-Operational  
BCA was selected since it is one of the few CIS available for the Black Sea. |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Operational context and information content</td>
<td></td>
</tr>
<tr>
<td>2a</td>
<td>ICZM dimensions</td>
<td>The environment and the territory dimensions will be in depth developed, also with information regarding erosion and coast protection structures. The economic information in the system will be related for example to fisheries and aquaculture.</td>
</tr>
</tbody>
</table>
| 2b | ICZM Sectors | According to the presentation of the system given at the 4th ICAN workshop (Stanchev, 2009), the following information sectors will be covered by the atlas:  
- Ecological features and eutrophication status  
- Topographic and nautical maps  
- Geomorphic typology  
- Erosion sections, sandy beaches and coast-protection structures  
- Sea level rise  
- Census data for population  
- Photos of coastline and port/coast-protection structures  
- Data from CTD monitoring station  
- Fisheries and aquaculture  
- Infrastructure  
- Socio-economic data |
| 2c | Completeness and integration | No specific integrated data among different information is directly provided within the system |
| 2d | Spatial scale | National – Bulgarian Black Sea coast.  
The geographical area covered by the BCA includes the Bulgarian Black Sea catchment area, coastline, internal waters, territorial waters, contiguous zone and exclusive economic zone (EEZ). |
<p>| 2e | Flexibility | BCA was developed to be specifically applied to the Bulgarian Black Sea coast. |
| 3 | ICZM functionalities | |
| 3a | Knowledge related functionalities | Currently the system does not provide specific ICZM knowledge related functionalities. |
| 3b | Process related functionalities | Currently the system does not provide specific ICZM process related functionalities. |
| 4 | Users | |
| 4a | User typology | Different target groups could benefit from the implementation of the BCA: the coastal scientific/research community in Bulgaria and outside; environmental agencies; governmental and municipal authorities; local communities/owners; civil protection authorities; coastal-protection agencies; and decision-makers. |</p>
<table>
<thead>
<tr>
<th>5</th>
<th>Use of the system</th>
</tr>
</thead>
<tbody>
<tr>
<td>5a</td>
<td>Accessibility</td>
</tr>
<tr>
<td>5b</td>
<td>User-friendliness</td>
</tr>
<tr>
<td>5c</td>
<td>Interactiveness</td>
</tr>
<tr>
<td>5d</td>
<td>Data access</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6</th>
<th>Technological characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>6a</td>
<td>Used technology</td>
</tr>
<tr>
<td>6b</td>
<td>Integration with other tools</td>
</tr>
<tr>
<td>6c</td>
<td>Integration with other CIS</td>
</tr>
<tr>
<td>6d</td>
<td>Interoperability</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>7</th>
<th>Cost/Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>7a</td>
<td>Resources</td>
</tr>
</tbody>
</table>
Information sources for the overview analysis of Bulgarian Black Sea Coastal Atlas:


Web-site consultation for the overview analysis of Bulgarian Black Sea Coastal Atlas:

- http://www.bgodc.io-bas.bg/ last visit on 02/09/2011 at 10.00
# Akçakoca Costal Information System

<table>
<thead>
<tr>
<th>1</th>
<th>General Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>Name</td>
</tr>
</tbody>
</table>
| 1b | Description | The Akçakoca CIS was developed within the pilot project on “testing of methodology on spatial planning for ICZM” (9 months project in year 2007) engaged to the Istanbul Technical University (ITU) as consultant to perform the services required by the UN Office for Project Services (UNOPS). The specific objective of the ICZM pilot project was the development of a spatial plan for the Akçakoca District coastal area – along the Black Sea coast of Turkey - according to the methodology developed within the Tacis/Europe Aid Projects (1998-2003). Related goals were (Tanik et al., 2008):

- To improve the protection of the marine environment and vulnerable coastal zone;
- To help in creating the common regional understanding of ICZM approach and its benefit to the area;
- To enhance and strengthen the capabilities of the regional authorities for the coastal planning and management;
- To contribute to the effective implementation of the Black Sea Strategic Action Plan in the pilot area.

One of the main outcomes of CIS application was the production of integrated land use maps, supporting the analysis of inter-sectoral conflicts and coastal spatial planning. |
| 1c | Operating entity | Istanbul technical University |
| 1d | Management structure | Istanbul technical University; Environmental Engineering Department, Geodesy and Photogrammetry Department and Urban and Regional Planning Department |
| 1e | Contacts | Aysegul Tanik; e-mail: tanika@itu.edu.tr; Dursun Zafer Seker; e-mail: dzseker@ins.itu.edu.tr Department of Environmental Engineering Istanbul Technical University Faculty of Civil Engineering 34469, Maslak - Istanbul, Turkey |
| 1f | Typology | The system was developed by and used within the pilot project implemented by the Istanbul technical University. It is not clear whether the system is currently used or not. |

## Operational context and information content

<table>
<thead>
<tr>
<th>2</th>
<th>ICZM dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>2a</td>
<td>The GIS database focuses on the territory ICZM dimension (mainly addressed in terms of land use/land cover), also including other three ICZM dimension: environment (e.g. ecological status of the district), economy and society (e.g. socio-demographic data).</td>
</tr>
<tr>
<td>2b</td>
<td>ICZM Sectors</td>
</tr>
<tr>
<td>---</td>
<td>----------------</td>
</tr>
</tbody>
</table>
| 2b | Layers included in the Akçakoca CIS mainly refer to:

- Spatial-Base-Data (e.g. topography, administrative boundaries, |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th>bathymetry);</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Environmental and territorial data (e.g. geological data, erosion, slope, water resources and streams, forests, land use and land cover);</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Natural hazard and polluted areas;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>socio economic data (e.g. place of interest, transportation network, infrastructures for waste and water management).</td>
</tr>
</tbody>
</table>

### 2c Integration

The Akçakoca CIS was widely used to derive integrated maps, thus providing scientific-based knowledge to the related ICZM processes. Illustrative examples are:

- Sectoral conflicts between different land uses (e.g. map showing hazelnuts cultivation in forestry areas);
- Conflicts between a specific land use and the natural soil features (e.g. map showing hazelnuts cultivation in highly erodible areas);
- Maps of importance and vulnerability levels for the Akçakoca District; vulnerability is defined as the tolerance level of the natural resource or structure to the human activities.
- Final maps of functional zoning, identifying different zones with different land-use functionality (e.g. forestry, agriculture, tourism) and different sectoral conflicts.

### 2d Spatial scale

Local scale - Akçakoca District along the Turkish Black sea coast. The system mainly includes data and maps related to the land component of the coastal area.

### 2d Flexibility

The system has been developed in order to be specifically applied to the Akçakoca District territory.

### 3 ICZM functionalities

#### 3a Knowledge related functionalities

Akçakoca CIS provides only partly ICZM knowledge related functionalities considered by the analysis; in particular the integrated analysis is supported by means of various maps and information (see 2c).

#### 3b Process related functionalities

The Akçakoca CIS was specifically developed to support the application and testing of an ICZM approach to the Akçakoca District aiming to develop a related spatial plan. The CIS was likely particularly useful for

- Problem understanding and structuring, in particular supported by the various integrated maps provided by the CIS, that can be also useful in prioritising coastal uses;
- Planning; as said above the CIS was intended to support the development of a spatial plan for the Akçakoca coastal area, in particular addressing uses conflicts.

### 4 Users

#### 4a User typology

The project aimed at testing a methodology on spatial planning for ICZM also through the use of the Akçakoca CIS; principal target users therefore were decision-makers and coastal planners.
### 5 Use of the system

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5a</td>
<td>Accessibility</td>
<td>Only off-line access</td>
</tr>
<tr>
<td>5b</td>
<td>User-friendliness</td>
<td></td>
</tr>
<tr>
<td>5c</td>
<td>Interactivity</td>
<td>No specific e-participation tools are provided</td>
</tr>
<tr>
<td>5d</td>
<td>Data access</td>
<td>The access of the system is restricted only to off-line users; thus no data and metadata are provided to free access.</td>
</tr>
</tbody>
</table>

### 6 Technological characteristics

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>6a</td>
<td>Used technology</td>
<td></td>
</tr>
<tr>
<td>6b</td>
<td>Integration with other tools</td>
<td>No integration with other tools</td>
</tr>
<tr>
<td>6c</td>
<td>Integration with other CIS</td>
<td>No integration with other CIS</td>
</tr>
<tr>
<td>6d</td>
<td>Interoperability</td>
<td></td>
</tr>
</tbody>
</table>

### 7 Cost/resources

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>7a</td>
<td>Resources</td>
<td>The GIS work involved Senior experts of the Environmental Engineering Department of ITU, together with the staff from the Geodesy and Photogrammetry Department and Urban and Regional Planning Department</td>
</tr>
</tbody>
</table>

Information sources for the overview analysis of Akçakoca CIS:


## Odessa Coastal Information System

<table>
<thead>
<tr>
<th></th>
<th>General Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>Name</td>
</tr>
<tr>
<td>1b</td>
<td>Description</td>
</tr>
<tr>
<td>1c</td>
<td>Operating entity</td>
</tr>
<tr>
<td>1d</td>
<td>Management structure</td>
</tr>
<tr>
<td>1f</td>
<td>Typology</td>
</tr>
</tbody>
</table>

## Operational context and information content

<table>
<thead>
<tr>
<th></th>
<th>ICZM dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>2a</td>
<td>The Odessa CIS addresses four of the five considered ICZM dimensions: territory (e.g. city agglomeration, marine and coastal protected areas,) environment (e.g. maritime flora and fauna, natural habitat), economy (e.g. land and sea uses, industrial and waste water treatment plants, tourism infrastructure, pipelines and navigation lines), society (human pressure).</td>
</tr>
<tr>
<td>2b</td>
<td>The Odessa CIS includes the spatial layers related to the main following topics:  - CIS area of interest, including three detailed areas Illichevsk, Odessa and Ugnii  - Topographic information, including: channels, lakes, rivers, railways, roads, city names, parks, gardens, building, etc.  - Depth  - Coastal human uses  - Tourism infrastructure</td>
</tr>
</tbody>
</table>
- Sewer discharge and surface/underwater outfall
- Recreational zones;
- Coastal protected zone
- Marine flora and fauna
- Natural habitats
- Birds
- Ecological Sensitivity Index (ESI)
- Information relevant for port activities, including: anchorage area and points, wreck, fishing facilities, navigation lines, underwater pipelines, recommended tracks, traffic separation scheme.

### 2c Integration

The CIS does not provide much integration among different information. A layer on Ecological Sensitivity Index (ESI) is included; however no clear information on the computation method is provided.

### 2d Spatial scale

Local – Odessa coastal area in the Black Sea

### 2d Flexibility

The system has been developed in order to be applied specifically to Odessa territory.

### 3 ICZM functionalities

#### 3a Knowledge related functionalities

The CIS does not provide ICZM knowledge related functionalities, besides examples of integration among different information, i.e. the Ecological Sensitivity Index (ESI) layer (see 2c)

#### 3b Process related functionalities

The Web-GIS does not include specific ICZM process related functionalities. The tool has been however used to support coastal and marine planning. Indeed, within the PlanCoast project, the Odessa CIS was expressly designed and implemented to support spatial planning of the coastal zone and marine area of the region of concern, specifically in relation to oil spill risk.

### 4 Users

#### 4a User typology

Main users of the Odessa CIS appear to be decision-makers and coastal planners; actually the CIS was developed to support planning and management of oil spill related risks. On-line access to the Web-GIS enables any user to have access to available maps.

### 5 Use of the system

#### 5a Accessibility

Free access on line (access allowed to all users without password) to the Web-GIS.

#### 5b User-friendliness

Medium. Intuitive operation of the system for the turn-off or turn-on of the informative layers. An identify function is available that helps the user to identify the specific features. The system is in Ukraine, also including parts in English.

#### 5c Interactiveness

No specific e-participation tools are provided.
5d Data access
Spatial data (GIS layer) are not downloadable. The maps can be visualised but can not be printed. There is no specific function to create the legend, so the user can hardly manage maps with lots of different data. There is no specific tool for map saving. The meta-data are available (mainly in Ukrainian).

6 Technological characteristics

<table>
<thead>
<tr>
<th>6a Used technology</th>
<th>The Odessa CIS is designed on the basis of ESRI technology. The system uses an ArcIMS service for the application connect to the web server and ArcSDE service for the database connection.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6b Integration with other tools</td>
<td>No specific integration with other tools</td>
</tr>
<tr>
<td>6c Integration with other CIS</td>
<td>No specific integration with other CIS</td>
</tr>
<tr>
<td>6d Interoperability</td>
<td>Low. The GIS project was developed in ArcGis 9.2 so the data layers are ESRI shape file. Spatial data however can not be downloaded and shared. Metadata do not meet requirements of ISO standards (INSPIRE Directive).</td>
</tr>
</tbody>
</table>

7 Cost/Resources

| 7a Resources |

Information sources for the overview analysis of the Odessa CIS:


Web-site consultation for the overview analysis of the Odessa CIS:

Annex 2 – Overview analysis: analytical tables of Extra-European CIS cases
1 General Information

<table>
<thead>
<tr>
<th>1a Name</th>
<th>Massachusetts Ocean Resource Information System (MORIS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1b Description</td>
<td>The Massachusetts Ocean Resource Information System (MORIS) is an on-line mapping tool (Web-GIS) created by the Massachusetts Office of Coastal Zone Management (CZM), the Massachusetts Office of Geographic Information (MassGIS), the Massachusetts Ocean Partnership (MOP), Applied Science Associates (ASA), and Charlton Galvarino. MORIS can be used to search and display spatial data pertaining to the Massachusetts coastal zone. Users can interactively view various data layers (e.g., tide gauge stations, marine protected areas, access points, eelgrass beds, etc.) over a backdrop of aerial photographs, political boundaries, natural resources, human uses, bathymetry, or other data including Google base maps. In particular, MORIS is designed to:</td>
</tr>
<tr>
<td></td>
<td>- Provide spatial data that are, to the extent possible, accurate, scientifically sound, and credible;</td>
</tr>
<tr>
<td></td>
<td>- Provide information to decision makers, planners, and the general public that can be used to strengthen environmental policy and guide management decisions;</td>
</tr>
<tr>
<td></td>
<td>- Use a collaborative, interactive process that involves a variety of partners and data sources;</td>
</tr>
<tr>
<td></td>
<td>- Ensure that the data are available in an easily accessible and useful manner.</td>
</tr>
<tr>
<td>1c Operating entity</td>
<td>Massachusetts Office of Coastal Zone Management</td>
</tr>
<tr>
<td>1d Management structure</td>
<td>Massachusetts Office of Coastal Zone Management</td>
</tr>
</tbody>
</table>
| 1d Contacts              | e-mail: czm@state.ma.us  
Massachusetts Office of Coastal Zone Management  
251 Causeway Street, Suite 800  
Boston, MA 02114-2138  
<table>
<thead>
<tr>
<th></th>
<th>Typology</th>
<th>Operational</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Operational context and information content</td>
<td></td>
</tr>
<tr>
<td>2a</td>
<td>ICZM dimensions</td>
<td>MORIS addresses all the five ICZM dimensions. For more details on the information provided by MORIS see next point (2b).</td>
</tr>
</tbody>
</table>
| 2b | ICZM Sectors     | Data/cartographic information included in MORIS are structured in the following principal groups:  
- Bathymetry;  
- Elevation;  
- Hydrograph features;  
- Intertidal flats;  
- Wind speed;  
- Land uses and land cover;  
- Nautical charts;  
- Ortho photos (Aerial photos) and topographic maps;  
- Biological marine and estuarine data;  
- Habitat;  
- Colonial water bird;  
- Geological marine and estuarine data;  
- Shoreline and sea bottom data;  
- Physical marine and estuarine data;  
- Ocean management (etc. management areas, sand and gravel extraction, pipelines, cable, wind farm, etc.)  
- Massachusetts ocean management planning area;  
- Administrative boundaries;  
- Infrastructure and transportation;  
- Activities connected with the fisheries (e.g. fishing traffic);  
- Important fish resources areas;  
- Recreation and tourism (e.g. boating, coastal access, diving);  
- Concentrated commerce traffic;  
- Wind energy areas.  
The Web-GIS contains more layers in particular related to marine and coastal planning and management. |
| 2c | Integration      | No specific integration among different information is directly provided within the system. However the system contains a huge number of spatial data freely available and downloadable that can properly support integrated analysis and assessment. |
| 2d | Spatial scale    | Sub-national – Massachusetts sea and coastal areas in the North Atlantic coast of the USA, as well as including spatial data on the drainage basin. |
| 2e | Flexibility      | MORIS seems to be specifically developed for the Massachusetts sea and coastal areas. |
### 3 ICZM functionalities

#### 3a Knowledge related functionalities
MORIS provides some of the knowledge related functionalities considered by the analysis; specifically:
- Availability of spatial data: major part of the data collected in this online mapping tool is downloadable in shape files format through an apposite function;
- Operation at the different spatial scale; some of the available spatial data can be re-scaled according to the considered spatial extent; thus enabling to visualize more details at a higher scales. This functionality is particularly developed in MORIS;
- Availability of multi-time data; a lot of spatial data are available for different time periods, such as for example the ortho photo layers (6 years in the period 1994-2008).

#### 3b Process related functionalities
MORIS contains a huge amount of spatial data on the marine and coastal system organised in an articulated structure; it can therefore support problem understanding and structuring for the Massachusetts coastal and marine area. MORIS specifically aims to scientifically-based knowledge and data to decision makers, planners, and the general public that can be used to strengthen environmental policy and guide management decisions.

No specific ICZM process related functionalities appear to be provided by MORIS. It is however really important to stress that MORIS is directly managed, and therefore used, by the Massachusetts Office of Coastal Zone Management (CZM), that is the office directly dealing with sustainable development of the coastal system.

### 4 Users

#### 4a User typology
MORIS specifically aims to provide information to decision makers, coastal and marine planners and the general public. The wide variety and very numerous spatial data included in the system can results in being also useful for the research community.

### 5 Use of the system

#### 5a Accessibility
Free access on-line to all the MORIS contents and functionalities.

#### 5b User-friendliness
Highly user-friendly. MORIS is very easy to be used and only requires very basic GIS expertise. It also uses the common and well-known Google earth background and approach.

#### 5c Interactiveness
No specific e-participation tools are currently provided by the system.

#### 5d Data access
Direct access to:
- All spatial layers; the majority of spatial data can be directly downloadable. Uses of other spatial information is restricted
by confidentiality reasons defined by data producers;
- Metadata are provided for all layers. They are quickly and easily accessible and full explanatory.

## 6 Technological characteristics

### 6a Used technology

MORIS is a JavaScript web application that utilizes various components of GeoExt, a JavaScript toolkit for rich mapping applications. The application is run through a client-side web browser. MORIS pulls data through the GeoServer mapping software. GeoServer is a free, open-source, map-serving platform that serves data using Open Geospatial Consortium, Inc. (OGC) WMS and WFS formats, among others.

### 6b Integration with other tools

No specific integration with other tools

### 6c Integration with other CIS

Some of the data contained in MORIS are provided and maintained by various agencies external to CZM.

### 6d Interoperability

High. MORIS pulls data through the GeoServer mapping software. GeoServer is a free, open-source, map-serving platform that serves data using Open Geospatial Consortium, Inc. (OGC) WMS and WFS formats, among others. Metadata description is particularly rich and complete.

## 7 Cost/resources

### 7a Resources

Web-site consultation for the overview analysis of MORIS:

- [http://www.mass.gov/czm/mapping/index.htm](http://www.mass.gov/czm/mapping/index.htm); visited on 25/03/2011 at 16.30
# Mapping and Planning Portal of the Mid-Atlantic Regional Council on the Ocean

<table>
<thead>
<tr>
<th></th>
<th>General Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>Name</td>
</tr>
</tbody>
</table>
|   | Description | The MARCO Mapping and Planning Portal (MARCO-MPP) is an on-line Web-GIS based system that allows state, federal, and local decision-makers and the public users to visualize, query, map, and analyze ocean and coastal data in the Mid-Atlantic Region (involving five federal states). The Governors of New York, New Jersey, Delaware, Maryland and Virginia have committed to a new comprehensive, regional approach, creating the Mid-Atlantic Regional Council on the Ocean (MARCO). MARCO involves the following representative of the five federal states:  
- New York State Department of State Division of Coastal Resources and New York Ocean and Great Lakes Ecosystem Conservation Council (New York);  
- Coastal Management Program and New Jersey Department of Environmental Protection (New Jersey);  
- Maryland Oceans (Maryland);  
- Department of Natural Resources and Environmental Control and Delaware Coastal Program (Delaware);  
- Virginia Secretary of Natural Resources and Virginia Coastal Zone Management Program (Virginia).  
The four MARCO’s priority issue areas and goals are:  
- Collaborate on Regional approach to support the sustainable development of renewable energy in offshore areas;  
- Coordinate protection of important habitats and sensitive unique offshore areas on regional scale;  
- Prepare the region’s coastal communities for the impacts of climate change on ocean and coastal resources;  
- Promote improvements in the region’s coastal water quality.  
The five MARCO states are working to maintain and improve the health of their ocean and coastal resources, and ensure that they continue to contribute to the high quality of life and economic vitality of their region’s communities well into the future. The five MARCO states agreed to work together to develop a regional, web-based portal as part of their 2009 Action Plan. In response to this need, the Virginia Coastal Zone Management Program provided funding (through their CZM Award from the National Oceanic and Atmospheric Administration - NOAA) for the creation of the mapping and planning portal for the Mid-Atlantic region.  
The structure of MARCO is composed of:  
- The Council (the five Mid-Atlantic Governors);  
- An Executive Committee (State Secretaries and Agency Heads);  
- A Management Board (State CZM Directors and Senior |
### 1c Operating entity

Mid-Atlantic Regional Council on the Ocean. The portal was developed by a team of representatives from each of the Mid-Atlantic States, NOAA, and The Nature Conservancy.

### 1d Management structure

Mid-Atlantic Regional Council on the Ocean.

### 1d Contacts

- e-mail: ccortina@dnr.state.md.us
- MARCO Web-site: [http://www.midatlanticocean.org/index.htm](http://www.midatlanticocean.org/index.htm)

### 1e Typology

Operational

### 2 Operational context and information content

#### 2a ICZM dimensions

MARCO-MPP mainly addresses three of the five considered information dimensions. The environment and the territory dimension are in depth developed. The economic information in the system is provided with layers regarding fishing effort and commercial shipping density.

#### 2b ICZM Sectors

Currently, the MARCO portal includes map data layers grouped into five broad categories:
- Administrative layers (e.g. administrative boundaries, marine boundaries and jurisdictions, territorial sea, contiguous zone, exclusive economic zone, wind energy areas, etc.);
- Decision Support (e.g. overlays of various uses and natural features, 50 mile shoreline buffer etc.);
- Human Uses (e.g. fishing effort, commercial shipping density etc.);
- Biological (e.g. sea and benthic habitats, artificial reefs, water birds density information, etc.);
- Geophysical (e.g. vulnerability to sea level rise, bathymetry, major canyons, sediment grain size, seabed form, wind speed, etc.).
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2c</td>
<td>Integration</td>
<td>MARCO-MPP contains some layers with integrated information. The most relevant one is the vulnerability to sea level rise calculated along all the Atlantic coastal area (from Maine to Florida). This layer provides a preliminary overview of the relative susceptibility of the Atlantic coast to sea level rise through the use of a coastal vulnerability index (CVI). The computation of the index is based upon the variables geomorphology, regional coastal slope, tide range, wave height, relative sea-level rise and shoreline erosion and accretion rates. CVI is finally expressed in four classes (low, medium, high, very high). Other examples of integrated analysis are layers included in the Decision Support category.</td>
</tr>
<tr>
<td>2d</td>
<td>Spatial scale</td>
<td>Regional – Mid-Atlantic Ocean, including coastal areas of five states (New York, New Jersey, Delaware, Maryland and Virginia). Layer on coastal vulnerability to sea level rise is referred to the whole Atlantic coast of the United States.</td>
</tr>
<tr>
<td>2e</td>
<td>Flexibility</td>
<td>MARCO-MPP is specifically developed to address Mid-Atlantic Ocean and related coastal area. However, MARCO-MPP’s structure is very similar to the one adopted by HELCOM Map and Data Service supporting the activity of the Helsinki Commission.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>ICZM functionalities</td>
<td></td>
</tr>
</tbody>
</table>
| 3a | Knowledge related functionalities | MARCO-MPP provides some of the knowledge related functionalities considered by the analysis, specifically:  
- Integration among different information sectors (see point 2c);  
- Availability of spatial data; a function inside MARCO-MPP opens a web-page with the list of the downloadable layers and the respective link where the user can find them. Most layers are available for the download.  
- Operation at the different spatial scale; some of the available spatial data can be re-scaled according to the considered spatial extent; thus enabling to visualize more details at a higher scales;  
- Function abilities or maps related to assessment coastal vulnerability; MARCO-MPP includes a specific layer representing coastal vulnerability to sea level rise (see point 2c). The spatial extension of this layer is from the coast of Florida to the coast of Maine. |
| 3b | Process related functionalities | Currently MARCO-MPP does not include ICZM process related functionality. The system is however under constant development. To fully support the coastal and marine spatial planning process, the portal will evolve including more sophisticated decision support features, such as the ability for ocean users and managers to create spatial management scenarios and monitor and evaluate trends and goals. |
### Users

| 4a User typology | MARCO-MPP is an on-line tool intended for anyone who may be interested in Mid-Atlantic coastal and marine information. Potential and effective users are mainly state, federal, and local decision-makers and the other public users. |

### Use of the system

| 5a Accessibility | Free access on-line to all the MARCO-MPP contents and functionalities. |
| 5b User-friendliness | Highly user-friendly. MARCO MPP is provided with customised interfaces that are rather simple to be used. Moreover use of the system is supported by a detailed and simply usable “Help Page” and a clear and explanatory description of layers contained in the system. |
| 5c Interactiveness | No specific e-participation tools are currently provided by the system. |
| 5d Data access | - More than 90% of spatial layers are directly downloadable; - Users can generate a customized map and a printable file in pdf format; - Metadata description and explanation are provided by all layers included in MARCO-MPP, through a summary fact sheet and a Full Metadata description. |

### Technological characteristics

| 6a Used technology | ESRI ArcGis Server and Flex (licensed software). |
| 6b Integration with other tools | No specific integration with other tools |
| 6c Integration with other CIS | MARCO-MPP is not directly integrated to other CIS. The general MARCO web-site provide a link to the following other mapping systems: - Multipurpose Marine Cadastre; - Integrated Ocean Observing System Data Catalog; - Virginia Coastal GEMS; - Maryland Coastal Atlas; - New York Ocean and Great Lakes Atlas. |
| 6d Interoperability | High Metadata description is particularly rich and complete. They are structured according to the Esri Profile of the Content Standard for Digital Geospatial Metadata. |
### Cost/resources

<table>
<thead>
<tr>
<th>7a</th>
<th>Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The Mid-Atlantic Governors’ commitment to a regional approach is evidenced by the rapid creation of the Mid-Atlantic Regional Council on the Ocean (MARCO). Coastal policy makers and Coastal Zone Management Program (CZM) directors from New York, New Jersey, Delaware, Maryland and Virginia each devoted time and funds to bring about this new regional organization. Exclusive of staff time, the five states have, to date, dedicated about $300,000 to the formation of MARCO and implementation of initial actions.</td>
</tr>
</tbody>
</table>

Web-site consultation for the overview analysis of MARCO-MPP:

- [http://maps.tnc.org/MARCO/index.html](http://maps.tnc.org/MARCO/index.html); last visit on 29/03/2011 at 10.30;
- [http://www.midatlanticocean.org/index.htm](http://www.midatlanticocean.org/index.htm); last visit on 29/03/2011 at 10.30.
<table>
<thead>
<tr>
<th></th>
<th>General Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>Name</td>
</tr>
<tr>
<td>1b</td>
<td>Description</td>
</tr>
<tr>
<td>1c</td>
<td>Operating entity</td>
</tr>
<tr>
<td>1d</td>
<td>Management structure</td>
</tr>
<tr>
<td>1e</td>
<td>Typology</td>
</tr>
</tbody>
</table>
### Operational context and information content

#### 2a ICZM dimensions

Coastal GEMS mainly addresses four of the five considered information dimensions. The environment and the territory dimension are in depth developed. The economic information in the system is provided with layers mainly regarding fisheries management area and touristic port and harbour. The governance dimension is also highly developed including all the layers related to two main groups: Conservation Planning Tools and Conservation planning examples.

#### 2b ICZM Sectors

Coastal GEMS currently includes a high number and a wide variety of spatial layers. Additional data layers are going to be continuously incorporated into Coastal GEMS as agencies continue to develop data and make it available for inclusion. Spatial data are structured in the following topics:

- Water features, including for example: fisheries management areas, private oyster leases, state constructed oyster reefs, commercial shellfish aquaculture sites, oyster gardening sites, submerged aquatic vegetation (SAV), seaside SAV planting sites, anadromous fish use areas, threatened and endangered species waters, seaside oyster density and healthy streams, etc.;
- Shoreline features, including for example: beaches above high water, Chesapeake Bay dunes, wetlands (tidal and non tidal), restored riparian buffer sites, etc.;
- Land features, including for example: conservation lands, forest cover, barrier island ownership, etc.;
- Wildlife features, including for example: essential wildlife habitat, important bird areas, migratory songbird stopover habitat, etc.;
- Recreational features, including for example: boat ramps, scenic rivers, birding and wildlife trail sites and loops, seaside eastern shore water trail, public access sites, etc.;
- Conservation Planning Tools, including for example: clam/oyster aquaculture suitability models, invasive reed (*Phragmites*), historic and cultural value model, predicted growth model, ecological cores and landscape corridors, marina sitting suitability model, impediments to fish movement, impaired waters, biotic stream assessment (INSTAR) locations, recreational value model, watershed integrity model, agricultural value model, forest economics model, tidal flushing rates, clam/oyster aquaculture vulnerability models, benthic index of biotic integrity, condemned shellfish areas, potential wetland restoration sites, etc.;
- Conservation Planning Example, including for example: coastal avian protection zone, seaside heritage program boundary, southern watersheds program, Hampton roads conservation corridors and Priority Conservation Areas, etc.

#### 2c Integration

Coastal GEMS include a high number of spatial information derived through the integrated analysis of different data.
typologies. This is particularly evident for layers included in the Conservation Planning Tools category, that are often results of modelling application. A couple of examples are:

- **Aquaculture Vulnerability Model**: this layer is the result of a model studying the risks associated with the shellfish aquaculture. The model firstly considers basic physical and biological conditions necessary for aquaculture success and secondly, the impacts that current land use and proposed local zoning has on suitable growing areas.

- **Tidal rushing rates**: this layer shows an evaluation of the water bodies in the Virginia coastal zone using several water quality models to calculate residence time. Results are grouped into tidal flushing categories: quickly, intermediate and slowly.

| 2d | Spatial scale | Sub-national – Virginia coastal zone along the Atlantic ocean |
| 2e | Flexibility   | Coastal GEMS is specifically developed for the Virginia coastal area |

### 3 ICZM functionalities

#### 3a Knowledge related functionalities

Coastal GEMS provides some of the knowledge related functionalities considered by the analysis, specifically:

- Integration among different information sectors (see point 2c); this functionality is particularly developed and a relevant number of integrated information are included in and accessible through the Web-GIS;

- Availability of spatial data; the system allows the downloading of GIS layers in shape file format;

- Operation at the different spatial scale; some of the available spatial data can be re-scaled according to the considered spatial extent; thus enabling to visualize more details at a higher scales.

#### 3b Process related functionalities

Coastal GMES contains a huge amount of spatial data on the marine and coastal system organised in an articulated structure; it can therefore support problem understanding and structuring for the Virginia coastal and marine area. Furthermore, coastal vulnerability is evaluated for various relevant topics (see the category Conservation Planning Tools, including for example spatial data on: vulnerability for clam aquaculture or oyster aquaculture), also through the use of specific models, and related layers are included in the Web-GIS.

The system also includes relevant spatial data about plans mainly dealing with coastal protection, thus also showing some of the results of the ICZM process.
## 4 Users

### 4a User typology

As reported in the Coastal GEMS web-site, the system is mainly dedicated to:
- Local and regional planning agencies to better manage growth by determining the most suitable areas for conservation and development;
- State and federal agencies to better manage projects such as roads and major facilities, habitat restoration, and public access plans. They could also use Coastal GEMS as a starting point for the environmental review process in order to quickly access agency data;
- Academic institutions to educate students about coastal resource use and values and to provide a basis of information for classroom projects and/or research;
- Private citizens, advocacy groups, and businesses to formulate their positions on the potential impacts of projects on coastal resources;
- General public to learn more about Virginia’s coastal resources.

Indeed the wide nature of data included in the Coastal GMES can properly address the above variety of target users.

## 5 Use of the system

### 5a Accessibility

Free access on-line to all the Coastal GEMS contents and functionalities.

### 5b User-friendliness

Highly user-friendly.
The Coastal GEMS is built around an interactive map very easy to browse, which allows anyone to identify, visualize and query those datasets relevant to their interest. Each layer is described accurately by a metadata description with all the information necessary to support the correct comprehension of the data.

### 5c Interactiveness

No e-participation tools are currently provided by the Coastal GMES.

### 5d Data access

- The majority of spatial layers are downloadable through the link proposed in the “fact sheet”, also illustrating metadata information;
- Metadata description and explanation for all the layers included in the Coastal GEMS. Metadata are managed through detailed fact sheets. It is relevant stressing that these sheets also clearly indicate the last data updating that is a very useful information for the correct use of data.
### 6 Technological characteristics

<table>
<thead>
<tr>
<th></th>
<th>Used technology</th>
<th>ESRI ArcGis (licensed software).</th>
</tr>
</thead>
<tbody>
<tr>
<td>6a Integration with other tools</td>
<td>Coastal GMES includes a relevant number of layers that are the results of specific model (in particular include in the Conservation Planning Tools category). Model results are provided mainly by the Centre for Coastal Resources Management that specifically works in the development of and support to integrated and adaptive management of coastal zone resources. The same Centre provides Interactive maps such as: aquaculture vulnerability model, erosion vulnerability, marina suitability tool, oil spill clean-up and response, shallow water use conflict tool, shoreline managers assessment mapper, wetland data viewer, wetland mitigation targeting tool <a href="http://ccrm.vims.edu/gis_data_maps/interactive_maps/index.html">http://ccrm.vims.edu/gis_data_maps/interactive_maps/index.html</a></td>
<td></td>
</tr>
<tr>
<td>6c Integration with other CIS</td>
<td>Coastal GEMS is a member of the International Coastal Atlas Network (ICAN).</td>
<td></td>
</tr>
<tr>
<td>6d Interoperability</td>
<td>High/Medium Metadata description is particularly rich and complete.</td>
<td></td>
</tr>
</tbody>
</table>

### 7 Cost/resources

|   | Resources | Funding for the development of Coastal GEMS was provided by the Virginia CZM Program through grants from the Office of Ocean and Coastal Resource Management at the National Oceanic and Atmospheric Administration under the Coastal Zone Management Act. |

Information sources for the overview analysis of Coastal GEMS:


Web-site consultation for the overview analysis of Coastal GEMS:

- [http://ican.science.oregonstate.edu/member_dir](http://ican.science.oregonstate.edu/member_dir); last visit on 14/04/2011 at 9.00.
## General Information

<table>
<thead>
<tr>
<th>1</th>
<th>Operating entity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1c</td>
<td>OCA is a multi-group project established by a partnership between Oregon Ocean Coastal Management Program, Oregon State University Department of Geosciences and Ecotrust a NGO based in Portland (Oregon).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1</th>
<th>Management structure</th>
</tr>
</thead>
</table>
| 1d | Atlas info mail CoastalAtlas@lists.oregonstate.edu  
Dawn Wright; e-mail dusk.geo.orst.edu  
Department of geosciences 104 Wilkinson Hall – Oregon State University, Corvallis, Oregon, USA  
Tania Haddad; e-mail: Tanya.Haddad@state.or.us |

<table>
<thead>
<tr>
<th>1</th>
<th>Contacts</th>
</tr>
</thead>
</table>
| 1e | The Oregon Coastal Atlas is a web atlas including background information for different coastal systems, access to interactive mapping, online geospatial analysis tools and direct download access to various planning and natural resource datasets related to coastal zone management.  
The heart of the Coastal Atlas is the archive of geospatial data collected over the years by various program partners of the Oregon Ocean-Coastal Management Program. The Atlas includes four main sections:  
- The "Search" section of the OCA website, constantly upgraded, allows to Search and download GIS Spatial Data from the above mentioned archive. Data search can be performed by coastal setting (from a list of predefined coastal places), keyword, data source or spatial scale.  
- The Coastal Atlas includes an Internet Map Server to create simple personalized maps, visualising and downloading data relevant to the coast. Maps can be exported as pdf format.  
- The OCA web site provides also access to a variety of tools (see 6b) created by NOAA, FEMA and others designed to help different types of coastal users answer questions that are common in coastal areas. In addition, a series of Oregon topic-specific coastal tools constructed by Atlas partners are made available.  
- Finally OCA provides a “Learn” section, containing simple introductory information for a range of coastal geographic settings (estuaries, sandy shores, rocky shores, ocean areas) and coastal topics (access, hazards, history, processes)  
The Oregon Coastal Atlas is a member of the International Coastal Atlas Network (ICAN), an informal group of organizations who have been meeting since 2006 to scope and implement data interoperability approaches to coastal web atlases. The Atlas is funded by the National Science Foundation, NOAA Coastal Services Centre, and U.S. geological service/Federal Geographic Data Centre. |
<table>
<thead>
<tr>
<th>Typology</th>
<th>Operational context and information content</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2a</strong> ICZM dimensions</td>
<td>The atlas mainly deals with ICZM dimension of territory and environment. Some information are also available for the economic (e.g. fishery, energy exploitation), social (beach access, bathing waters) and governance (State marine managed areas, dredge material disposal sites, wave energy preliminary permit sites) dimensions.</td>
</tr>
</tbody>
</table>
| **2b** ICZM Sectors | The information contained in the OCA mainly concerns the following themes:  
- Physical environment  
- Coastal habitats  
- Imagery  
- Biology  
- Management  
- Human impact  
- Conservation  
- Environmental monitoring  
- Infrastructures  
- Natural resource  
- Fisheries, aquaculture & agriculture  
- Tourism and recreation |
<p>| <strong>2c</strong> Integration | Some limited integrated information is available through the Map viewer, i.e. landslide hazard areas, shorelines exposure to waves, beach water quality assessment (different coloured flags). Much more integrated information can be accessed by the tools section (see 6b), in particular: Coastal Inundation Visualization; Coastal Risk and Vulnerability Assessment Tool; Landslide Hazard Maps; HAZUS-MH risk assessment software program for analyzing potential losses from floods, hurricane winds and earthquakes. |
| <strong>2d</strong> Spatial scale | Sub-national scale - Oregon coasts and sea. |
| <strong>2d</strong> Flexibility | Oregon Coastal Atlas is specifically designed to deal with the coastal area of Oregon. |</p>
<table>
<thead>
<tr>
<th>3</th>
<th>ICZM functionalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>3a</td>
<td>Knowledge related functionalities</td>
</tr>
<tr>
<td></td>
<td>Some knowledge related functionalities are provided by OCA:</td>
</tr>
<tr>
<td></td>
<td>- Integration among different information sectors (see point 2c);</td>
</tr>
<tr>
<td></td>
<td>- Availability of spatial data; the system allows the downloading of GIS layers through an intuitive search functionality;</td>
</tr>
<tr>
<td></td>
<td>- Operation at the different spatial scale; some of the available spatial data can be re-scaled according to the considered spatial extent; thus enabling to visualize more details at a higher scales.</td>
</tr>
<tr>
<td>3b</td>
<td>Process related functionalities</td>
</tr>
<tr>
<td></td>
<td>OCA provides a high variety of data on the marine and coastal system organised in an articulated structure; it can therefore support problem understanding and structuring for the Oregon Coastal Areas. Extended texts and images provide further support to problem understanding. This kind of information is especially available in the Learn Section of the web site which provides introductory information for a range of coastal geographic settings (Estuaries, Sandy Shores, Rocky Shores, Ocean Areas), and coastal topics (Access, Water Quality, Hazards, Processes). Text information is also available in the Map Viewer section, interrogating the displayed layers. Learn section is also very useful in addressing communication purposes.</td>
</tr>
<tr>
<td>4</td>
<td>Users</td>
</tr>
<tr>
<td>4a</td>
<td>User typology</td>
</tr>
<tr>
<td></td>
<td>The Oregon Coastal Atlas aims at being an useful resource for various user typologies involved or interested in Oregon Coastal Zone management, such as:</td>
</tr>
<tr>
<td></td>
<td>- Researchers/scientists;</td>
</tr>
<tr>
<td></td>
<td>- NGOs;</td>
</tr>
<tr>
<td></td>
<td>- Government/public bodies;</td>
</tr>
<tr>
<td></td>
<td>- Consultancies;</td>
</tr>
<tr>
<td></td>
<td>- Coastal/environmental managers;</td>
</tr>
<tr>
<td></td>
<td>- Decision makers;</td>
</tr>
<tr>
<td></td>
<td>- General Public.</td>
</tr>
<tr>
<td></td>
<td>Specific tools are also developed for three specific groups of users (public, planners and researchers, see 6b). On average OCA receives about 13,945 visit per month resulting in about 280,745 page views per month (Haddad et al., 2011).</td>
</tr>
<tr>
<td>5</td>
<td>Use of the system</td>
</tr>
<tr>
<td>5a</td>
<td>Accessibility</td>
</tr>
<tr>
<td></td>
<td>Free access on-line without password to the complete CIS</td>
</tr>
<tr>
<td>5b</td>
<td>User-friendliness</td>
</tr>
<tr>
<td></td>
<td>Highly user-friendliness (designing simple, intuitive and informative web interface; complete help user-guide).</td>
</tr>
<tr>
<td>5c</td>
<td>Interactiveness</td>
</tr>
<tr>
<td></td>
<td>No specific participation tools are available, though it was declared that the OCA has been developed also thanks of coastal people by “thoughtful feedback” on atlas prototypes and other interim steps (see information provided in <a href="http://www.coastalatlas.net/">http://www.coastalatlas.net/</a>).</td>
</tr>
<tr>
<td>5d</td>
<td>Data access</td>
</tr>
<tr>
<td></td>
<td>Geospatial data and metadata are available from the search tool of</td>
</tr>
</tbody>
</table>
OCA. Metadata are compliant with FGDC Content Standards for Digital Geospatial Metadata, Map can be printed/exported from the Internet Map Server.

<table>
<thead>
<tr>
<th>6</th>
<th>Technological characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>6a</td>
<td>Used technology</td>
</tr>
<tr>
<td></td>
<td>Maps are served using both proprietary software (ArcIMS) and Open Source Minnesota MapServer and a modified version of the ka-Explorer interface of ka-Map. Ka-Map is an open source project that is aimed at providing highly interactive web-mapping interfaces using features available in modern web browsers. Server operating System: red Hat Linux, windows 2000 SP3</td>
</tr>
<tr>
<td>6b</td>
<td>Integration with other tools</td>
</tr>
<tr>
<td></td>
<td>Within the coastal atlas web site a variety of tools has been assembled. They are created by several entities (e.g. NOAA, FEMA) and by Atlas partners, designed to help different types of coastal users answer questions that are common in coastal areas and specific for Oregon topics. Tools are thought for public (e.g. link to The Oregon coastal access inventory for an accurate description of all public beach access points in Coastal Oregon), planners (e.g. Coastal Risk and Vulnerability Assessment Tool of NOAA) or researchers (e.g. link to OrCOOS website facilitates the access to of a wide variety of near real-time ocean observing and modelling systems). The full list of tools is provided at <a href="http://www.coastalatlas.net/index.php?option=com_content&amp;task=blogsection&amp;id=3&amp;Itemid=4">http://www.coastalatlas.net/index.php?option=com_content&amp;task=blogsection&amp;id=3&amp;Itemid=4</a></td>
</tr>
<tr>
<td>6c</td>
<td>Integration with other CIS</td>
</tr>
<tr>
<td></td>
<td>OCA is a member of the International Coastal Atlas Network (ICAN).</td>
</tr>
<tr>
<td>6d</td>
<td>Interoperability</td>
</tr>
<tr>
<td></td>
<td>Use of metadata standard FGDC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>7</th>
<th>Cost/resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>7a</td>
<td>Resources</td>
</tr>
</tbody>
</table>
## General Information

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>Name</td>
</tr>
<tr>
<td>1b</td>
<td>OzCoasts is a freely accessible on-line system with a web-based interface that provides comprehensive information about Australia's coasts (including its estuaries and coastal waterways) to natural resource managers, marine scientists, planners, policy makers and general public. The content of OzCoasts represents the collaborative efforts of more than 100 coastal scientists from a wide range of government agencies and universities. OzCoasts was originally called OzEstuaries and was developed during the first National Land and Water Resources Audit to incorporate the Australian Estuarine Database and estuarine datasets compiled in the 2000. The content of the web-site was upgraded several times during the years. Information collected in the web-site is structured in modules that have been designed in different time steps starting from 2000, involving collaboration with various partners. The web-site modules are:</td>
</tr>
<tr>
<td></td>
<td>- <strong>Climate Change</strong>; it provides information and tools to help communicate the risks of sea level rise and other potential impacts of climate change on coastal areas.</td>
</tr>
<tr>
<td></td>
<td>- <strong>Conceptual Models</strong>; it provides information and useful diagrams on conceptual modelling of different ecosystems;</td>
</tr>
<tr>
<td></td>
<td>- <strong>Coastal Indicators</strong>; the coastal indicator knowledge and information system is an information source and education tool for managers, students, researchers and policy makers with an interest in the coastal zone. It consists of a series of fact sheets that provide background scientific information on issues and measures that are commonly used as indicators.</td>
</tr>
<tr>
<td></td>
<td>- <strong>Habitat Mapping</strong>; it provides different links to web-sites with interactive mapping tools dealing with specific areas. Some of them are interactive three dimension models (i.e. Sydney harbour, Woody Island, Keppel Bay and Cockburn Sound);</td>
</tr>
<tr>
<td></td>
<td>- <strong>Natural Resource Management</strong>; it provides online access to key information and data that support Natural Resource Management Reporting. Information on natural resource condition informs policy at national and state levels, and underpins management at regional and local scales;</td>
</tr>
<tr>
<td></td>
<td>- <strong>Landform and stability maps</strong>; it provides detailed coastal landform and landform sensitivity mapping for the entire continental Australian coastline. Related (topography, bathymetry, estuaries, beaches, political boundaries, bio-regions, geology, infrastructure and land uses and population centres) is provided through a Web-GIS interface.</td>
</tr>
<tr>
<td></td>
<td>OzCoasts web-site also includes a “Search Data” function to undertake a simple and advance (estuary search, beach search and</td>
</tr>
<tr>
<td>1c</td>
<td>Operating entity</td>
</tr>
<tr>
<td>----</td>
<td>------------------</td>
</tr>
<tr>
<td>1d</td>
<td>Management structure</td>
</tr>
</tbody>
</table>
| 1d | Contacts | e-mail: ga@ozcoasts.org.au  
OzCoasts  
Marine & Coastal Environment Group  
Geoscience Australia  
GPO Box 378  
CANBERRA ACT 2601  
Australia  
Web-site: [http://www.ozcoasts.org.au/about/about.jsp](http://www.ozcoasts.org.au/about/about.jsp) |
| 1e | Typology | Operational |
| 2 | Operational context and information content |
| 2a | ICZM dimensions | OzCoasts addresses all the five considered information dimensions. The Coastal Indicators module includes information related to the territory, environmental, social and economic dimensions. The governance dimension in depth covered by the “Natural Resource Management” module. Indeed, this module allows to query all typologies of Regional plans and/or strategies for each Australian Region. |
| 2b | ICZM Sectors | Data, geographic information and coastal indicators included in the various modules of the OzCoasts are related to the following main topics:  
- Climate change and scenarios maps (Climate change module);  
- Wide set of coastal indicators (Coastal indicators module) organised in the following main categories and subcategories: (i) coastal issues, including the following sub-categories: declining water quality, climate change, habitat/species alterations, economic values and consequences; (ii) biophysical indicators, including the following sub-categories: water quality, sediment quality, habitant extent and quality, biotic indictors; (iii) pressure indicators, including the following sub-categories: agricultural, industrial, urban, catchment condition; (iv) coastal management indicators (i.e. coastal care community groups, marine network participation, marine protected areas);  
- Coastal habitats with some links at external web-site providing interactive mapping tools for the coastal habitats (Habitat mapping module);  
- **Land form and stability maps** of the entire Australian coastal area, viewable through a Web-GIS component. The module |
provides a detailed map of the coastal landform types (or geomorphology) of continental Australia and most adjacent islands (excluding the Great Barrier Reef). As a geomorphological map, it represents not just the topography of the coast, elevation and shape of the coastal landforms but it also indicates what the differing coastal landforms are made of (e.g. varying rock types, laterite, coral, sand, mud, boulders, beachrock). The map classifies coastal landforms into differing combinations of form (generalised shape) and constituents (or fabric) which in turn are indicative of the differing natural processes by which each coastal landform has developed.

<table>
<thead>
<tr>
<th>2c</th>
<th>Integration</th>
<th>OzCoasts includes a wide range of integrated information. Some relevant examples are: land forms, stability maps, vulnerability to inundation and different climate change scenarios maps. Furthermore a complete set of coastal indicators propose integrated views and analysis of the coastal area (see 2a).</th>
</tr>
</thead>
<tbody>
<tr>
<td>2d</td>
<td>Spatial scale</td>
<td>National – Australian coasts.</td>
</tr>
<tr>
<td>2e</td>
<td>Flexibility</td>
<td>The system has been developed in order to be applied specifically to the Australian coastal area.</td>
</tr>
</tbody>
</table>

### 3 ICZM functionalities

#### 3a Knowledge related functionalities
OzCoasts provides a relevant number of knowledge related functionalities, specifically:
- Integration among different information sectors (see point 2c);
- Availability of spatial data; some information regarding the coastal habitat are downloadable in shape-files format. Other information are available through the link to the original documents;
- Inclusion of a wide set of indicators focusing on coastal management, issues (see point 2b);
- Inside the OzCoasts are provided a lot of coastal indicators on different ICZM dimensions and sectors (see 2a and 2c);
- Inclusion of various information related to coastal vulnerability to climate change. In particular a specific module is entirely dedicated to climate change, including detailed maps of sea level rise vulnerability and other related information (for example in relation to adaptation strategies to climate change or elevation data and modelling). The indicator set contains a specific sub-category dedicated to climate change, including the following indicators: global warming, ocean acidification, saline intrusion, sea level rise, vector borne disease.

#### 3b Process related functionalities
Process related functionalities are also widely covered by OzCoasts, specifically:
- OzCoasts offers a wide range of conceptual models, in particular: beach geomorphic models, estuarine biophysical models, stressor models process/threat models. This module also enables user to build its own conceptual models. Problem understanding and conceptual modelling is also supported by the wide set of indicators and the module focusing on coastal landform and stability maps. Furthermore the system will soon
include a Coastal Eutrophication Risk Assessment Tool.
- The *coastal stakeholder link search* (within the Search Data function) enables to search stakeholders involved in coastal management according to spatial criteria and governance levels. This tool can actually support stakeholder cooperation within the ICZM process;
- Similarly to the previous tool, the *regional plan and strategies link search* enables to search planning documents according to spatial and typology criteria (e.g. coastal action plan, estuarine management plan, river plan, coastal management plan, wetland management plan, coastal strategies, etc.). This tool can properly support ICZ planning and management.
- Scenario building is provided for coastal vulnerability to sea level rise; in particular detailed inundation maps are available for some coastal areas at the sub-national and local scale.

### 4 Users

| 4a | User typology | OzCoasts contains a wide variety of information, thus potentially addressing more users:
- Policy and decision-makers, may be more interested in summary information such as those provided by coastal indicators or related to vulnerability maps to sea level rise;
- Same information can be also very useful for coastal planners and/or managers, that can be also interested in information on plans and strategies related to the coastal zones as well as in pre-defined and customised conceptual models;
- Experts can find in the system specific data related to coastal habitats and spatial data related to landform and stability maps;
- Fact sheets on indicators can be also useful to improve civil society awareness on Australian coastal problems. |

### 5 Use of the system

<table>
<thead>
<tr>
<th>5a</th>
<th>Accessibility</th>
<th>Free access on-line to all Ozcoasts contents and its functionalities.</th>
</tr>
</thead>
<tbody>
<tr>
<td>5b</td>
<td>User-friendliness</td>
<td>Medium user-friendly. OzCoasts is structured on functional modules (those described in point 1b); this actually helps significantly the use of the system. However, also due to the complexity of the system use of some of the modules is not totally intuitive and requires a high number of steps.</td>
</tr>
</tbody>
</table>
| 5c | Interactiveness | Two participation tools are included in the OzCoasts system:
- A tool for the creation of customised conceptual models of coastal habitats and processes;
- The *coastal stakeholder link search* (within the Search Data function) enabling users to search stakeholders involved in coastal management according to spatial and governance criteria. This tool can actually support stakeholder cooperation within the ICZM process. |
| 5d | Data access | This field is not properly applicable to OzCoasts |
### 6 Technological characteristics

<table>
<thead>
<tr>
<th></th>
<th>Used technology</th>
<th>Integration with other tools</th>
<th>Integration with other CIS</th>
<th>Interoperability</th>
</tr>
</thead>
<tbody>
<tr>
<td>6a</td>
<td>OzCoasts is a web-site developed with <em>java scripts</em> languages and standards.</td>
<td>No integration with other tools. OzCoasts is actually a systems formed by various tools (or modules).</td>
<td>No specific integration with other CIS. OzCoasts is actually an on-line system including a high number of link to other coastal systems and web-site.</td>
<td>Not applicable</td>
</tr>
<tr>
<td>6b</td>
<td>Integration with other tools</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6c</td>
<td>Integration with other CIS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6d</td>
<td>Interoperability</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 7 Cost/resources

<table>
<thead>
<tr>
<th></th>
<th>Resources</th>
</tr>
</thead>
</table>

Web-site consultation for the overview analysis of OzCoasts:

Annex 3 – Results of the in-depth analysis
HELCOM Map and Data Service

General Information

One of the main roles of Helsinki Commission (HELCOM) is to act as regional environmental focal point, providing access to a wide range of information on pressures, state and trends characterising the coastal and marine environment of the Baltic Sea.

During recent years, HELCOM has been increasingly using GIS solutions to analyse data and to visualise complex scientific information on both static maps and interactive internet based maps.

The HELCOM Map and Data Service (MDS) aims to make environmental information accessible for stakeholders and for general public, providing data on efficiency of measures undertaken to protect the Baltic Sea, information about monitoring activities and regional preparedness for accident response. HELCOM MDS gives particular attention to the issue of nutrients and hazardous substances loads to the Baltic Sea and their effect on the marine ecosystem.

HELCOM MDS is formally operated by the Secretariat of the Helsinki Commission (Baltic Marine Environment Protection Commission). A contractual agreement has been set by HELCOM with centres providing data to the system.

The HELCOM MDS current on-line is a recently updated version, which has been made possible by the work of the HELCOM project Development of HELCOM Data and Geographic Information System which is funded by the Nordic Council of Minsters during 2009-2010.

HELCOM MDS is configured as a Web-GIS visualising and making accessible Baltic Sea related datasets. Former GIS map services (e.g. MARIS; Nutrient GIS; Marine spatial GIS; Coastal fish monitoring; COMBINE monitoring GIS and Data delivery service) have been joint into one single service, making it easier to combine and analyse data.

From the web site of HELCOM MDS, http://maps.helcom.fi/website/mapservice/index.html, (Figure A3-1), users are able to:

- visualize, analyse and search Baltic Sea environmental data;
- draw and save or print customized maps;
- download ESRI shape files;
- access layers in OGC WMS standard protocol.

For any feedback, questions or assistance, data administrator at HELCOM Secretariat (Katajanokanlaituri 6 B, FI-00170 Helsinki Finland), Joni Kairaranta can be contacted at joni.kairaranta@helcom.fi.
Operational context and information content

The main information contained in HELCOM MDS matches four of the five ICZM dimension: Environment, Territory, Economy and Society. The environment and the territory dimensions are in depth developed, mainly for the marine space. The economic information in the system is provided with layers regarding commercial fishery, nuclear facilities, off shore winds farm, oil platform, maritime traffic, etc. Finally, the social dimension is represented by population density.

The information is structured in the following main topics, acting as folders containing different GIS layers:

- Ecological features (e.g. ecosystem health status, modelled photic zone, important birds area, coastal fish abundance, etc.);
- Protected area (e.g. UNESCO sites, fisheries closure area, Baltic sea protected area, RAMSAR sites, Natura 2000 sites, etc.);
- Monitoring (e.g. coastal fish monitoring, COMBINE project monitoring, MORS project monitoring for radioactive substance, etc.);
- Pollution (e.g. hazardous substances, waterborne loads, river loads, atmospheric loads, etc.);
- Shipping (maritime traffic, accidents, emergency capabilities, etc.);
• Pressures (e.g. Baltic Sea Pressure Index, Baltic Sea Impacts Index, coastal defence structures, etc.);
• Fisheries (e.g. total commercial fishery, etc.);
• Eutrophication status (e.g. nutrients, chlorophyll, benthic invertebrate communities)
• Background layer information related to the marine and terrestrial environment (e.g. Corine land cover, population density in the Baltic basin, etc.).

Data come from different providers, mainly the HELCOM secretariat, the Finnish Environmental Institute (SYKE), the Radiation and Nuclear Safety Authority of Finland (STUK), the European Monitoring and Evaluation Programme (EMEP), the International Council for exploration of the Sea (ICES).

The HELCOM MDS provides various examples of integration among data related to different sectors and information dimensions (Table A3-1). They mainly concern the following 3 thematic issues:

• the integrated assessment of the environmental status of coastal areas and open sea (ecological, chemical, biological and eutrophication state);
• the overall assessment of pressure and impacts from anthropogenic sources;
• shore sensitivity to oil spill.
### Table A3-1 Integrated data published in HELCOM MDS.

<table>
<thead>
<tr>
<th>Folder</th>
<th>Layer</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecological</td>
<td>Overall ecosystem health status, coastal area/open sea</td>
<td>Integrated classification of the ecosystem health status (HOLAS) in coastal/open sea assessment units. The holistic assessment builds on three thematic assessments: 1) Biodiversity status assessment tool (BEAT) 2) Chemical status assessment tool (CHASE) 3) Eutrophication status assessment tool (HEAT)</td>
</tr>
<tr>
<td></td>
<td>Overall Biodiversity status, coastal area/open sea</td>
<td>Integrated classification on biodiversity status of the Baltic Sea (BEAT) in coastal sites/open sea. It is the end result of the HELCOM Biodiversity Assessment Tool (BEAT).</td>
</tr>
<tr>
<td>Pollution</td>
<td>Overall chemical status, coastal area/open sea</td>
<td>Integrated classification of the hazardous substances status in coastal assessment units, using the HELCOM Hazardous Substances Status Assessment Tool (CHASE)</td>
</tr>
<tr>
<td>Shipping</td>
<td>Shore sensitivity to oil spill, summer, winter</td>
<td>Ranked polygons based on their sensitivity to oil spills.</td>
</tr>
<tr>
<td>Other pressures</td>
<td>Baltic sea Pressure Index</td>
<td>Baltic Sea Pressure Index (BSPI- HOLAS project), calculated from spatial analysis of 52 human activities causing pressures on the Baltic Sea marine environment</td>
</tr>
<tr>
<td></td>
<td>Baltic Sea Impact Index</td>
<td>Baltic Sea Impact Index (BSII- HOLAS project), calculated from spatial analysis of 52 human activities causing impacts on the Baltic Sea marine environment</td>
</tr>
<tr>
<td>Eutrophication</td>
<td>Overall (integrated) eutrophication status, coastal area/open sea</td>
<td>Classification of Eutrophication status based on an integration of all core set indicators using the HELCOM eutrophication assessment tool (HEAT).</td>
</tr>
</tbody>
</table>

For all the available layers, HELCOM MDS allows easy access to detailed and clear metadata (metadata sheets). They are structured and described according to the standard ISO 19115 and are compliant with the INSPIRE Directive standard.

HELCOM MDS, covering the whole Baltic Sea Area, is specifically developed to address Baltic Sea specificities. Layers fit to the whole Baltic Sea and the Baltic coastal area, allowing zoom to visualize information with more detail. A bookmark function, available among the web-GIS tools, allows to switch quickly to customized sub regions of Baltic Sea. Two bookmarks already available as examples in the HELCOM MDS are “Gulf of Finland” and “Bothnian Bay” (Figure A3-2).
Figure A3- 2 An example of Bookmark (widget on bottom right): the Gulf of Finland.

Technological characteristics

The used technology is ESRI ArcGIS Server 9.3.1, which gradually replaced the previous service based in ArcIMS. As indicated on the HELCOM web page, the service is designed as a Service Oriented Architecture (SOA), i.e., ArcGIS Server must be running and exposing services. All transactions between Flash Player client and ArcGIS Server happen via a REST based service endpoint. Since Flash is a client platform only the requests to ArcGIS Server leave the client.

Databases are a key component of HELCOM’s information and data strategy, according to which all HELCOM data should be openly available for anyone interested. HELCOM datasets are generally compiled by HELCOM data consultants or the HELCOM secretariat from information and data submitted by the HELCOM contracting parties. Data are adopted after proper data quality checking, depending on the various data provider and relative agreements with HELCOM. Graphs and maps are published in Indicator Fact Sheets, various reports and assessments and interactive map services are accessible via the HELCOM website.

Most of HELCOM MDS map services and databases are hosted by the HELCOM Secretariat server, while some databases are hosted by HELCOM’s external data hosts. The web page of the Helsinki Commission (http://www.helcom.fi/GIS/en_GB/HelcomGIS) provides links to relevant websites for database and map services related to the activities of the same Commission, whose data are at least partially viewable through and integrated within the HELCOM MDS. Some of the databases:

- Baltic Sea Protected Areas (BSPA) database (http://bspa.helcom.fi/), accessible through a link from HELCOM home page. Protected areas are visible in HELCOM MDS;
• COMBINE monitoring data, downloadable from ICES Oceanographic database and viewable and downloadable in the ICES EcoSystemData map service (http://ecosystemdata.ices.dk/map/index.aspx).

• HELCOM MORS; database of the MORS project dealing with monitoring of radioactive substances in water, sediments, and biota downloaded via International Atomic Energy Agency's Marine Information System (http://maris.iaea.org). In the HELCOM MDS only monitoring stations are shown;

• Data and metadata produced by the EU funded project BALANCE (Baltic Sea Management – Nature Conservation and Sustainable Development of the Ecosystem through Spatial Planning, http://www.helcom.fi/GIS/BalanceData/en_GB/main). Part of the BALANCE datasets can be visualized and downloaded in the HELCOM Map and Data Service.

The diagram of the current architecture of the HELCOM data and GIS system is shown in the Figure A3-3. “Web map services”, “Metadata portal” and “Data delivery services” are provided in the new version of the MDS as tools of the same web GIS application.

STUK: Radiation and Nuclear Safety Authority of Finland; ICES: International Council for the Exploration of the Sea; BSPA: Baltic Sea Protected Areas database; PLC: Pollution Load Compilation database; MORS: Monitoring of Radioactive Substance database

Figure A3-3 Diagram of the current architecture of the HELCOM data and GIS system.
The interoperability of the system is high, as specific tools for static map export, download of shapefiles and connection to layers via WMS are implemented (Figure A3-4). One of the next challenges of HELCOM is to move to an OGC-WFS (web feature service) providing an interface allowing requests for geographical features across the web using platform-independent calls. Moreover, metadata are structured and described according to the standard ISO 19115, being therefore complying with the INSPIRE Directive.

![Figure A3-4 Tools for data delivery of HELCOM MDS.](image)

**ICZM related functionalities**

HELCOM MDS provides various functionalities supporting the ICZM process. Knowledge related functionalities are various and powerful: extended information contents structured by thematic groups are easily consultable with an user friendly web-GIS.

The high interactivity of the systems is ensured by different tools available in the web-GIS application, helping users to find specific information and to combine these in integrated custom maps. The tools (Figure A3-5) allow to:

- Formulate a Query;
- Draw lines and text;
- Interrogate the map for point information;
- Export the map (JPG, PNG, SVG formats);
- Create bookmarks;
- Search layers, by graphical selection or by text, viewing results in detailed table.

As indicated in the previous section the system allows downloading of GIS layers in shape file format and via WMS (all layers are available as WMS on: [http://maps.helcom.fi/ArcGIS/services/DataDelivery/MapServer/WMSServer](http://maps.helcom.fi/ArcGIS/services/DataDelivery/MapServer/WMSServer)).
The articulated structure of data organisation in different thematic folders and the availability of a high variety of data on the marine and coastal system can efficiently support problem understanding and structuring in Baltic Sea management.

Moreover, the presence of several integrated data, as those ones synthetically describing the environmental status of Baltic Sea, surely help users to better understand environmental problems and processes characterising the region.

Some multi-time information is also available, allowing users to explore changes in some parameters over time. This is the case for example for datasets on maritime traffic (in the shipping folder), as the number of ships equipped with Automatic Identification Systems (AIS) crossing specific passage lines in the Baltic Sea during different period (from 2007 to 2010). Furthermore the monitoring folder shows the evolution of the monitoring network from 2005 to 2007.

Some of the information provided matches some of the ICZM indicators, as detailed in the followings:

- The amount of oil pollution;
- The amount of nutrients in coastal waters;
- The volume of port traffic;
- Fish stocks and fish landings (catches/landings)
- The area of sea protected by statutory designations, including:
  - Baltic sea fishery closure: the area closed for fishing has been drawn according to EC Council Regulation No 2187/2005 of 21 December 2005 for the conservation of fishery;
  - Cod fishery closures, according to the EC Council Regulation (EC) No 1098/2007 of 18 September 2007 establishing a multiannual plan for the cod stocks in the Baltic Sea and the fisheries exploiting those stocks;
- Baltic sea protected area: it includes the borders of designated Baltic Sea Protected Areas, according to the HELCOM Recommendation 15/5 (1994);
- Ramsar sites;
- Natura 2000 sites.

More in general the system is intended to provide knowledge-based support to the activities of the Helsinki Commission related to the integrated planning and management of the marine and coastal environment of the Baltic Sea. HELCOM MDS, acting as data integrator, is indeed a fundamental information system for Baltic Sea management and planning.

**System development and management**

One of the main challenge of The HELCOM MDS is to constitute a data integrator from different data sources. Data comes from different databases and different data providers and therefore one of the main difficulties encountered by the system developers is related to the heterogeneity of the available data, each of them having different format, different quality level and different or lacking metadata. The process of data check and data validation, carried out by the HELCOM secretariat and its data consultants, is therefore different depending on the different data providers and on the established agreement with them.

The data updating is periodically performed to maintain the Map and Data Service, depending on the availability of relevant new data as well as regular reporting requirements under the HELCOM framework (e.g. shipping accidents, illegal discharges, pollution loads etc).

The current application of the ArcGIS Server based HELCOM MDS developed during 2009-2010, is the result of a long work starting about 5 years ago with:

- A first application of MARIS (2005-2007), developed at SYKE (the Finnish Environmental Institute), only hosted by HELCOM.
- A following ArcIMS based systems, developed at HELCOM (2007-2009). The work involved one person working part time with map services with additional help from 2-3 person for layer preparation and optimization. Additionally, the HELCOM GIS system was developed with expert input provided on a project basis.

The now available application and the current maintaining and updating of HELCOM Map and data service for 2011 is carried out by one person working full time with data administration issues. Input in layer preparation and optimization is also provided by ~2-3 persons as well as various HELCOM projects.

The target users of the HELCOM MDS are:

- Decision-makers, at the Regional Sea level;
- Coastal planners and/or managers, at the Regional Sea level;
- Specialised and expert users;
- Civil society, for awareness and communication issues related to the sustainable use of the Baltic Sea;
- Teachers and students for education programmes.

All the information published in HELCOM MDS is public, without any restriction or privilege for different users.
HELCOM MDS includes a feedback tool to send suggestions in order to improve system’s functionalities and contents. HELCOM is also considering the use of so called Web 2.0 communication channels such us Twitter, Flickr, LinkedIn or Facebook, considering also that one of the principles of the Data and Information Strategy of the Helsinki Commission is to facilitate the access of the environmental information to the general public.

Experience with the implementation

This scientific information contained in HELCOM MDS is the basis for many HELCOM assessments, which in turn provide direct input to policy making.

In March 2009 a survey was prepared by the HELCOM Secretariat targeted to all existing as well as potential future users of the HELCOM GIS and Data Services. The aim of the questionnaire was to assess the quality, usefulness and user-friendliness of the current services in order to identify methods to enhance it.

HELCOM Secretariat received a total of 16 responses out of 230 users and potential users whom the questionnaire was sent to. This 7% response rate was considered normal for this kind of e-mail satisfaction survey questionnaire. The distribution of the responses indicates Sweden, Finland and Poland in the first position, followed by Russia, Estonia and Latvia (Figure A3-6). These countries are therefore likely to be the main provenance of the main web-GIS users.

Figure A3-6 Spatial distribution of HELCOM GIS and data survey (% responses).
The resulting statistics of these survey, referring however to the former version of HELCOM MDS (the ArcIMS based system), indicate (Figure A3-7) that the respondent users were experienced GIS users or had a geography/cartography background, and most have been using HELCOM GIS and data services for a long time. Most of the respondents used HELCOM GIS and Data services every 3 to 6 months and they had been using it for more than one year (56%). They mostly searched and visualized data whereas only few of them downloaded or edited the data. This may be because the HELCOM data delivery tool was only launched in December 2008 and therefore still relatively unknown at the time of the survey, and the fact that the system was not yet fully operative and needed significant improvement.

The most recent statistics (from Google Analytics) about people visiting the web-site, indicate, for the period February 19 – March 21, 2011, an overall number of 1100 visits, of which 53.55% are new visits.

Figure A3-7 Some of the statistical results of survey by HELCOM secretariat (march 2009).

No information about the effective use of the system as a support tool for ICZM is currently available.
Concluding remarks

HELCOM Map and Data Service is the result of a successful project of data integration combined with top of the range technological solutions for data publication and sharing.

The focus of the service, as defined by Helsinki Commission itself, is to provide a tool to support environmental planning of the Baltic Sea, which is a fundamental aspect of ICZM.

On the other hand, information on coastal characteristics and dynamics is not very detailed, and actually the system is poorly linked with coastal plans and policies.
Coastal Information System Oder Estuary

General Information

The Coastal Information System (CIS) Oder estuary is a web portal collecting scientific information (data, projects results, publications, etc.) about the Oder estuary region.

The Oder estuary region forms the border between Germany and Poland and is located at the south-western side of the Baltic Sea. This estuary region (also known as Oder coastal zone) covers an area of 30-60 km landwards from the sea-shore as well as the Pomeranian Bay (up to 12 nm seawards from the outer coastline). The land area (about 7.000 km²) includes two administrative districts on the German side (Ostvorpommern and Uecker-Randow) as well as three administrative districts (Goleniowski, Kamienski, Policki) and two urban districts (Szczecin and Świnoujście) on the Polish side.

The CIS of Oder Estuary is part of the ICZM-Oder project “Research for an Integrated Coastal Zone Management in the German Oder Estuary Region”, fully described in the Web portal at this specific address: http://www.ikzm-oder.de/en/projekt-ikzm-oder.html.

The ICZM-ODER project, started in 2004 and funded by the Federal Ministry for Education and Research (BMBF), has been dealing mainly with the following key topics:

- Dialogues and regional participation;
- Internet supported tools for ICZM (e.g. the CIS Oder Estuary);
- Spatially integrated regional ICZM;
- Coastal waters in transition (climate change);
- National strategy, training and international integration.

One major task of the ICZM-ODER was the development of the Coastal Information System Oder Estuary in the German/Polish cross-border region, aiming at:

- serving as a container for data information, project results, publications etc.;
- giving access to this data and information to a broad public;
- supporting integrated management and planning processes;
- serving as a transferable model for other regions. The aim was to develop a system, that is spatially expandable and transferable to other regions;
- establishing a German-Polish dialogue concerning coastal areas;
- setting up concrete tools in order to build a basis for a sustainable development for the Oder estuary.

The CIS Oder Estuary Web portal (http://www.ikzm-oder.de/en/startseite.html, Figure A3- 8) also links the web GIS tool, called GIS-ICZM, which allows free access to regional spatial information (http://gis.eucc-d.de/ikzm). The system includes multi-disciplinary spatial data related to the transnational coastal area of Oder. Because of the cross-border character of the Oder estuary region, the information system is translated in German, Polish and English in order to promote the international integration of the project.
More in general, the Oder estuary region has been included in a high number of projects dealing with ICZM and related aspects, such as:

- LOICZ-IGBP (Land Ocean Interactions in the Coastal Zone);
- Indicator programme of UNESCO-IOC (Intergovernmental Oceanographic Commission);
- Integrated Coastal Area - River Basin Management (ICARM) of UNEP (United Nations Environment Programme);
- EU FP6 SPICOSA project (Science and Policy Integration for Coastal Systems Assessment);
- INTEREG IIIB ASTRA project "Developing Policies & Adaptation Strategies to Climate Change in the Baltic Sea Region";
- EU South Baltic Programme ARTWEI project (Action for the Reinforcement of the Transitional Water's Environmental Integrity).

Information and results of these projects are included in the CIS Oder Estuary web portal. In particular, some of the results are included in the GIS-ICZM tool (e.g. those generated by the ASTRA project).

The CIS is currently managed by the German branch of the Coastal & Marine Union (EUCC-D, http://eucc-d.de/) with the main objective of promoting sustainable coastal management in Germany by integrating coastal sciences and practice, and more in general aiming at raising
international awareness of German initiatives of ICZM. The point of contact at EUCC-D is Nardine Stybel, e-mail: stybel@eucc-d.de; nardine.stybel@io-warnemuende.de, EUCC Germany, Baltic Sea Research Institute.

**Operational context and information content**

The GIS-ICZM addresses the ICZM dimensions: territory (e.g. in relation to geographic descriptors, administrative boundaries, infrastructure, coastal protection, etc.), environment (biological reserve, water pollution, results of the eutrophication model, harmful substance in fish and mussels), social and economic dimensions (churches, hospitals, museum, tourism facilitates, pipeline, wind-farms and traffic features). About the governance ICZM dimension, only the layers about coastal protection can be traced back to this dimension, as no information about plans or policies if provided.

More in detail, the GIS-ICZM contains a wide variety and as high number of spatial information; concerning the following sectors:

- Bathymetry;
- Sediment characteristics;
- Shoreline typology and coastal structures (dunes, dikes, piers, etc.);
- Coastal protection;
- Flooding zones according to different levels of flood risk;
- Biological aspects (benthic species, feeding area for birds, fish species);
- Biological reserves (national protected areas and international reserves, etc.);
- Seasonal sensitivity to oil spills for the coast and for the marine area;
- Coastal water typology according to the Water Framework Directive;
- Water eutrophication (i.e. concentration of nitrate and phosphate);
- Results of the eutrophication model in different years;
- Water and sediment chemical pollution;
- Harmful substance in fish and mussels;
- Naval and terrestrial traffic features;
- Tourism facilities;
- Civil features (Church, hospital, museum etc.);
- Offshore wind farm;
- Pipes and cables;
- Administrative boundaries;
- Mining area; i.e. areas for the extraction of sediments.

The CIS provides also integrated analysis, including in particular layers related to:

- Flooding zones according to four different levels of flood risk;
– Sensitivity of the coastal and marine areas to oil spills, determined by the Precaution Pollution Control (VPS) Model.

Metadata are managed with a dedicated web application with search and export tools (Figure A3-9). Metadata of a specific GIS layer can be reached from a link in its attribute table.

Figure A3-9 Metadata manager.

**Technological characteristics**

The system has been developed with MapServer technology, in collaboration with the University of Rostock. MapServer is an Open Source platform for publishing spatial data and interactive mapping applications to the web. A former release of the GIS ICZM was developed through the licensed ESRI software, and then abandoned due to economical and technical issues.

The system, even if not properly integrated with other tools, includes the outcomes of an eutrophication model, showing the modelled concentration of nutrients in different seasons and years in the marine coastal area (Figure A3-10 as illustrative example).
Figure A3- 10 Example of an outcome of the Oder Water Model: map of winter nitrate concentration.

As an example of integration with other CISs, the link from the web portal to the GIS ICZM for the federal state of Mecklenburg - Vorpommern (MV) has to be mentioned. As indicated in the web portal, the GIS ICZM MV acts as an umbrella system for the GIS ICZM of the Oder Estuary, also aiming to establish a connection to the systems of neighbouring regions: i.e. the federal state Schleswig-Holstein and those in Denmark and Poland.


**ICZM related functionalities**

The CIS includes several ICZM related functionalities, concerning both knowledge and processes. As for knowledge related functionalities, the GIS-ICZM is provided with integrated information, information supporting the analysis of coastal vulnerability to climate change and scalability.

An interesting example of integrated data available is represented by the layers on flooding zones (see Figure A3- 11), deriving from the ASTRA project "Developing Policies & Adaptation Strategies to Climate Change in the Baltic Sea Region", aiming at estimating regional effects of global climate change in the Baltic Sea Region and developing strategies to face climate change. The ASTRA project analysed 12 case studies, including the significant case of Oder estuary.

The maps of flooding areas, together with other information related to the ASTRA project, support the knowledge about Oder coastal vulnerability to climate change. The web portal is
linked to the ASTRA web-site (http://www.astra-project.org) and to the online available papers and publications discussed on regional workshops and meetings with regional stakeholders, authorities and partners. These informative contributions deal with the impacts of climate change on water quality and effects on economic development.

The web GIS operates at different spatial scales and plan and zoom tools are provided. Spatial data can be re-scaled according to the considered spatial extent, enabling to visualize more details at higher scales. For example, the information regarding the coastal ship traffic can be scaled until the very local scale.

As for process related information, the GIS-ICZM includes a high number and a wide variety of spatial information, organised in two-level tree structures. This hierarchical structure helps finding useful information. The GIS-ICZM tool is constantly used to support the various phases of the Oder ICZM process and related projects (including EU funded ones). The development of the whole web portal has been strongly supported by several institutions and administrations, providing a demand driven implementation of the system.

The Baltic Sea Research Institute Warnemünde and the German branch of the Coastal & Marine Union tested different indicator sets and helped to specify and improve international ICZM indicator sets. Some examples are given in the following list.

- the above activity also resulted in the contribution to the UNESCO publication “A handbook for measuring the progress and outcomes of integrated coastal and ocean management” (downloadable at http://unesdoc.unesco.org/images/0014/001473/147313e.pdf);

- indicators as a tool to measure the adaptability to climate change (see http://databases.eucc-d.de/files/documents/00000268_Artikel20_Loeser.pdf);


The portal also offers learning opportunities, in order to train and educate interested parties and regional leaders, as well as students, promoting and disseminating the ICZM concept.

E-learning modules on Oder Estuary regions and ICZM themes are provided by mean of the E-learning Platform “ICZM-D Lernen”, a freely accessible web-based learning system consisting of on-line studies, information and teaching modules that is a useful tool for the participation and dissemination of the information (Figure A3-12). There is a module about the Oder estuary region as well as thematic modules including a focus on the project ICZM-Oder as case study. The modules address experts, students and interested citizens.

Finally, GIS-ICZM, including multi-disciplinary spatial data related to a cross-border (German-Polish) coastal and marine area, contributes to support the German-Polish dialogue and cooperation on ICZM. From the web portal, a database of pictures taken in the area of interest is also available.

Figure A3-12 An example of interactive e-learning module from IKZM-D Lernen Platform.
System development and management

The whole project ICZM Oder started in May 2004 with a budget of 2 million of Euros for the first 3 years period, supported by the Federal Ministry of Education and Research Germany (BMBF). After this successful first three years period (2004-2007), the project has been renewed for other three years (2007-2010).

Between 2004 and 2008, the realisation of the CIS Oder estuary web Portal has been funded with about € 425.000 provided by BMBF, part of phase I and II of the ICZM Oder project. The implementation cost of the web-GIS is around € 365.000.

The first version of the CIS has been developed by an external company using ESRI technologies. This phase resulted in high expenses and technical problems related to the integration of the CIS with databases and other information sources, so the second implementation phase has been carried out directly by EUCC-D staff using open source technologies (MapServer).

An overview of the steering group and the stakeholder involvement is reported in the following scheme provided by the CIS managers (Figure A3-13).

---

Figure A3-13 Regional, bi-national and international integration of the ICZM-Oder project.
The steering group, during the development phase of the project, consisted of 12 direct and 8 indirect (extended steering committee) members from the following institutions: 1 NGO, 1 Department of Ministry of Federal State of Mecklenburg-Vorpommern, 6 State Agencies of Mecklenburg-Vorpommern, 2 Districts, and 1 tourist association.

Polish stakeholders were involved mainly via smaller workshops and cross-border conferences (the so called "German-Polish Coastal Dialogues").

The system is addressed to local and regional authorities, scientists, Polish and German actors and citizens (also including students and teachers). All the information published in the web portal and in the web GIS is accessible without any restriction or privilege for different users.

The system is currently maintained by four persons at EUCC-D; further improvements are foreseen, like the integration of an extensive geo-referenced photographic database to the CIS.

Experience with the implementation

In the graph reported in Figure A3-14, the long term history of page visits of website portal (http://www.ikzm-oder.de/) is shown. A growing number of visits characterised the first period of the time series, with an initial peak in occasion of the launch of the portal and a second higher peak in 2007; then visits have settled oscillating around a more stable value. Visitors come from the German Baltic Coastal region (44.8%), followed by Poland (29.6) and Germany. Outside these areas, the coastal information system attracted comparatively lower numbers of users (see Figure A3-15). Taking into account the visiting hours (mainly during the typical office hours from 8 a.m. to 5 p.m.) a professional use of the portal was deduced.
Figure A3- 15 Distribution of the origin of people visiting the web portal during August 2007 and July 2009 (GBCR stand for German Baltic Coastal Region).

Some of the results of the project carried out by the Baltic Sea Research Institute and the German branch of the Coastal & Marine Union, after being implemented in the CIS, have been used for some planning approval procedures (e.g. carried out by State Board of Mines).

The Oder CIS is one of the German case studies included in the OURCOAST project database (see [http://ec.europa.eu/ourcoast/index.cfm?menuID=7&articleID=202](http://ec.europa.eu/ourcoast/index.cfm?menuID=7&articleID=202)), aimed to be a comprehensive sharing tool that will further encourage the adoption of good practices in coastal management and support the decision-making process towards a more integrated and sustainable approach exchange.

Concluding remarks

The Oder web portal and web GIS are the result of successful project of data gathering and implementation to support ICZM. Stakeholders were involved in the development phase to support and to steer the project, and this resulted in a system strongly oriented to support the needs of regional coastal mangers and specialists.

The system therefore mostly provides information about specific issues (like water quality), and is not intended to be an exhaustive catalogue of all the useful information for ICZM. The CIS focus is on cross boarder information that can integrate the contents of the single stakeholders’ systems.

The Oder case study is nowadays promoted nationally and worldwide as an ICZM reference and model, and could be further implemented to identify and analyse decision processes, becoming an operative support system to coastal management. To achieve a real integration with coastal policies the next improvements should ensure that the CIS will become more and more accepted and valuable for regional decision-makers.
North Sea Atlas

General Information

The North Sea Atlas is a collection of maps on the marine environment of the Dutch North Sea, with information on the water system, use, policy and management of the North Sea (continental shelf and coastal area). The information content, based on the most recent available data, is limited to the water system including the seabed, with no specific information on land. The information content is planned to be gradually updated.

The Atlas provides interactive and printable maps very easy to browse, which allows anyone to visualize provided maps and layers.

The Atlas’ contents can be accessed by means of three ways:

1. using the online version of the Atlas (http://www.noordzeeatlas.nl/en/nzaEn.html);
2. visualising the printed version (2004 edition, which can be requested through the North Sea Office website http://www.noordzeeatlas.nl/en/index.html);
3. using an ESRI GIS software, like ArcGIS 9.1 (licensed) or ArcExplorer (free reader software).

The Atlas has been developed and is managed by the North Sea Office (Noordzee loket) to support the activity of the North Sea Interdepartmental Consultation Directorate (IDON), acting as a supervisor. IDON is a cooperative board of 10 representatives from different government sub-structure levels (e.g. agency, directorate general, directorate, department) belonging to four ministries:

- Ministry of Infrastructure and the Environment: spatial planning, use of the sea, coastguard;
- Ministry of Economic Affairs, Agriculture and Innovation: Oil & Gas Mining & Exploration;
- Ministry of Foreign Affairs;
- Ministry of Defence, Navy, Coastguard.

The primary purpose of IDON, created in 1998, is to debate and coordinate policies, directives and legislation about the North Sea.

For information about North Sea Atlas an info mail is available (noordzeeloket@rws); the contact person at the Ministry of Infrastructure and Environment, North Sea Directorate (P.O. Box 5807, 2280 HV Rijswijk - The Netherlands) is Ad Stolk (ad.stolk@rws.nl). Project leader of the North Sea Atlas is Marcel Bommele (marcel.bommele@rws.nl).
Operational context and information content

The North Sea Atlas includes information related to four of the five considered ICZM dimensions: territory (e.g. 3 and 12 miles nautical limits, protected areas, bathymetry), environment (e.g., characteristics of biological systems in various environmental matrixes such as sediment and marine water, pollutant concentrations) and economy (e.g. locations of offshore wind-farms, marine traffic). Governance is also properly addressed; a specific section of the Atlas deals with information related to “Policy and management of the Dutch North Sea”.

The Atlas is structured in three main sections:

- Part I. Water system (concerning physical, chemical and biological issues of the marine area);
- Part II. Usages (different uses of the sea);
- Part III. Policy and management (concerning administration policies for safeguarding the North Sea).

Figure A3-16 North Sea Atlas online featuring Geomorphology map.
More in detail, information as bathymetry, geomorphology, sediment granulometry, hydrodynamics compose the information about the physical geography of the area. The biological system is described through the analysis of species distribution for sediment, water and air. Data of pollutant concentration in sediments, data about salinity, suspended matter in water and data about erosion and transportation process of the suspended matter, compose the chemical description of the sea. The monitoring network is also shown, with the specification of the monitored stations for physical, chemical and biological data.

The information about the different uses of the sea includes archaeological zones, division of the Dutch Continental Shelf, pollution reports on Dutch Continental Shelf, sand and shell extraction, dumping sites of dredged material, submarine cables, platforms and pipelines, traffic separation scheme, military use.

The section about the policy and management of the Dutch North Sea includes national competence areas, maritime zoning (statutory administrative zones), maps of the spatial policy document PKB “key planning decision”, protected sites according to the EU Birds and Habitats Directive, drainage basins according to the Water Framework Directive, maps showing elements related to mining uses, and seabed protection areas.

Some integrated information is also provided in the Atlas. The most interesting are the analysis of the sedimentation/erosion areas together with the transportation direction of suspended matter in the seawater, the map showing the mining uses of the sea and the related regulation and the map of the spatial policy document PKB.

In particular, the PKB, “key planning decision”, gives an overall picture of the spatial developments of the area. PKB defines two key objectives of spatial policy concerning the North Sea: to enhance the economic significance of the North Sea and to conserve and develop internationally important ecological and landscape values.

The Atlas content refers to the national scale: all the Atlas information fit the Dutch Continental shelf or more specifically the Dutch coastal area of the North Sea. For some layers, information is available for a larger portion of the North Sea. The system has been developed in order to be applied specifically to the zone of Dutch Sea. However, an upgrade of the system is planned in order to make the Atlas a more flexible tool.

Metadata, available as descriptive sheets, are in general provided for the pre-defined maps (groups of layers) included in the Atlas. However, they are not available for the specific layers.

**Technological characteristics**

The technology used for the North Sea Atlas is the licensed software ESRI ArcSDE. Data standardization and validation is performed with ESRI ArcGIS.

The North Sea Atlas is part of the European Atlas of the Seas, offering a wide range of information about Europe’s seas. It was developed to raise awareness of Europe’s oceans and seas, in the context of the EU’s integrated maritime policy (http://ec.europa.eu/maritimeaffairs/atlas/index_en.htm).

About interoperability, the Atlas’ architecture is structured with ESRI technologies, so the formats of spatial datasets are shapefile and ESRI Geo-DB. Data can be consulted in the web application, but also through ArcExplorer / ArcExplorerWeb applications and IMS-server connections. Direct download of spatial data from the Atlas is not available.
ISO 19115 compliant metadata are available in ESRI sheet format only for some layers. A metadata catalogue is not available, while some additional description is provided for every static map, as in the paper version of the Atlas.

The intention of the steering committee is to upgrade the Atlas towards a more flexible and interactive tool, developed with open source technologies and based on system architectures and data formats that ensure high interoperability.

**ICZM related functionalities**

The high variety and well-structured information contained in the North Sea Atlas, some of them integrated, together with a particular focus on the water policies and spatial planning of the marine area are the main peculiar functionalities related to ICZM Knowledge and process.

Furthermore, the Atlas is specifically developed to support the activity of the North Sea Interdepartmental Consultation Directorate (IDON) in the perspective of Maritime Spatial Planning (MSP) and Integrated Maritime Policy (IMP), with evident connection to the ICZM issues.

In this perspective, the Atlas in particular provides support to assessment of alternatives in marine planning and management. The North Sea Office (http://www.noordzeeloket.nl/) website in fact provides information about law, policy and regulations in the Dutch Sea area, allowing to download relevant planning documents, as for example the Management Plan for the North Sea – 2015, adopted in 2005. The North Sea Office website also provides a link to the Ministry of Infrastructure and the Environment, Rijkswaterstaat (http://www.rws.nl/rws/dnz), enabling, after requesting an account, to find maps and shapefiles of the existing different uses in the North Sea.

However, lacking data about the land territory, the Atlas cannot properly be defined as a Coastal information System and cannot strictly support the whole ICZM process.
Some multi-time data, such as concentration of pollutants in the sea sediment, are also available in the North Sea Atlas, supporting knowledge about the evolution of coastal pollution. These information concern both metals and persistent organic pollutants. By comparing results of different years, data for example indicate that cadmium levels fell by 71% between 1981 and 1996. It was linked with a huge drop in the amount of cadmium in the Rhine, in dredging sludge and in the atmosphere.

The system finally provides spatial data enabling direct connection of users thought ESRI Arc Explorer (free software) that allows the visualisation of selected layers on a client computer. Pre-defined static maps available in the Atlas and customised maps can be exported and print.

**System development and management**

The North Sea Atlas was first published as a book more than ten years ago. In occasion of the update that took place in 2002, the Atlas has been also published in a dedicated web site.

The Atlas has been developed by a specialised GIS private company under the coordination of the North Sea Office and the supervision of IDON. The first web version of the Atlas involved 2 full time developers for about one year of work.

The system is continuously updated with new maps and technically upgraded with new functionalities in order to acquire better usability. The cost of this activity is around € 15.000 / year, and involves about 8 persons.

The main difficulties encountered in developing the atlas were not related to technological issues but rather concerning data acquisition and institutional cooperation.

The North Sea Office is the focal point for the information about the North Sea and its management. The publishing of new maps in the Atlas needs to be approved by all the Ministries that supervise the Atlas’ implementation. For this reason not all the maps produced by the North Sea Office are finally published in the Atlas. The communication and agreement among Ministries represents a crucial point for institutional cooperation and for the steering of the Atlas’ porpoises.

The steering group of the Atlas meets periodically to verify the contents of the Atlas and define the new cartography to be developed in accordance with the annual budget. Technological upgrade to enhance the Atlas with new functionalities is budgeted as a separate expenditure and commissioned to a maintenance company.

The Atlas, free to all users and without any restriction or privilege for different users, is oriented to a wide kind of users, including public and private entities, research institutions, students and general public.
Experience with the implementation

The main purpose of the Atlas is to share data about water system, use and management of the North Sea, and represents a focal point to visualise updated information about maritime issues. The Atlas nowadays is not designed as a participation tool for coastal planners, as its initial aim is to spread general information about the North Sea to a wide range of users, with different interests and roles.

On the other hand, the need of information systems to support marine spatial planning and ICZM is becoming more and more evident, and the number of requests to the Atlas' managers for thematic data and scientific information has been growing in the last years. As a consequence, IDON and the steering committee of the Atlas are heading in that direction, planning to provide new information contents and functionalities that will allow an easiest consultation by general public and a more profitable usage by decision makers and stakeholders.

The Atlas is currently used within ICZM processes just as an investigation tool to acquire an overview on the state and usage of marine areas.

Concluding remarks

The North Sea Atlas is the main source of updated information about Dutch marine areas, dealing with physical and quality characteristics, but also with the actual use of the sea and with the ongoing protection policies.

The actual state of the Atlas can provide a useful overview on marine areas to ICZM processes, and can represent a good base to develop a more comprehensive tool to support ICZM processes. This is one of the main aims of the steering group of the Atlas that foresees important updates and upgrades both on information contents and on functionalities. Among them, the inclusion of information about inland areas and the implementation of process related functionalities seem to be the most relevant.
KustAtlas – Belgian Coastal Atlas

General Information

The KustAtlas (coastal atlas) is an initiative of the Co-ordination Centre for Integrated Coastal Zone Management, a contact centre for integrated matters in the coastal zone, also responsible for the maintenance of the atlas and updating the information.

The Atlas contains maps and other information on different coastal aspects, useful to support ICZM process. It focuses mainly on the Belgian coast but for some issues (ICZM indicators) also contains data about the wider area of Southern North Sea (Essex – UK; Kent – UK, Nord-Pas De Calais - France, West Flanders - Belgium and Zeeland - the Netherlands).

The Coastal Atlas is a member of the newly formed International Coastal Atlas Network (ICAN), a group of organizations who have been meeting over the past two years, to share experience and knowledge on Coastal Web Atlases and to look at possibilities and added-value of data interoperability approaches to coastal web atlases.

The Belgian Coastal Atlas was first published as a book in 2004, triggered by the reporting obligations to the European Commission about the state of the Belgian coasts related to the ICZM Recommendations (2002/413/EC). From the beginning, the main aim was to present a general and synthesised overview of the main characteristics of the Belgian coast in relation to ICZM. The many requests for maps encouraged the developers to launch a web-based atlas. Since November 2005, the on-line web-atlas is a fully operational system and it is available in 4 languages. Following the initial book perspective, the on-line system mainly aims to provide an easily accessible, simple, user-friendly atlas to users, as well as to make available readily usable maps on Belgian coasts. Maps have been produced using data mostly provided by the public authorities and their administrations.

KustAtlas home page (http://www.kustatlas.be/en, see Figure A3-18) offers downloadable maps (as PDF documents) with low possibility of interaction but high attention to the quality and look of the image. Figures, diagrams and charts are also available and downloadable. The Atlas is structured in 12 main sectors (chapters).

For direct information requests and suggestions, the contact person is Kathy Belpaeme of the Belgium Coordination Centre on Integrated Coastal Zone Management in Belgium (Ghent, BELGIUM, e-mail Kathy.belpaeme@kustbeheer.be). Web-site of the Belgium Coordination Centre on ICZM is http://www.kustbeheer.be.
The coastal atlas existing at the moment of writing this report is actually under development, and will be upgraded in interactivity and user-friendliness of cartographic and consultation sections. The new Coastal Atlas should be published in May 2011 and is intended to become a portal for coastal information with integrated functions and tools to communicate and inform on the complexity of the coast.

**Operational context and information content**

The Atlas is multilingual: almost every section is available in Dutch, German, French and English. Actually the Atlas is organised in 12 main thematic issues, listed in the followings:

1. *Spatial setting*, about the location in Europe and the spatial demarcation of the coast;
2. *Physical environment*, about landscape development, coastal geomorphology, hydrodynamics, climate;
3. *Spatial structure*, about current land use, spatial planning and policy priorities;
4. *Use of the sea*, about multifunctional use of the sea and monitoring and research activities;
5. *Environment and nature*, about natural reserves, wildlife areas and forests along the coast;
6. *Tourism and recreation*, about tourism attractions, tourism facilities and accommodations;
7. *Industry and business*, about industrial estates, ports and airports;
8. **Fishery and agriculture**, about general facts on the fishery in Belgium and Agriculture in the coastal plains, including a brief historical perspective;

9. **Culture and heritage**, about main events, activities and cultural centres;

10. **Living by the sea**, about coastal conurbation, settlement types and coastal architectures;

11. **Coastal defence**, about erosion, sedimentation and coastal protection structures;

12. **Integrated coastal zone management**, about the balance between the social, economic and ecological aspects of the coast with link to sustainability indicators.

The above mentioned chapters - each of them containing data, maps and descriptive information related to various items - match all the five ICZM dimensions of Environment, Territory, Economy, Society and Governance.

Of particular interest, the Integrated coastal management sector (chapter 12) links the Atlas to the databases of the sustainability indicator of the coast (for most indicators Dutch only, some indicators developed in the SAIL project available in English), adding therefore a rich set of data to the Atlas. Indicators can also be linked to in different thematic chapters.

The so called “sustainability barometer for the coast” is a tool created by the Coordination Centre for ICZM, in order to monitor the evolution of a set of themes or ‘indicators’ that are important for the coast and coastal policy. The indicators can refer to a single data set or can be the results of aggregated data.

The system provides other examples of integrated data, merging together information from different sectors. They can be especially found among the ICZM coastal indicators (defined by SAIL Project and all considered in the KustAtlas) which are accessible from every chapter of the Atlas. For example, the percentage of Natura 2000 sites in Favourable Conservation Status (FCS) according to the Habitat and birds EC directives provides information about the effective management of designed sites, integrating territorial information (Natura 2000 sites) with environmental current status.

Furthermore, the number of people living in the area at risk from coastal flooding integrates population density data with territorial data (areas delimited by the 5m height contours).

Similarly, the area of protected sites and value of economic assets within the zone at risk from coastal flooding is another example of integrated information provided by KustAtlas, merging economic and environmental data with territorial data.

Integrated maps are also provided, with multiple information contents related to a specific issue in the same map. For example, the map of multifunctional use of the sea shows economic activities together with Natura 2000 sites and planned energy production locations; the same concept is applied to the map of mixed land use. The map of coastal evolution shows areas in erosion/sedimentation together with the fixed coastline protection structures.

Information factsheets, interactive graphs, maps, trend and indication of data providers are also available for every ICZM indicator.

Data providers are public authorities and their administrations, gathering the information themselves within their objectives and policies; in other cases, the data is generated by universities, consultants or other institutions commissioned by the authorities.

KustAtlas, specifically drawn up for the coastal area of Belgium, served as an example to develop similar atlases in Vietnam and Catalonia (Spain). Thematic viewers fit to a
transnational scale, being referred not only to the Belgian coast, but also, as for ICZM indicators, to the wider area of Southern North Sea. Currently maps can be consulted at two fixed scales, but the new Atlas now being updated will provide more interactive zoom and pan functionalities.

**Technical characteristics**

The system works on the Apache web-server and it runs on a MSSQL relational database. The web-site is set up in PHP/HTML and, for the interactive maps, flash applications and action-scripts are used.

As mentioned in the previous section and deepened in the following section, the website is integrated with the “sustainability barometer” tool, through a link to an external website, from the chapter 12 (Integrated management of the coast) and from the thematic chapters.

There is no proper integration with other coastal information system. The future development of KustAtlas will be strictly connected to the development of the new CIS now being developed by the Dorset Coastal Forum, as both are participating to the European project C-Scope, aiming, *inter alia*, to develop tools for achieving sustainable coastal economies and environments. Moreover, KustAtlas is included in the European Atlas of the Seas (http://ec.europa.eu/maritimeaffairs/atlas/index_en.htm).

Actually interoperability is low, as the possibilities to analyze, compare and integrate the different informational contents are not very flexible. The new Atlas will have a strong focus on cartography, with an enhanced web map viewer application that will allow interactively visualizing and identifying several layers at different scales. Some new tools (like measure) will be provided.

![Figure A3-19 Preview of the interactive map viewer to be published in the new coastal atlas in progress.](image)
ICZM related functionalities

KustAtlas features two main functionalities related to ICZM process: the sustainability barometer and the analysis of the ICZM indicators.

The first functionality allows direct access to the sustainability indicators database (http://www.vliz.be/projects/indicatoren/, Dutch only). The so called “sustainability barometer” allows to gain an overview of the current state and trend of several sustainability indicators of the coast, as well as identifying possible signals for coastal policy adjustment or harmonisation. A trend is given for each indicator stating whether the latter is positive, negative or neutral.

The indicators give an insight about the state of the coast and the sustainability of its development, and could represent a policy support tool for coastal managers and decision-makers. Indicators outputs are presented as graphs and tables, without a geographical spatial reference. The 21 indicators are grouped in 7 chapters:

1. Improving the quality of living environment;
2. Maintaining and strengthening the socio-cultural heritage;
3. Improving the environment and nature;
4. Strengthening the economic fabric;
5. Support tourism and recreation;
6. Implement administrative reforms;
7. Additional Chapter: Climate Change and Coastal Defence.

Another useful functionality to support ICZM processes knowledge is the analysis of the 27 ICZM indicators. Each chapter of the atlas explores relevant indicators for that thematic issue, by linking to the SAIL project website (http://www.vliz.be/projects/SAIL/db.php). The SAIL project (Schéma d’Aménagement Intégré du Littoral) was a partnership of regional and local authorities, maritime organisations, and coastal and marine agencies, working together for the sustainable development of the Southern North Sea tidal area. One of the major accomplishments of the SAIL partnership is the implementation of sustainability indicators for the Southern North Sea region.

Both for sustainability and ICZM indicators some integrated data and maps are provided (see section on “Operational context and information content”).

Other functionalities mark the system:

- Even if designed using thematic classification, the Atlas contains cross-references aimed to allow seamless navigation through themes and aspects. In the new web Atlas now being updated figures, graphs, tables, photographs, maps and external links will always be readily available.
- The availability of multi-time information, as for the coastal evolution (sedimentation / erosion process), landscape evolution, historical perspective of some economic activities;
- The availability of interactive graphics, extended explanations of coastal processes help the users, especially stakeholders, to fully manage the information content, capturing the implications in coastal planning and management.
• The presence of dedicated fact sheets for each ICZM indicator (PDF documents) reporting origin, source, results, implications in ICZM and reliability of every indicator.

• A key message is furthermore reported in every fact sheet as useful summary information for the monitored indicator.

• Maps and graphics are downloadable in PDF format and available in printable versions while data underlying some maps are available as XLS files. For some few layers shapefiles and interactive Google earth layers are also available. This aspect is one of the main focuses of the actual improvement and updating of the Atlas.

**System development and management**

For the development of the atlas online at the moment of writing this report, the Coordination Centre on ICZM collaborated with three private partners:

• Aquaterra (http://www.aquaterra.be/nl/) for the geographic information, map digitisation and content of the atlas;

• Five to Nine (http://www.quoted.be/) for the website development;

• Magenta (http://www.magenta.be/) for the design.

As for costs, the former printed version of the atlas cost € 46,381, while the development of the on-line atlas cost € 25,073 for the set up of the on-line version and € 5,855 for the development/translation of German and French version. The book and the online version of the Belgian Coastal Atlas were financed by the project partners of the Coordination Centre: the province of West-Flanders and the two main Flemish coastal administrations, and by European structural funds within the objective 2 program for the Belgian coast.

The actual further upgrading and updating of the atlas is carried out by the Coordination Centre within the C-SCOPE project, with the structure and roles reported in the Figure A3-20.
The developing and management of the Atlas is closely followed by a Task & Finish (T&F) group, with members of all relevant administrations involved in coastal and marine management. The complete network of the Coordination Centre and the T&F group is used to promote the atlas to as much administration levels and to as much target groups as possible.

The new website is developed by an external consultant, who updates data and software according to the data delivered by the T&F Group.

It is important to underline that the scope, aim and target audience of the KustAtlas have been discussed during a workshop with stakeholders, which outpointed the need of a portal for the coast to be used as communication tool. As a result, the Atlas is not aimed at giving an exhaustive list of data layers and detailed data.

The main difficulties encountered in developing the system were related to data acquisition, definition of an impartial and general approach, management of the development in relation to budget limitations.
The group in charge of data acquisition made a lot of efforts to deliver the necessary data to the Co-ordination Centre. There were minor difficulties with copyright issues and indecisions of some administrations about the terms and conditions of data accessibility. Additional contracts and agreements on data acquisition had to be signed during the development of the Atlas.

Another difficulty was related to the need of keeping the data general, avoiding to go too much into detail as regards to naming institutions, concrete projects, dates, etc., because the atlas wants to be timeless and free from competition issues between institutions.

During the development, the project leader had to make firm decisions to keep the scope clear and to limit to the budget the multitude of ideas and suggestions received to feed the atlas, as in the development phase many more layers than foreseen were being collected.

The Atlas is intended to be a communication instrument for teachers, students, guides, educational initiatives and other coastal stakeholders, becoming an awareness raising tool to explain the complexity of the coast. Sustainability indicators could also be usefully exploited by policy makers and decision makers. With the next update, the Coordination Centre aims to develop the Belgian Coastal Atlas as a more interactive information tool for coastal stakeholders and members of the wider public interested in coastal complexity.

The access to the whole website is free, without privileges for different users. Illustrations, pictures, maps and texts of the atlas can be used subject to prior written permission of the copyright owners and an express mention of the source.

Experience with the implementation

On average, the site has 2,000 hits per month (an average of about 70 people per day) of which more than 50% are Belgian. Other top visiting countries are the Netherlands, Germany and France. Since the site is visited mainly during the working week and during working hours, it can be assumed that the site is visited mostly for work reasons. Most interested users, from which the main requests for further information come from, are scientific users as well as general public, administrations, supporting services and schools.

The stakeholders that participated in the definition of the aims of the Atlas were not interested in developing a decision support tool, and this is the condition that determines the actual structure of the KustAtlas and the on-going implementations. The integration of sustainability indicators in the atlas is also intended as an enhancement to add value in terms of raising awareness on coastal sustainability.

Concluding remarks

The KustAtlas features extensive information contents related to ICZM, with an ICZM dedicated section and links to specific ICZM coastal indicators defined within the SAIL project. The new upgraded version of the atlas to be published in May 2011 will enhance cartographic interactivity with spatial data and connections with implemented coastal policies.
Explicit aim of the Co-ordination Centre managing the atlas, in accordance with stakeholders involved in the target definition, is to provide a point of reference for coastal information rather than a decision support system for policy makers.

This analysis outpointed that the informational contents and functionalities of the atlas, with particular reference to sustainability indicators, ICZM indicators fact-sheets and reports of implemented policies, could be usefully exploited also by coastal planners and managers.

As the upgrade of the system foresees a stronger connection with policies on the coast, the interconnection among costal information, coastal sustainability and coastal management will be further investigated, and this could represent a great opportunity to develop an exhaustive portal rich in information and a powerful tool for coastal management as well.
MIDA – The Marine Irish Digital Atlas

General Information

The Marine Irish Digital Atlas (MIDA) is a web tool built in a web-GIS environment, where people interested in coastal and marine information for Ireland can visualize and identify pertinent geospatial datasets and determine where to acquire them. The atlas, which is being constantly updated, currently displays more than 140 layers from over 35 coastal and marine organizations both within Ireland and abroad. It also features an “InfoPort” which is a repository of text, imagery, links to spatial data sources and additional reference material for a wide range of coastal and marine topics.

The MIDA is part of the International Coastal Atlas Network (ICAN), the group of organizations that have been meeting since 2006 to scope and implement data interoperability approaches to coastal web atlases.

Specific objectives of the MIDA Atlas are to:

- Develop a web site for presentation of geo-referenced marine datasets of environmental importance;
- Provide greater accessibility to data and information in the form of a web enabled, customised GIS;
- Provide flexibility of use by providing a range of tools that allow users to select, overlay and compare geospatial layers;
- Enable users to identify sources of data, information and expertise on the marine environment;
- Encourage a greater appreciation of Ireland’s coastal regions by incorporating educational and informational materials based on multi-media technology.

MIDA, a fully operational system, has been developed by the Coastal and Marine Research Centre (CMRC) of University College Cork, in partnership with the Centre for Coastal and Marine Research, University of Ulster, Coleraine, Northern Ireland.

Funders of the Atlas are:

- Ireland’s Higher Education Authority under the National Development Plan PRTLI III Programme (development funds);
- Environment and Heritage Service, Northern Ireland (Northern Ireland data and partnership);
- Coastal and Marine Research Centre, University College Cork.

From the Home page of the Atlas (http://mida.ucc.ie/pages/atlas/atlas.php, Figure A3- 21), it is possible to add layers to the map, to access layer information (quick overview, metadata and data files), to zoom to pre-selected regions and specific themes (in order to get an integrated map displaying all the information layers related to the selected theme and the selected spatial area), to link to general information about MIDA (Atlas help, list of Layers, data contributors, information Resource, contacts) and finally to access the search tool (to find layers by text or spatial selection).
For information, comments about MIDA, data sharing or mailing list joining an info mail is available: mida@ucc.ie; the point of contact is Ned Dwyer (n.dwyer@ucc.ie), Coastal and Marine Research Centre - University College Cork (Naval Base, Haulbowline, Cobh, County Cork, Ireland).

Operational context and information content

The Atlas mainly addresses four of the five considered information dimensions: environment, territory, economic and governance.

The environment and the territory dimension are the most developed dimensions (50 layers refer to the physical environment and more than 100 layer refer to the biological environment), while the economic information is provided by a great variety of layers regarding tourism, recreation, fisheries, aquaculture, agriculture and coastal and marine industry. Governance information integrated in the system mainly refers to rural areas targeted for investment, current exploration authorizations and license blocks given by the Petroleum Affairs Division.
The information content is related to following topics:

- Physical environment;
- Coastal habitats;
- Biology;
- Management;
- Human impact;
- Conservation;
- Environmental monitoring;
- Infrastructure;
- Industry;
- Culture and heritage;
- Natural resources;
- Fisheries, aquaculture agriculture;
- Tourism and recreation.

The list of layers published in the atlas, provided with description, indication of data owner and status of the publication is available at http://mida.ucc.ie/pages/dataLayers.htm.

The data hierarchy was structured around four main categories (folders in the web-GIS interface): Management, Physical Environment, Biological Environment, Socio-economic Activity. Each of these categories is subdivided in several sub-categories.

Data are provided by various and heterogeneous private and public institutions acting at local, national or international level, as research institution, environmental protection agencies, cultural and recreation associations, information and cartographic services etc. The complete list of the 37 current data contributors is available at http://mida.ucc.ie/pages/providers.htm.

Although data layer in the MIDA are provided from numerous organizations, many of these can be grouped as government organizations, followed by educational institutions (about 27%) and non governmental organizations (17%) while only about 4% of data layers is provided by the private sector. The private sector has a low representation among data providers, mainly due to the commercial sensitivity of certain type of data.

The system can display preset maps on 19 specific themes and 37 specific subregions, by mean of the “Zoom to” tool, accessible from the homepage. These maps are good examples of integrated maps, integrating all useful layers to compose a complete information framework about a selected theme on a selected region. As an example, selecting “climatology” among the available themes, layers about the location of the weather stations, the amount of seasonal rainfall and the annual rainfall, over base layers on coastline and bathymetry will be displayed. Selecting “tourist/recreation”, all the information about the pertinent socio-economic activities (marinas and pontoons, visitor moorings, surfing associations etc.) and management activities (national monuments, national parks, nature reserves, areas of outstanding natural beauty etc.) are displayed together with base layers (bathymetry, coastline).

For each layer, complete metadata is available, stored in a database in order to optimize data management. Metadata is compliant to ISO 19115 standard, used also by other key
organisations handling spatial data in Ireland (e.g., Marine Institute, Environmental Protection Agency with the Water Framework Directive, The Department of the Environment with the ISDI). In 2002 the Irish government began developing the Irish Spatial Data Infrastructure (ISDI; McCormack 2004).

The atlas contains three levels of metadata:

- Abstract metadata, which provides a brief summary of the dataset; it includes the dataset title, description, geographical extent, data owner and the data publication date. It is the first window that appears when the metadata button is clicked in the Information table;

- Discovery metadata, which consists of core metadata elements, providing more detailed information about the dataset, in order to give a better idea of data quality as well as contact information for the data owner; it serves as the central MIDA metadata database;

- Full metadata, which is supplied by data owners and not stored in the MIDA XML database. Each full metadata page is displayed in HTML as the owner provides it, therefore its quality, standardisation, and completeness is the responsibility of the data providers themselves and not of the MIDA development team.

Hyperlinks within the atlas allow users to move easily between the different metadata levels.

MIDA is explicitly dedicated to the whole coastal and marine Irish territory, which includes two jurisdictions namely the Republic of Ireland and Northern Ireland (which is part of the United Kingdom). This choice influenced data collection, which is focused on information available on wide parts of the coast rather than local contexts. The possibility of developing several “local MIDA” has been considered

Thematic viewers fit national scale, allowing zoom to visualize information with more detail. The “Zoom to” tool allows working in 37 preset subregions of Ireland, as mentioned above. All dataset include information pertinent to coastal and/or marine areas. When the dataset includes information on the inland areas, the complete dataset is presented rather than clipped. On the seaward side datasets extend to the British coast on the East and the continental shelf claim area to the West.

The participation in the International Coastal Atlas Network (ICAN), for which the MIDA team served also as a catalyst together with the Oregon Coastal Atlas, represents another point of strength towards the flexibility of the system.

Technological characteristics

MIDA has been implemented with Minnesota MapServer software, free and open source technology. The system uses Apache Web Server, MapServer, and PostgreS Database. Metadata is stored in a database in order to optimize data management, permit efficient searching, and facilitate catalogue sharing. Data management is operated with ESRI desktop applications.

About the server and data repository, a dedicated computer with a LINUX operating system runs all software and contains all data (geospatial data, metadata and non-geospatial data as texts, photos, animations etc). Currently, the atlas is not dynamically WMS supported.

The technological architecture of MIDA system is illustrated in the Figure A3- 22.
ICZM related functionalities

MIDA provides various functionalities supporting ICZM knowledge and processes, as:

- the typology of the information content, supporting an integrated and dynamic view of the coastal processes through preset integrated maps, multi-time information and ICZM indicators;
- the GIS tools, allowing the interactivity and the access to spatial data;
- the structured organisation of the available information;
- the availability of extensive information like texts and images;
- the availability of the info email and tools for stakeholder involvement.

About the first topic, multi-time information is displayed only for some layers, such as land cover change from 1990 to 2000 to 2006, seasonal pattern of rainfall and sea surface temperature. The data layers include also some of the ICZM specific indicators. These are coastal erosion, indication of areas of land and seas protected by statutory designations, sea level rise, pressure for marine and coastal recreations (number of moorings) and quality of
bathing waters. The inclusion of data on erosion trends, together with those on sea level rise in different coastal areas of Ireland, can also be useful for coastal vulnerability assessment to climate change impacts. As for integrated maps, see section on “Operational Context and Information Contents”.

About GIS functionalities, the web-GIS interface provide a high interactivity, allowing to customise own maps, to make multi-layer interrogations, to search specific topics by text or spatial selection and to zoom to specific preset areas. This can help user to create customised work views, possibly useful for ICZM.

Spatial data are also downloadable in shapefile format for about 85 of the 140 layers. The other data cannot be directly downloaded due to confidentiality reasons defined by data providers, but links to data owner or internet page where the layer can be downloaded are provided in metadata contents.

MIDA’s structure is well articulated and complete, thus enabling users to easily find data and information and relate the same to specific issues. The list of layers prepared for display in MIDA (http://mida.ucc.ie/pages/dataLayers.htm), with direct link for visualisation in the atlas, represents a powerful knowledge related functionality.

Metadata is presented in a user-friendly and easy to follow layout. Thus, MIDA is well shaped for problem understanding and structuring, as well as coastal management and planning at the national level. The user statistics confirm that the Atlas is constantly visited attesting to its relevance and usefulness.

Finally, the MIDA InfoPort, directly accessible from the information area, is a comprehensive guide (work in progress) to information on coastal and marine themes and issues in Ireland. It offers overview text and images, links to relevant organisations and documentation, and recommendations on sources of geospatial data, both within and outside of the MIDA (Figure A3- 23). For some data layer, needing a deeper analysis, the information page is more complex and structured in five tabs (overview, details, data sources, links and reference). In this regard the MIDA follows the approach of traditional, printed atlases, which provide text information in addition to the thematic maps.

Concerning stakeholder involvement and participation, MIDA is totally accessible on-line and, through the “contribute” link, explicitly stimulates organisation to share their own data through the MIDA tool, with expected benefits for data owners, data users, and Ireland as a whole.
System development and management

MIDA has been developed by CMRC with funds from the Higher Education Authority (HEA) under the Programme for Research in Third-Level Institutions (PRTLI). Additional funding came from the Environment and Heritage Service, Northern Ireland. CMRC currently maintains the Atlas from its own resources, since the initial development programme ended in 2007.

The implementation started in 2002, aiming to set up a centralized repository of spatial datasets to be displayed via the web-GIS application. The main problems encountered during the development were related to the wide range of data sources, with different data management practices, data quality, scale, data licensing and metadata quantity, quality and format.
The identification of data owners represented a time consuming activity, as well as the
digitalization of back data in non-GIS format and the production of missing layers. The MIDA
team had also to face problems related to data acquisition and licensing restrictions.

Quality control of data produced by other entities resulted very difficult to be performed;
system managers therefore decided to reduce to the minimum the elaboration of other
providers’ data and to include in metadata contents some indications about data quality.

The management of MIDA currently involves one full time staff and four part time resources.
Among them, Ned Dwyer is the MIDA manager. Kathrin Kopke is the data manager; she is the
coordinator of the acquisition and of preparation of new layers as well as updating the atlas.
The others provide technical support, contributing to the database design and programming
and creating, editing and preparing various GIS layers as well as completing metadata
records.

The broad nature of the atlas contents can be exploited by a wide range of potential users,
like:
- Policy-makers;
- Decision-makers;
- Coastal planners and/or managers;
- Specialised and expert GIS users;
- Representative of private sectors (e.g. industrial or energy companies);
- Students;
- General public.

There are no different privileges/restrictions for different user typology. The on-line data
access is free to all the MIDA Atlas contents and functionalities.

**Experience with the implementation**

The graph below shows the number of visits per month as well as the number of unique visits
per month over the last year. The number of visits is always more than 600 visits/months, with
a peak in November with 1400 visits/months (Figure A3-24).

An analysis performed in 2008 outpointed that most Atlas visitors were from the Republic of
Ireland, followed by visitors from the UK and the USA. High UK interest was expected, as the
MIDA was a cross border collaboration featuring island-wide dataset as well as some specific
Northern Irish data layers. The same 2008 usage statistics showed that the most popular
layers were from the socio-economic activity section, specifically water-based recreation. The
MIDA is also used in teaching on a number of courses organized by the Department of
Geography within UCC. Feedback by students indicates that MIDA is also utilized as a tool by
teachers in some secondary schools.
Further developments of MIDA are planned, depending on the availability of new resources. In this perspective, the most important activity is the constant update of data and information published in the Atlas. Other planned activities are the upgrade of the technology for metadata management and web GIS interface. It is hoped to leverage developments in other funded projects and re-use these elements within MIDA; an upgrade is expected by the end of 2011.

Concluding remarks

MIDA is a point of reference for coastal spatial data at national scale, and can be usefully exploited by several kinds of users involved in ICZM. Among them County Councils, in charge of strategic planning at local scale, can use the information contents of the atlas as a consolidated and updated basis for further implementation and more detailed analysis through their own methodologies and technologies.

Constant updating and further development of the system are crucial to guarantee MIDA’s key driving role in regard to developing catalogue and atlas interoperability on a national and international level, and could be an opportunity to strengthen the national consciousness of coastal state and evolution, a fundamental step to implement adequate policies for ICZM.
Dorset Coastal Explorer

General Information

Dorset Coastal Explorer is a web GIS allowing users to visualize a great number of layers related to the Dorset Region in the South of England. Spatial information is not only related to the coastal area, but more in general to the whole Dorset territory. The system is also particularly interesting since provides some innovative functionalities for data query and investigation, also enabling to re-call information related to local planning. Dorset Coastal Explorer provides the possibility to export customised maps as PDF documents.

Dorset Coastal Explorer development is strictly related to the activities of the Dorset Coast Forum (http://www.dorsetforyou.com/dcf) that has been at the forefront of ICZM since 1995. The Dorset Coast Forum is an established Strategic Coastal Partnership made up of over 220 public, private and voluntary member organisations, covering fishing, commercial, environmental, recreational, historical and touristic sectors that, as a whole, have expertise and local knowledge of Dorset's coast and inshore waters.

The Dorset Coast Forum covers from Lyme Regis to Christchurch out to 12 nautical miles. Its primary objective is to encourage co-operation and dialogue between all the different stakeholders of the coast in the Dorset area, promoting a sustainable approach to the management, use and development of Dorset's coast and inshore waters.

C-SCOPE Interreg project (Cross Border 2 Seas Programme, http://www.cscope.eu/en/), currently under going, is providing funds for the development of the Dorset Coastal Explorer. This will be an innovative tool that will provide information on prevailing policies, ecology, current uses and land/seascape features. It will list relevant planning policies and provide links to their detail. The tool should be finalised by the end of 2011.

C-SCOPE will also develop a framework for integrating terrestrial and marine management planning, involving the development of a pilot Marine Spatial Plan for a selected area of the Dorset coast. Finally, C-SCOPE will provide a series of hi-tech interactive coastal information points (or Coastal explorer access points) to improve stakeholders’ engagement.

The operating entity is the Dorset Coast Forum; the Dorset Coast Forum team is hosted by Dorset County Council and funded by Weymouth and Portland Borough Council, Borough of Poole, Environment Agency, Natural England, Wessex Water, Dorset Wildlife Trust, Dorset County Council, West Dorset District Council.

The contact person at Dorset Coast Forum is James Feaver (e-mail: j.feaver@dorsetcc.gov.uk), Marine and Coastal GIS Officer, Dorset Coast Forum, Environment Services, County Hall, Dorchester, Dorset, DT1 1XJ, United Kingdom.
Operational context and information content

The Dorset Coastal Explorer addresses all the ICZM dimensions, providing a lot of related information. Governance dimension is particularly dense of information, while the environmental dimension is less considered in the current version of the Dorset Coastal Explorer.

Data and information providers are mostly government bodies and private entities. An exhaustive list is provided in Table A3- 2.

Table A3- 2 Dorset Coastal Explorer data providers.

<table>
<thead>
<tr>
<th>Provider</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>British Marine Aggregates Producers Association</td>
<td>Industry body</td>
</tr>
<tr>
<td>British Marine Federation</td>
<td>Recreational Industry body</td>
</tr>
<tr>
<td>CEFAS</td>
<td>Government Agency</td>
</tr>
<tr>
<td>Channel Coast Observatory</td>
<td>Regional Coastal Monitoring Programme</td>
</tr>
<tr>
<td>Fish Farms</td>
<td>Private Company</td>
</tr>
<tr>
<td>DEFRA</td>
<td>National Government Department</td>
</tr>
<tr>
<td>Department for Business, Enterprise &amp; Regulatory Reform</td>
<td>National Government Department</td>
</tr>
<tr>
<td>Department of Energy and Climate Change.</td>
<td>National Government Department</td>
</tr>
<tr>
<td>District Councils</td>
<td>Local Authorities</td>
</tr>
<tr>
<td>Dorset Coast Forum</td>
<td>Coastal Partnership</td>
</tr>
<tr>
<td>Dorset County Council</td>
<td>Local Authority</td>
</tr>
<tr>
<td>Dorset Wildlife Trust</td>
<td>Voluntary Sector</td>
</tr>
<tr>
<td>Dorset's Important Geological Sites Group</td>
<td>Voluntary Sector</td>
</tr>
<tr>
<td>Eneco</td>
<td>Private Company</td>
</tr>
<tr>
<td>English Heritage</td>
<td>Government Agency</td>
</tr>
<tr>
<td>Environment Agency</td>
<td>Government Agency</td>
</tr>
<tr>
<td>EROCIPS</td>
<td>Previous EU project</td>
</tr>
<tr>
<td>European Environment Agency</td>
<td>Project for Government Agencies</td>
</tr>
<tr>
<td>Finding Sanctuary</td>
<td>Private Companies</td>
</tr>
<tr>
<td>GetMapping and UK Perspectives</td>
<td>Project for Government Agencies</td>
</tr>
<tr>
<td>Halcrows (for South Devon and Dorset Coastal Advisory Group)</td>
<td>Private Company project for Local Authorities</td>
</tr>
<tr>
<td>Joint Nature Conservation Committee (JNCC)</td>
<td>Government Agency</td>
</tr>
<tr>
<td>London 2012</td>
<td>Government Agency</td>
</tr>
<tr>
<td>Marine Fisheries Agency</td>
<td>Government Agency</td>
</tr>
<tr>
<td>National Grid</td>
<td>Private Company</td>
</tr>
<tr>
<td>Natural England</td>
<td>Government Agency</td>
</tr>
<tr>
<td>NOMIS</td>
<td>Government Agency</td>
</tr>
<tr>
<td>Office for National Statistics (ONS)</td>
<td>Government Agency</td>
</tr>
<tr>
<td>Oil &amp; Gas UK DEAL</td>
<td>Government Agency</td>
</tr>
<tr>
<td>Ordnance Survey</td>
<td>National Mapping Agency</td>
</tr>
<tr>
<td>Plantlife</td>
<td>Voluntary Sector</td>
</tr>
<tr>
<td>Portland Gas Ltd</td>
<td>Private Company</td>
</tr>
<tr>
<td>Portland Harbour Authority</td>
<td>Harbour Authority</td>
</tr>
<tr>
<td>Portland Port</td>
<td>Private Company</td>
</tr>
</tbody>
</table>
It is important to report in this analysis that at the moment many versions of the Dorset Explorer 2.5 are available, like the Standard Edition, the East Dorset Local Plan Edition and other versions dedicated to thematic groups (like highway and roads, footpaths, emergency planning, etc.). Many of them are online while others are used via intranet or LAN.

Dorset Coastal Explorer is the version that is now under development within the C-SCOPE project, and that will feature additional tools to support Marine Spatial Planning.

The different versions of the Dorset Explorer 2.5 have the same graphical interface, similar tools and the same base maps and general thematic layers, but the dedicated versions deepen the thematic sectors of interest.

The information content here described mainly refers to the Standard Edition and the Dorset Coastal Explorer edition, but the reader must take into consideration that these systems are currently being upgraded with new contents and functionalities.

Dorset Coastal Explorer includes a complex and wide series of layers, mainly related to:

- Base data (maps, historical aerial photos, boundaries, Digital Terrain Model (DTM));
- Historic environment (marine and terrestrial);
- Coastal Defence and Engineering (Shoreline Management, Shoreline Management Policies in Short/Medium/Long Term, Flooding);
- Coastal Demographics;
- Conservation - Habitats (Intertidal, Terrestrial);
- Conservation - Protected Sites (Marine and Terrestrial, Statutory and Non-Statuary);
- Conservation - Species;
- Dredging and dredged material disposal;
- Fisheries (Bylaws, Closed Areas/Restrictions, Fishing Areas, Fishing Industry, Monitoring, Nursery Areas, Shellfish, Spawning Areas);
- Geophysical (Geology, Oceanography, Bathymetry);
- Infrastructure;
- Land Ownership and Land Use;
- Marine Inputs;
- Military Activities;
- Mineral Extraction;
- Oil and Gas (On shore and off shore sites, Contingency Planning);
- Policies - Portland Harbour MSP;
- Policies - Weymouth & Portland Local Plan (Sport & Community Facilities, Natural Environment, Development Constraints & Opportunities, Housing, Design & Built Environment, Transport & Telecommunications, Tourism);
– Renewable Energy (Electricity Network, Tide and Wave, Wind);
– Shipping (General, Navigation, Ship Routes);
– Tourism and Recreation.

The above listed information fits the sub-national scale of Dorset region and relative coastal marine zone. The various Dorset Explorer versions have been developed to be applied to specific issues of the Dorset region, coastal management is one of them.

Integration among different information typologies is a task that will be performed in the next development phase, in which ICZM and sustainability indicators could be implemented and included in the system to fully support scientific-based decision making.

Metadata are currently available only in offline applications, in the new system to be developed the UK GEMINI metadata standard and INSPIRE standard will be used to provide online metadata.

**Technological characteristics**

Dorset Explorer 2.5 has been developed with MapInfo and MapXtreme technologies.

A technological upgrade of the system is also under development: the information contents and functionalities of the Dorset Explorer 2.5 - currently being updated as well - will be transferred to a more flexible platform, developed with jQuery, OpenLayers, Modernizr, Proj4js, Google Chart API for the Client-side and FME, RouteWare, Oracle, .NET 4.0, .NET MVC, ODP.NET (Oracle Data Provider), GeoServer with GeoWebCache (for WMS and WFS) for the Server-side.

At the actual state of development, many of the layers reported in the previews sections are “hotlinked” to additional information provided by interested entities. For example: identifying (or interrogating) a ferry route a link to the home page of the ferry company providing the service is available in the attribute table, or identifying a marine industry area a fact sheet with information and web page of the specific facility is provided. Attribute tables and fact sheets are downloadable in CSV format, while the download of spatial data is currently unavailable.

Even if at the actual state of development the Dorset Explorer has no proper integration with other coastal information systems, the CIS development itself is strictly connected to the development of the KustAtlas by the Belgian Co-ordination Centre for ICZM, as both are participating to the European project C-Scope, aiming, *inter alia*, to develop tools for achieving sustainable coastal economies and environments.

**ICZM related functionalities**

The online versions available at the moment feature standard pan, zoom, multi-layer identify and measure tools; multi-time data is currently limited to the aerial photos, available for 2002, 2005, 2009).

The extensive information contents already available in the CSCOPE Dorset Explorer, with particular reference to the inclusion of layers referred to coastal plans, policies and coastal defence interventions, represent a powerful ICZM related functionality.

The flooding group layer, featuring flood zones (coastal and river), flood defences and areas benefitting from flood defences, is another useful content for adaptive planning.
Particularly relevant for the process related functionalities is the “Local Plan Policy Report tool” enabling to re-call (through an hyperlink function) and visualise a report with all relevant policies, documents or other information about the selected area (see Figure A3- 25).

Furthermore for some layers (natural area, marine natural areas, monuments or other important areas, short reports, activated through an hyperlink function, can be generated describing the selected features. Reports may be useful in supporting some of the ICZM related aspects (such as for example communication and raising awareness).

Figure A3- 25 Example of the “local plan policy report tool” at work in the CIS currently under development.

Dorset Explorer development and future implementation is strictly related to the objectives and activities of the Dorset Coast Forum, whose principal aim is to encourage co-operation and dialogue within the ICZM process. Web-GIS and other web-tools can support this objective.

Taking into account the future development of Dorset Coastal Explorer, several functionalities will be added, better supporting ICZM process:

- Enhanced functionalities about policy information. A framework for integrating terrestrial and marine management planning will be developed, involving the establishment of a pilot Marine Spatial Plan for a selected area of the Dorset coast. This experience will contribute in supporting integration between ICZM and MSP policies and tools.
**System development and management**

Responsibilities for the system are divided. The Dorset Coast Forum manages the coastal data (1 person). The tool (development and maintenance including base mapping data) is managed by the County Council GIS team (5 persons).

Difficulties in developing the system mainly deal with copyright issues.

It is important to underline that the development of Dorset Coastal Explorer has been steered by a Task and Finish group made up of Coast Forum Staff, GIS team members and a number of external stakeholders.

**Experience with the implementation**

The actual versions of the Dorset Explorer 2.5 are used by different departments of public entities (Fire department, for example). The Dorset Explorer 2.5 version dedicated to coastal management (Dorset Coastal Explorer) is under development and therefore not in use yet.

The scope, aim and target audience of Dorset Coastal Explorer under development within the C-SCOPE project have been discussed with stakeholders, which outpointed the need of a tool to analyse and support coastal management and planning.

Public participation has been used for useful data collection by the Dorset Coast Forum.

**Concluding remarks**

The CIS under development by the Dorset Coast Forum within the C-SCOPE project already features powerful ICZM related functionalities explicitly aimed to support coastal management. While the other CIS developed within the C-SCOPE - the KustAtlas - has been oriented by the involved stakeholder to a wide audience, the Dorset CIS addresses policy makers and coastal planners.

C-SCOPE will also develop a framework for integrating terrestrial and marine management planning, involving the development of a pilot Marine Spatial Plan for a selected area of the Dorset coast. This experience will contribute in supporting integration between ICZM and MSP policies and tools.

The Dorset Coastal Explorer in its final release could be one of the best examples of tools in support of ICZM. The following challenge could be represented by its effective use in decision-making processes dealing with coastal and marine zones.
Cork Harbour Geographic Information System

General Information

The Cork Harbour GIS was initially developed within the Interreg COREPOINT project (COastal REsearch and POlicy INTergration) between 2004 and 2008, and then maintained and updated by the Coastal and Marine Research Centre of the University College Cork (CMRC, website http://cmrc.ucc.ie).

One of the main goals of the COREPOINT project was to bridge the gap between research institutions and local authorities dealing with ICZM. The project intended to properly use scientific experience and resources to provide improved information for planners responsible for local coastal areas as part of an ICZM approach. The project selected Cork Harbour as one of the sites for the development of GIS tools supporting the ICZM process.

The Cork Harbour initiative focused on coastal vulnerability, habitat loss, tourism pressures and development options for a Brownfield area. Inside the COREPOINT activity, the final outcome of the Cork Harbour ICZM related initiative was the development and publication of an Integrated Management Strategy for Cork Harbour in 2008. The strategy was the result of a cooperative effort jointly produced by local authorities and academic experts.

The Cork Harbour initiative also included the development of a GIS providing support to the above ICZM processes. The GIS is also used as an intermediary mechanism to collect shoreline feature data and as a framework to house the “Coastal Inventory spatial database” of shoreline features (see http://cmrc.ucc.ie/CI/index.htm). The GIS and the coastal inventory compose a Coastal Information System (CIS) aiming to support the monitoring, management, development and conservation of coastal, estuarine and riparian habitats.

Cork Harbour and the related CIS were also analysed by the EU FP7 SPICOSA project (2009-2011) to develop a self-evolving and operational research approach framework for the assessment of policy options for the sustainable management of coastal zone systems.

At the moment funding for the support and the implementation of the Integrated Management Strategy and hence the development of the CIS, are allocated through a new INTERREG project called IMCORE.

The Planning Policy Unit (PPU) of Cork County Council and the Coastal and Marine Research Centre (CMRC) of University College Cork are IMCORE project partners. They also operate the Secretariat function in joint venture, representing the CIS operating entity. One of the main functions of the Secretariat is to manage the stakeholder’s involvement in the process, and to maintain the http://www.corkharbour.ie website, which will be a focal point for information on relevant activities. Cork Harbour CIS is currently an operational offline system used c/o CMRC.

The contact person at CMRC is Cathal O’Mahony, email c.omahony@ucc.ie, while Darragh O’Suilleabhain is the executive planner at the Planning Policy Unit (PPU) of Cork County Council.
Operational context and information content

The CIS is scaled to the Cork Harbour area, a large natural harbour on the southern coast of Ireland, that represents a complex estuarine coastal system with a water body surface area of approximately 100 km². Some parts of the area are also densely populated, with about 65% of County Cork’s population living in close proximity to the coast.

The CIS addresses all the considered information dimensions: environmental (e.g. shoreline, river), territorial (land use manmade shoreline, roads) society (e.g. residential structures, marinas, water safety training, diving), economic (industrial area, tourism activities), governance (County Development Plan).

The Coastal Harbour CIS includes the following main spatial layers:
- Base data (Orthoimagery, Administrative boundaries, etc.);
- Shoreline type (natural or manmade, e.g. revetments, sea walls, beaches, docks, rocky shores);
- Shoreline features (e.g. jetties, piers, pontoons, steps, ladders);
- Shoreline vulnerability (e.g. state of repair, conditions, erosion);
- Adjacent Land use (e.g. agriculture, industry, residential, amenity);
- Population density;
- Tourism structures (marinas, diving, charter companies, and sailings clubs);
- Infrastructures and footpaths;
- Activities (Angling, Sailing, Family and adventure, Rowing, Diving, Surfing);
- County Development Plan layers.

Data providers are universities, research institutions, cartographic institutions or agencies that allow free data distribution. CMRC also carries out in-field geomorphological surveys and monitoring activities using GPS technologies to integrate the system’s informational content. The CIS is offline, so metadata is managed with desktop applications.

The system is intended to be a model that can be easily replicated in different sites. The Coastal Inventory is currently used at CMRC and PPU and by local emergency planners and tourism agencies, and can be easily replicated and integrated in other local contexts.

Technological characteristics

The core component of the CIS is the Coastal Inventory spatial database, a repository of vector and raster data in various formats. Data implementation and DB management is operated at CMRC with ESRI desktop applications. PPU use the Coastal Inventory spatial database as an additional component to the MapInfo systems in use at their offices.

In relation to interoperability and data access, data (raster and vector) can be distributed by CMRC in accordance with copyrights of third parties and the governing law, by directly contacting the Coastal Inventory Team at CMRC.

The CIS is not directly integrated with other systems, but part of the informational contents are shared with the Marine Irish Digital Atlas http://mida.ucc.ie/.
ICZM related functionalities

Cork Harbour CIS provides some of the knowledge related functionalities considered by the analysis, like the availability of spatial information in GIS format, the availability of multi-time data, the inclusion of data related to the assessment of coastal vulnerability.

The actual conformation of the CIS provides little summary information that can directly support the ICZM process (costal vulnerability layers are available). Indicators, integrated maps, graphs, summary reports and fact sheets can be easily produced by expert GIS users exploiting the Coastal Inventory spatial database.

The Cork Harbour CIS was developed in order to specifically support the local ICZM experience. Within the COREPOINT project, the ICZM experience focused on the first three (of the five) steps identified for the Cork Harbour area: (i) Issue identification and assessment, (ii) Programme preparation, (iii) Formal adopting and funding. These activities finally led to the publication of an Integrated Management Strategy for Cork Harbour in 2008.

The process that underpinned the development of this Strategy document involved a leadership and facilitation role by the local COREPOINT project partners, communication with stakeholders through the Cork Harbour Forum, the organisation of two stakeholder workshops, and consultation with a Strategic Advisory Group (SAG, currently named Harbour Management Focus Group).

The implementation of the ICZM Strategy (forth step of the process) is currently on-progress and involve the design and publication of an ICZM Action Plan (2008-2011). The Action Plan is yearly delivered and subsequently reviewed taking into consideration the interactive nature.
of ICZM and the need to ensure a flexible process to deal with emerging and changing priorities.

The Cork Harbour CIS has therefore provided data and functionalities supporting various aspects of the ICZM experience, including problem understanding and structuring, assessment of alternatives in planning and management, monitoring and evaluation, adaptive planning and management. Furthermore, through the IMCORE project, specific research is undertaken to examine the use of scenarios to support the planning process for climate change and ultimately benefit local coastal communities.

**System development and management**

The Coastal Inventory and the Cork Harbour GIS are developed by CMRC on voluntary basis, aiming at providing a local model to be used in many ICZM contexts, filling an informational gap in the local authorities’ coastal governance.

The main barriers encountered in developing the system are related to copyright issues and to the definition of a shared goal. Another bottleneck is that the Integrated Management Strategy reported in the previous paragraphs is a volunteer initiative, not binding for the entities taking part to it. Even if the strategy sets quarterly meetings of the partners, some lack of interaction between entities can be observed.

The Cork Harbour CIS was created following the guide line set out in the report "Guidelines for Implementing Local Information Systems at the Coast", developed within the COREPOINT project. The Guidelines were developed on the basis of the experience on local ICZM processes of six COREPOINT partners (Essex Estuaries, Sefton Coast, Severn Estuary, Fal Estuary, and Cork Harbour) and results of the engagement and participation of over 100 local stakeholders.

System development and management is in charge of 4-5 persons (not at full time) at CMRC. Cathal O’Mahony is manager of the local node of the system, while Vicki O’Donnell, in charge of data validation and updating, is the contact person at CMRC for data commissioning.

Users of the Cork Harbour CIS are mainly coastal planners, managers, and regulators (i.e. decision makers level).

Future activities foresee the development of a web GIS that will be made available to all potential users (see [http://www.corkharbour.ie/pages/gis.htm](http://www.corkharbour.ie/pages/gis.htm)).

**Experience with the implementation**

At the moment, the access of the system is restricted only to off-line users at CMRC and PPU. Next development steps will implement a web GIS that will enhance Interactiveness and data access. CMRC developed the Cork Harbour GIS as a model to be replicated and further developed in different institutions to support the Cork Harbour development strategy.

At the Planning Policy Unit (PPU) of Cork County Council the Coastal Inventory is used as an additional informational component of the systems in use at their offices. Darragh O’Suilleabhain is the executive planner at PPU that follows the project. The CIS has been used as a support tool to develop the “Marine Leisure Infrastructure Strategy” of the Cork County Council.
No specific e-participation tools are currently available apart from the point of contact in the CMRC web page, but the actual state of the system derives from a wide participatory approach and activities (i.e. Cork Harbour Forum, Harbour Management Focus Group, Cork Harbour News, thematic workshops, Working Groups, etc.).

**Concluding remarks**

The Cork Harbour GIS is a system with a very simple architecture, not oriented to provide an exhaustive set of information contents and tools for ICZM, but rather aimed at offering a case study approach to bridge the gap between research institutions and local authorities dealing with ICZM.

The actual efficacy of the system in supporting the implementation of the ICZM process is demonstrated by the successful and productive joint venture between the research institution that developed the system (CMRC) and the local planners involved in ICZM (PPU).

The further implementation of the system, which will enhance the participatory and process related functionalities, could lead to a more structured and deployable tool able to support many other aspects of the ICZM.
GEOIDD-Litto

General Information

GEOIDD-Litto (Géographie et indicateurs liés au développement durable sur le littoral - Geography and indicators related to coastal sustainable development) is a coastal, marine and maritime web cartographical tool that allows to access a variety of geographical and statistical information, both for land and sea, along the French coast and overseas departments (Guadeloupe, Martinique, Guyane, Reunion).

GEOIDD-Litto is an initiative of the Observatoire du Littoral (French Coastal observatory). The Observatory includes, as part of an agreement, the Ministry of Ecology, Sustainable Development, Transportation and Housing; the Inter-ministerial Delegation for Territorial Planning (DATAR) and the General Secretariat of the Sea. The Centre has a Steering Committee, a body chaired by DATAR and bringing together all government signatories of the agreement as well as the Ministry of Food, Agriculture and Fisheries, the French Research Institute for Exploitation of the Sea (IFREMER), Hydrographic and Oceanographic Department of the Navy (SHOM), the National Council for Geographic information (CNIG), the Agency for Marine Protected Areas and the coastal conservancy.

GEOIDD-Litto responds to some of the main objectives of the French Observatoire du Littoral, in particular related to:

- Organise and share information and data on the coastal system;
- Improve the vertical and horizontal information flow among different administrations dealing with coastal management issues;
- Contribute to the discussion on the standardization of protocols for collecting, processing and sharing data.

The operating entity is the Observatoire du Littoral (French coastal observatory). It includes, as part of an agreement: the Ministry of Ecology, Sustainable Development, Transportation and Housing; the Inter-ministerial Delegation for Territorial Planning; the General Secretariat of the Sea.

The home page of the coastal observatory’s cartographical tool is [http://www.littoral.ifen.fr/Cartographie.6.0.html](http://www.littoral.ifen.fr/Cartographie.6.0.html). The contact person is Sébastien Colas at the Ministry of Ecology, Sustainable Development, Transportation and Housing (e-mail: [sebastien.colas@developpement-durable.gouv.fr](mailto:sebastien.colas@developpement-durable.gouv.fr)).
Operational context and information content

The CIS addresses all the ICZM dimensions considered by the analysis: territory (e.g. for general geographic descriptors, land and sea uses, marine protected areas), environment (specifically related to nature and biodiversity), economy (e.g. employment, tourism, use of the sea), society (e.g. housing), governance (e.g. urban planning in coastal areas).

GEOIDD-Litto allows users to print maps, extract statistical data, export images in different formats (JPG, PNG, PDF), implement “portrait of territories” (summary reports with tables and charts), map statistical and geographical data from other surveys through web-service protocols.

The system consists of two separated main tools, with two different web interfaces (Figure A3-27, Figure A3-28):

- A statistical data tool featuring more than 100 datasets, related to social, economic and environmental statistical indicators. The tool allows to map selected data (up to two indicators can be mapped together) at municipality level, changing the way data is presented and downloading the information in different formats. The system also allows to build and download “portrait of territories” describing statistical information of user-defined areas.

- A geographical data tool featuring more than 150 datasets, enabling the visualisation of various land and marine spatial information. It is possible to overlay data and manage colours and transparencies. The web GIS can also integrate remote data, disseminated by other producers, via a link to interoperable Web Map Services (WMS).

Figure A3-27 Statistical data tool of GEOIDD-Litto.
Information content is available for metropolitan French NUTS 3 and for overseas NUTS 3\(^1\), and is structured in the following thematic issues, for each of them the availability of geographical data and/or statistical data interface is indicated:

- land use - geographical and statistical data tool;
- water - geographical and statistical data tool;
- nature and biodiversity - geographical and statistical data tool;
- administrative boundaries - geographical data tool;
- transports routes - geographical data tool;
- zoning and uses of the sea - geographical data tool;
- coastal morphology - geographical data tool;
- natural risks - statistical data tool;
- agriculture - statistical data tool;
- tourism - statistical data tool;
- population housing - statistical data tool;
- employing - statistical data tool;
- urban planning - statistical data tool.

\(^1\) NUTS stands for Nomenclature d'Unités Territoriales Statistiques (Nomenclature of Territorial Units for Statistics). NUTS 3 is the more detailed NUTS level.
Data providers are mainly national public institutions and agencies. Most of the statistical data is provided by ministerial statistical surveys, Water Agency or IFREMER. Geographical data is mainly provided by the French National Institute for Geography (IGN) and by the Hydrographic and Oceanographic Service (SHOM). CORINE Land Cover is produced by the Ministry of the Environment, while protected areas are provided by the Ministry of Ecology, Sustainable Development, Transportation and Housing. Exhaustive lists of statistical and geographical data, with indication of data providers and date of publication, are available at the following pages linked to the coastal observatory webpage:


Integrated data are not directly provided. However, the statistical data tool enables to generate maps combining the simultaneous visualisation of two indicators, thus providing partially integrated information. By mean of the geographical data tool, more layers can be displayed in the same map, enabling to customize and export integrated maps.

Metadata is available for every dataset as a PDF factsheet linked to every indicator in both statistical and geographical tools, describing data domain, theme, type, description, date of publication, provider and scale.

Technological characteristics

The system uses Flash technology, while databases work with PHP and MySQL technologies.

The system collects most of the statistical and geographical data available in France. Integration with other tools is provided in the “useful links” page where, *inter alia*, the following links are available:

- Geolittoral, an additional tool managed by the CETE Normandy Centre Directorate General of Planning, Housing and Nature that provides large scale data including free coastal orthoimagery;
- Bosco webpage, observation base for coastal monitoring implemented jointly by the BRGM (French geological survey) and CETMEF (Maritime and River Technical Studies Centre), containing shoreline metadata from different sources;
- Territorial observatory, governmental web site providing interactive mapping and download of hundreds of environmental, social and economic data;
- Observatory of the Aquitaine coast, decision support tool for the management and development of the Aquitaine coast;
- The system has been developed following the INSPIRE and MOTIIVE standards, guaranteeing high interoperability. The geographical data tool provides full interoperability with other data providers’ spatial information through OGC - WMS application.

Only statistical data is downloadable as XLS files, while spatial data cannot be downloaded due to copyright issues, but only visualised in the web tools. Nevertheless, both statistical and geographical interfaces feature several tools to upload and visualise custom data, allowing integrated analysis with the information provided by the GEOIDD-Litto. The overall interoperability is good, the system is designed as a central node to visualise and analyse coastal data, rather than a portal to acquire data to be further implemented in decentralized systems.
ICZM related functionalities

Several knowledge and process related functionalities supporting ICZM are available in the GEOIDD-Litto. Multi-time information is available mainly for the statistical data tool for socio-economic and territorial data, (e.g. land use, unemployment rate) but also for environmental data (water quality in different years). A dedicated animation tool is available to analyze multi-time data as a temporal slideshow (Figure A3-29). The CIS includes also maps of ICZM indicators, such as for example area of built up land, protected areas, land take by intensive agriculture, sectoral employment.

![Figure A3-29 Temporal animation tool to analyse multi-time data.](image)

The statistical data tool is particularly relevant to support problem understanding and decision making in general. Indeed, it allows to not only map and download data and metadata related to selected statistics, but also to generate customized “portraits” on a specific spatial selection. “Portraits” are short report including summary tables and charts (see Figure A3-30).
Another specific tool, supporting problem understanding and coastal management is provided by the *Indicateurs* page, available in the website of the Observatoire du Littoral. In this section, specific indicators concerning coastal issues and coastal development are described, providing a quick overview of each considered theme:

- Agriculture;
- Building / housing;
- Economy / Employment;
- Properties;
- Nature and biodiversity;
- Population and demography;
- Water quality;
- Risks;
- Tourism;
- Transport;
- Land use.

Information is available as summary text, graphs and excel data. An example of an indicator fact sheet and its downloading options is given in Figure A3-31.
The availability of the territory “portraits” and indicator factsheets, together with the high variety of data related to different ICZM sectors and dimensions can properly support the problem understanding process.

**System development and management**

The statistical survey of the Ministry of Ecology, Sustainable Development, Transportation and Housing manages, through different units, the GEOIDD-Litto and the online interactive cartographic tool dedicated to the whole national territory (Géoïdd, [http://www.stats.environnement.developpement-durable.gouv.fr/index.php?id=3422](http://www.stats.environnement.developpement-durable.gouv.fr/index.php?id=3422)).

Géoïdd and GEOIDD-Litto are two separated online tools with different information contents, but with a similar aspect as they use the same web interface platform.

The web tool has been developed in a first version in 2006, and cost about € 45,000 within the Interreg DEDUCE project budget. The tool actually online has been developed in 2009, together with the Géoïdd tool, by the French private company EMC³ ([www.geoclip.fr](http://www.geoclip.fr)), with an additional cost of about € 50,000. Developers customised a generic tool (Géoclip) to the Coastal Observatory’s needs.

---

**Figure A3- 31 An example of the information available in the *Indicateurs* tool.**
GEOIDD Litto is developed in flash technology in order to provide quick and interactive map services and to work in vectorial format. All the databases work with PHP and MySQL technologies and are connected with a custom web interface that allows an easy consultation of new indicators and geographical data, change of reference frame, etc..

The management of the online system (i.e. publishing new geographical or statistical data, updating the "portraits " pages, publishing new zoning, updating the representation of indicators, updating of metadata, etc) is in charge of one person (not full-time).

About difficulties encountered in developing the system, the management of sensitive data can be reported. The Observatory in fact, as a National statistical service, has sometimes to deal with secret statistical data.

Online tools have no restricted areas or privileged user typologies. Taking into account the Observatory’s mission and the information content of the CIS, the target users can be mainly identified as:

- Decision makers;
- Coastal planners and/or managers;
- General public.

**Experience with the implementation**

Supporting the General Secretariat of the Sea (Secrétariat général de la mer), the Observatoire du Littoral represent France in the European working group about indicators and monitoring data of ICZM. It also constitutes the main interlocutor of the European Environmental Agency and of the European Topic Centre on Terrestrial Environment. Through the involvement of IFREMER (French Research Institute for Exploitation of the Sea), the Observatoire du Littoral is also involved in Interreg Project Deduce for the development of the 27 indicators of ICZM.

No information about the effective use of the system as a support tool for ICZM is currently available.

As reported by the CIS’s managers, the web tools are used by hundreds of people every month, mostly to map indicators or to produce "portraits" for local spatial planning. The typical users are researchers, local entities staff (like Départements and Régions employees), planners and students.

**Concluding remarks**

GEOIDD-Litto is the National point of reference for coastal statistical data. The system is designed as a central node to visualise and analyse coastal data, rather than a portal to acquire data to be further implemented in decentralized systems.

The system provides powerful knowledge related functionalities that can support ICZM processes, but has no interconnections with stakeholders or local authorities in charge of coastal planning.
REDIAM - Environmental Information Network of Andalusia

General Information

REDIAM is a web-oriented system designed for the integration, standardisation, use and publication of all the information about the Andalusian environment generated by all types of producers of environmental information centres in the Autonomous Community.

REDIAM home page (Figure A3- 32) is http://www.juntadeandalucia.es/medioambiente/site/web/rediam/; from this web site different services are available: a data catalogue for information and services, a download area, a section dedicated to information requests, FAQ and stakeholder involvement tools, thematic web GISs.

![Figure A3- 32 REDIAM home page.](image)

E-mails for direct information requests and suggestions are available (dgdsia.cma@juntadeandalucia.es and rediam.cma@juntadeandalucia.es respectively), as well as log-in section for registered users, news area and direct links section to general services.

The system is composed by several integrated subsystems, which refer to main topics whose importance and interest deserve special treatment, like:

- **Biodiversity**;
- **Geodiversity**;

- Climate;
- Waters;
- Wetlands;
- Urban environment;
- Coastal and marine environment.

Each subsystem is used in the different system functionalities as a reference to search and manage metadata and spatial / alpha-numeric information sets about these topics.

Coastal and marine environment subsystem include the information collected and controlled in the precedent CMA project called SIGLA (GIS of Andalusian Coast), which has been integrated in this new system to guarantee an easier update, standardisation and publication of coastal and marine information.

The coastal and marine environment subsystem is aimed to be the official information reference for all technician and decision-makers of Andalusian Government, but also for other members of the network, other entities involved in ICZM, stakeholders and general public. The coastal and marine environment subsystem is going to be upgraded with the publication in the REDIAM of a new web GIS application dedicated to coastal and marine environment, with specific functionalities for ICZM.

**Operational context and information content**

REDIAM is explicitly aimed to be the main repository of Andalusian environmental data, but also contains territory and society useful information for ICZM.

REDIAM information Catalogue is composed by the following topics:

- Territory characterization (topographic info, orthophotos and orthoimagery);
- Geographical references (reference systems, geographical grids, toponyms);
- Administrative units;
- Natural resources (biodiversity, geodiversity, climate, water, landscape);
- Environmental quality (atmosphere, water, soil, waste, forest ecosystems);
- Risk (natural hazards, accidents and natural disasters);
- Natural heritage (protected natural areas, public forests, trails, public facilities);
- Areas of special interest (urban environment, coastal and marine environment);
- Environmental planning (natural areas planning, forest plans, water plans);
- Land use (land use, forest resources, mineral resources, water resources, transport and mobility, hunting);
- Environmental protection facilities;
- Demography, Health.
The “coastal and marine environment” subsystem, accessible from the catalogue topic “Areas of special interest”, contains about 30 information dataset (mainly GIS layers, but also publications and indicators), mainly referring to coastal physiography, characterization of the coastline, bathymetry, land use, sea level, waves, winds, streams, reservoirs, water quality, fisheries, artificial reefs, etc.).

For every information dataset a detailed metadata page can be found in the web site or accessed through intranet or extranet applications dedicated to Andalusian Government personnel or other members of the network (Figure A3-33).

REDIAM is designed as an easy and flexible data provider that allows any user to make further data elaboration, but also provides thematic map viewers integrating different layers and tools, thematic web map services and downloadable static maps.

REDIAM is explicitly dedicated to Andalusian territory. Thematic viewers fit regional reference scale but allow to zoom into greater scale contexts. Multi-scale definitions are provided for raster data. Original scale of layers is indicated in metadata sheet when pertinent (for example topographic sheets imported from original paper version).

The system managers activated a membership programme to share information, methodologies and tools with universities, research institutions, statistics institutions, environmental agencies, cartographic institutions, etc.. Members contribute in providing and updating the information, and can access the system with a preferential channel (i.e. extranet connection to CMA servers).

In February 2011 REDIAM can count on about one hundred members, mainly representing departments of Andalusian universities with specific tasks dealing with environment and sustainable development, but public and private companies and institutions also belong to the network. Some of the members have specific tasks in close connection with ICZM dimensions, like for example:

- Coastal and marine geological unit, Earth Sciences Department of Cadiz University;
- Research unit for coastal planning, Geography Department of Seville University;
- Marine hydrographical institute (National Ministry of Defence);
- Public agency of Andalusian Ports, Andalusian Ministry of Transports;
- Andalusian Ministry of Tourism;
- Agricultural and Fishery research institution of Andalusia.

A scheme of REDIAM members follows.
Figure A3- 33 REDIAM members' scheme.
Technological characteristics

REDIAM makes up the Regional Focal Point of Andalusia for the European Information and Observation Network about the Environment (EIONET) and is the specialized node in Environmental Information within the Spatial Data Infrastructures of Andalusia (Infraestructura de Datos Espaciales de Andalucia - IDEAndalucia).

The main technologies used are:

- ESRI (for Geo-DB and spatial data standardisation),
- Oracle (for alphanumeric and metadata storage),
- MapServer (for web-GIS development),
- OGC (for spatial data services).

To guarantee a high level of interoperability and flexibility of the system, the REDIAM web page share standardised and uniform core information through Web map services (WMS) and downloadable data in SHP, GML and KML formats.

INSPIRE Directive has been used as the protocol to standardise spatial data, EUROSTAT standards for statistics, SEIS protocol for methodologies.

ICZM related functionalities

The Coastal and marine environment subsystem, explicitly aimed to support the Andalusian ICZM, contains the information gathered by the SIGLA project and several other specific studies, such as diagnostics of coastal sustainability plan developed by the Andalusian Ministry of Environment, the information on Management plans for natural resources of the coastal parks, maps by the Spanish Institute of Oceanography (ESPACE project), and other results of projects related to the costs developed by various research centres.

This information is gradually expanding and complementing the existing basic information. At the time of writing this report, the last WMSs published in Coastal and marine environment subsystem are:

- Physiographical Units of Andalusian Coasts, 2010;
- Urban sprawl along the coast, 1956-2007 (3 layers at different scales);
- Morphological characterisation of the coast (hierarchical legend and thematic layers for urban areas, infrastructures, river mouths, dunes and beaches).

For every information dataset a detailed metadata page (Figure A3- 34) can be found in the web site, where users can also ask for more information through a dedicated page that allow to send a certified message to system managers, or download the dataset containing spatial data (SHP and GML), PDF documents describing data template, data elaboration and classification and metadata (XSL and XML format). Useful spatial information for ICZM can also be directly accessed by Web Map Services and therefore integrated in desktop and web application.
Indicators included in the system (like coastal erosion, turbidity, chlorophyll, water temperature) are elaborated by CMA from remote sensing images. A publication on Andalusian ICZM Indicators (Sistema de Indicadores para la gestión integrada del Litoral de Andalucía - SILA) is also downloadable by the Coastal and Marine Subsystem. The document, published in 2007 by the Ministry of the Environment of Andalusia, is based on UNESCO handbook for measuring the progress and outcomes of Integrated Coastal and Ocean Management, and consists in the gathering of indicators developed by several institutions at different scales, in the analysis of the most suitable ones for Andalusian coastal areas and proposes a methodology to define and update a set of indicators for ICZM in Andalusia.

A coastal vulnerability index has also been developed, based on morphological, sea rise and urbanisation data, but is not published in the web application because needs an expert usage to be correctly understood and applied.

At present a new tool for ICZM is going to be integrated in the REDIAM, consisting in a dedicated 2D, hybrid and 3D web GIS integrating general territory information, dedicated coastal analysis and characterization, web map services provided by other entities (cadastre, geological service, protected natural areas network), digital terrain and marine bottom model associated layers and analysis tools (Figure A3- 35).
The new web GIS contains the spatial information about Andalusian coast mentioned above, and integrates it with new layers and tools, like toponyms, photographic documentation, environmental and tourist information, route tools, DTM derived layers (shaded relief, slopes, contours, etc.) and tools (sections and flooding simulator), marine geological and geomorphological maps, topographic maps and satellite images, tool for comparison of multi-time cartographies (Figure A3- 36 and Figure A3- 37).
Figure A3- 36 Preview of the new tool for comparison of multi time cartographies that will be available in new REDIAM web GIS for coastal and marine environment.

Figure A3- 37 Preview of flooding simulator that will be available in new REDIAM web GIS for coastal and marine environment.
System development and management

Since 1984 the Ministry of the Environment of Andalusia, using tools such as the SinambA (geographic and environmental information system of Andalusia) has been collecting and standardizing data and indicators, developing the information base for policy development and environmental planning and making available all information regarding the status of Andalusian environment and natural resources.

REDIAM represents a further step in this direction, aiming to make available to all stakeholders involved in the production and use of environmental information (technician management, members and general public) a web tool of information allowing interaction and participation in the creation and enhancement of environmental information about Andalusia.

The system is managed by the Ministry of the Environment of Andalusia with technical support of Egmasa, public environmental company of the regional government. About 60 persons are involved in the system management and development, 10 in CMA for strategic management (control and coordination, in accordance with annual budget), and about 50 in Egmasa for system management, data management, data check and validation, data publication, interaction with external users and data requests, data and software updating. Mr. José Enrique Frieyro at Egmasa (email: jfreyro@egmasa.es) is in charge of technical development and management of the Coastal and marine environment subsystem.

Centres or institutions can become members of the REDIAM network through collaboration agreements, sharing common environmental data bases, technical criteria for information gathering and classification, software to manage such information.

Egmasa and CMA defined a protocol to set standards for other providers’ incoming data, to guarantee data quality and total suitability to the system. Nevertheless reaching topological correctness of all layers from different providers represented a difficult task to accomplish. The alignment of hydrographical and topographical data also requested a long standardisation work but, as a result, this allow 3D views and analysis of different layers referred to dry land and submarine environment.

REDIAM can be accessed via internet (general public), extranet (members) and intranet (Ministry of the Environment staff). Extranet and intranet connection allow accessing the Geo-DB where all spatial data is stored, also through custom extensions of ArcGIS.

Personnel of Andalusian Autonomous Government can access REDIAM information also via intranet with different user types privileges (basically normal user and technical manager) (from Figure A3- 38 to Figure A3- 41).
Figure A3-38 Access to Coastal and marine environment subsystem information through intranet connection.
Figure A3- 39 REDIAM services accessible through custom extension of ESRI ArcMAP.

Figure A3- 40 Access to GeoDB through ESRI ArcMAP custom extension.
Figure A3-41 Access to GeoDB through ESRI ArcCatalogue for authorized personnel of Andalusian Autonomous Government.

Experience with the implementation

The system is actually exploited by different kinds of users. Web services represent a comprehensive tool for data sharing and allow stakeholders and general public to access the information about coastal and marine environment.

For REDIAM members, and in particular public institutions involved in ICZM processes, the system assures a guaranteed and recognized reference for standardised information.

The system is used by the Regional Ministry of Environment as the official data source for environmental evaluations and studies, like for example environmental impact assessment of plans and programmes, management of environmental protected areas. REDIAM has been used by the CMA as a support for the Andalusian adaptation plan to climate change, and it has been used by other entities of Andalusian Government to draw up the Andalusian Territory Plan (Plan de Ordenación del Territorio de Andalucía - POTA). Andalusian Ministry of
Agriculture and Fishery, as well as Ministry of Tourism, exploits the system to manage coastal data and to develop plans and analysis.

Concluding remarks

The system represents a very strong and adaptive tool to share information and methodologies for sustainable development and environmental management. ICZM functionalities are nowadays being developed and upgraded in accordance with Andalusian Strategy for ICZM published in 2007 by the Andalusian Ministry of the Environment.

The REDIAM can be usefully exploited for Andalusian coastal management by local entities and National Authorities in charge of interventions for coastal protection.
CRI GE PACA Spatial Data Infrastructure

General Information

The system here analysed is a framework of spatial data, metadata, users and tools that are interactively connected in order to use spatial data in an efficient and flexible way. This architecture is commonly called Spatial Data Infrastructure (SDI).

This SDI is operated and managed by CRI GE-PACA, the “Regional Centre for Geographic Information in Provence-Alpes-Côte d’Azur”. The online platform of the CRI GE-PACA SDI is the web site http://www.cri ge-paca.org, which is currently under further development and will be configured and named as Regional Geoportal.

CRI GE-PACA is a non-profit organization created in 2002, led by national and regional authorities through a seven-year financial plan (2000-2006 and 2007-2013). CRI GE- PACA main mission is to promote, facilitate, support and spread geographical information to public administrations on the one hand and, when possible, to general public and stakeholders on the other hand. This generic aim includes specific objectives:

- Provide geographic referenced data (digital data-sets) via the existing CRI GE-PACA website and its future evolution in the Regional Geoportal; the on-line participative and data-sharing platform (for public administrations) of the CRI GE-PACA SDI;
- Provide technical support to users, including: help-line for assistances, production of technical and requirements guides, editing specifications, technical meetings, on-line resources;
- Support the Regional Geomatic Network, through: promotion of cooperation between local users and data providers, support local communities of interests, management of thematic clusters, experiences and best practices exchange, acting as a resource centre on GIS concepts;
- Act as a coordination centre for the implementation of the INSPIRE directive at the regional level.

CRI GE-PACA is also the coordinator of the Regional Geomatic Network involving thematic clusters. These clusters are structured around local coordinators (or animators, as defined in the SDI) and a certain number of working groups, bringing together regional organisations interests in thematic issues. One of these twelve clusters deals with Sea and Coast (Mer & Littoral) bringing together the coastal stakeholders of the PACA region.

CRI GE PACA received in 2009 an “eSDI NET+ Best Practice Award” for its innovative organisational and institutional aspects in terms of cooperation, subsidiary and sustainability. The info mail contact@cri ge-paca.org is available to contact CRI GE PACA (located in Domaine du Petit Arbois- Bâtiment MARTEL, Avenue Louis Philibert, BP 10019 - 13 545 Aix-en-Provence cedex 4 – FRANCE).
Operational context and information content

The website of CRIGE-PACA enables to access different typologies of spatial information, like:

- Carthotéque (map library),
- Catalogue de donnés (data catalogue),
- Pôles métiers (Thematic working groups or thematic clusters).

From the map library, the regional Atlas “Cartopas 2010” (CARTOgraphie en Prêt A Servir) enables users to browse and visualise static maps related to several themes developed from data contained in the Geographic Information System (GIS) of the PACA DREAL (Direction Régionale de l’Environnement, de l’Aménagement et du Logement). The map library mainly concerns the environmental state of the region Provence-Alpes-Côte d’Azur, with particular attention also to management, planning and policies for sustainable development. A list of the map library themes follows, with some examples of contents.

- The territory and its evolution (e.g. land use, land use from 1990 to 2006, population density from 1996 to 2006 etc.);
- Management and planning (e.g. in French “Schémas de cohérence territoriale (SCoT) et Schémas Directeurs (SD)” and Local Plans (PLU), communal cards (CC), land use plans (POS), etc.);
- Air and climate (e.g. temperature, precipitation, state of air pollution by ozone, state of air pollution by suspended solids, etc.);
- Land polices for sustainable development (e.g. in French «Etat d’avancement des Schémas d’Aménagement et de Gestion des Eaux (SAGE)», the local Agenda 21 site and the map of the local plans energy environment (PLEE));
- Nature and biodiversity (e.g. natural reserve, natural areas of ecological interest for fauna and flora, site NATURA 2000 etc.);
- Landscapes and sites (e.g. map of regional synthesis of classified sites and sites registered under the Act of May 2, 1930 in the PACA region and Operations Great Sites, typology of regional landscapes, etc.);
- Data on water quality (e.g. aquifers and piezometric network, biological quality of the rivers, etc.);
- Water policy (e.g. principal water drainage, targets according to the Water Framework Directive (WFD), ecological and chemical status of rivers and coastal water, vulnerable and sensible zones for the nitrate, urban waste water treatment unit, annual volume of water used by geographical department, etc.);
- Energy (e.g. electricity transmission network, wind energy development, wind speed, wind power and potentially energy, development status of photo voltaic power projects, etc.);
- Housing (e.g. Status of the Local Housing Programs (PLH), percentage of social housing, etc.);
- Transport (e.g. road, traffic in major roads, etc.);
- Natural, technological and mining risk (e.g. flooding risk, atlas of the flooding zones, seismic risk, climatic occurrence of heavy rainfall, industrial risk, etc.).
An example map is shown in Figure A3-42. Maps are provided in PDF format (not interactive).

Figure A3-42 Map of ecological state of surface water, as an example of Cartopas 2010.

Another example of the information contents follows: a static map from the atlas of the erosion of the Bouches-du-Rhône province (Figure A3-43).

Figure A3-43 Atlas of the erosion of the Bouches-du-Rhône province.
The data catalogue enables to access to 4 groups of spatial layers:

- **Geographic information;** base information including for example topography, bathymetry, road, vegetation features, cadastral map, Euro Global Map, etc. Their production and maintenance are carried out by public institutions.

- **Thematic layers;** this section contains about 85 layers/documents produced by different organizations in the region such as for example: administrative boundary, land cover, flooding zones, rainfall, mean annual temperature, biological reserves, natural areas, forest zones, posidonia monitoring network, soil classification, altitudinal vegetation, etc). This group also contains some information related to the governance dimension, such as layers and documents related to: Plans de Développement de Massif (PDM), Plans Simples de Gestion (PSG), Schémas d'Aménagement et de Gestion des Eaux (SAGE) en région PACA, etc..

- **Aerial Ortho photos;** including for example: orthoimagery with high resolution (20 cm), historical aerial photographs of the coast (several years), etc.

- **Satellite images:** including false colour image of the Region PACA (1999-2006) and false colour image of the Mediterranean 2006.

The thematic sections allow downloading studies, news, documents, specifications, meeting minutes and static maps dealing with the thematic working group’s activity. Registered users can upload data in the thematic section through the mutualisation utilities.

The system can be exploited without registering, allowing to visualise a great number of spatial layers (some of them can be also downloaded) and static maps in PDF format. Members can download copyrighted data and access the upload utilities.

The CRIGE-PACA SDI addresses all the five ICZM dimensions, attempting to include the information relevant for the thematic information clusters part of the Regional Geomatic Network to analyse, produce and disseminate information, carrying out different actions, as shown in Figure A3- 44.
The thematic working groups are:

- Sea and Coast;
- Environment and Water;
- Agriculture;
- Forest;
- Forest Fire-fighting;
- Risks;
- Urban Planning;
- Employment;
- Telecom;
- Health;
- Economy;
- Roads and transportation.

Particularly relevant for coastal issues is the Sea and Coast (Mer et Littoral) thematic cluster, which involves stakeholders of the coastal territory as State offices, State Agencies, local governments (Region, Provinces, Municipalities), research laboratories, private companies.
involved in the coastal management. The main aim is to develop actions in the field of geographical information in coastal PACA as well as exchange and disseminate data through the regional CRIGE platform.

A metadata sheet is associated with each layer. For some layers further related documentation is also available for downloading.

Free access to data is available for most of the layers; the complete content of the SDI can be accessed by registered users. Full access to all data (including data sharing and exchange) is provided to public bodies of the PACA Region that are members of the Regional Geomatic Network. Every public entity can become member of the Network through an on-line application form available in the web-site. After CRIGE verification, the applicant entity can become member of the SDI.

Several examples of integrated information can be found in the Atlas “Cartopas 2010” related to the assessment of the natural and technological risks for the addressed territory. The “Natural risk” section for example includes maps related to flooding, seismic and landslide risks. Addressed technological risks include for example maps of risk related to large dams, industrial risk and risk related to mining and quarrying. Integrated information concern also the section about water policies, where maps about ecological and chemical status of rivers and coastal water, vulnerable and sensible zones for the nitrate are available.

Several integrated maps are available also in the data catalogue. One of the most interesting example are the Atlas of the flooding zones, analysing the phenomena of flooding that may occur by overflow of rivers, through an hydro-geomorphological approach.

Data providers are universities, research institution, statistics institutions, environmental agencies, cartographic institutions, etc.; a complete list is currently available at http://www.crige-paca.org/frontblocks/print/print_LOT_CARTES.asp.

**Technological characteristics**

The actual SDI is technically supported by a standard (and a bit outdated) web site. The map viewer linked to the web page was developed with ER Mapper technology. The new geoportal that will replace the actual web page has been developed mainly with open sources technologies (MapServer, PostGIS, OpenLayers, MySQL, Typo 3, Geonetwork or Geosource in France, etc.).

The enhancement of interoperability is one of the principal aims of the Regional Geoportal of next release, that will be compliant with Open Geospatial Consortium (OGC) standards and implement the existing specifications of the INSPIRE directive. Some interesting tools will be integrated in the new geoportal, like the Geo-viewer for data visualization (Figure A3- 45), that will allow to execute customized spatial data download (spatial reference, projection, extent, clip, data format, etc.). A preview of the new Geo-viewer of next publication is given below.

Interoperability of spatial data will be managed, in the new Regional Geoportal, by a clear and user-friendly data catalogue. A preview of the new interface is given below.
Figure A3- 45 Preview of the Geo-viewer of next publication in the CRIGE-PACA Regional Geoportal.

Figure A3- 46 Preview of the Geo-catalogue of next publication.
ICZM related functionalities

CRIGE-PACA SDI provides some of the knowledge related functionalities considered by the analysis, particularly regarding the integrated information about the coastal area of Provence-Alpes-Côte d'Azur provided by several public entities and organised in sectoral clusters.

Integrated information is currently provided mainly by static maps, but the new geoportal should sensibly improve the interactiveness of the SDI.

CRIGE-PACA SDI provides a variety of data related to different information sectors and dimensions and therefore can properly support problem understanding. Spatial data are organised according to an articulated structure that can support user in the elaboration of conceptual models of the territory.

Full access to the SDI is provided to public bodies of the PACA Region that are members of the Regional Geomatic Network. Every public entity can become member of the Network (after CRIGE validation) through an on-line application form. The online applications (the actual web page and the next Geoportal) allow and encourage exchanging experiences and best practices in relation to data management policies relative to the several issues.

Figure A3-47 Preview of the Marine and Coastal cluster in the new Regional Geoportal interface.
Stakeholder involvement and participation is therefore a focal point of the SDI, local data producers and planners can share information through the CRIGE-PACA SDI, providing a platform to create a strong mutualisation of decisions related to data and information sharing and exchange. The Marine and Coastal working group defined a sub-group dedicated to climate change that aims, *inter alia*, to implement an “Adaptation to climate change” database.

Some examples of documents provided by the SDI as a result of stakeholders consultation and Sea Coast thematic cluster “animation” are listed below:

- Information on Flooding Emergency Plan (*Plan de Submersions Rapides*), published in the SDI 2 March 2011, that will deal with inter-local approaches to achieve a National plan resulting in contractual agreements within National and Local authorities for the implementation of action plans including measures of prevention, prediction, protection and safeguarding of populations within 5 years;
- document published 24 September 2010 by the Sea Coast working group, resulting from previous meetings, containing the stakeholders’ contribution to the definition of the plan reported above;
- detailed presentation of the new national program “Litto3D” to produce a land-sea DSM on the coastal fringe produced jointly by the Hydrographic and Oceanographic Department of the Navy (SHOM) and the National Geographic Institute (IGN).

**System development and management**

CRIGE is in charge of the development and management of the CRIGE-PACA SDI and the related Regional Geoportal. CRIGE-PACA involves a team composed by 8 full-time persons. The budget for the SDI management from 2009 to 2011 is around 620,000 €/year. Data acquisition is budgeted as a separate expenditure, and its cost can vary a lot depending to the need of copyrighted data, with particular reference to cartography. Mr. Romain Buchaut is the Coordinator of Regional Geomatic Network at CRIGE.

CRIGE counts 3,193 members belonging to 1,424 organizations. Data acquisition and system development are driven by stakeholders needs. Thematic clusters coordinators (called animators) actively contribute to scope the system. Ms. Corine Lochet at PACA Regional Government is the animator of the coastal and marine thematic cluster working group, which is currently composed of 164 persons.

One of the major management difficulties is related to the definition and coordination of the working groups to share data and expertises. The inclusion in the coastal and marine working group of private companies commissioned to develop informative studies and interventions, for example, deserves particular attention in CRIGE-PACA vision, as they play an important role in coastal management. It frequently happens, in fact, that one private company performs studies or coastal interventions on behalf of different Municipalities that sometimes operate specifically in their territory in the absence of a broader plan.

Another main problem deals with the acquisition of data, which can represent a major cost to be concerned in budget setting. Good examples of this issue are the acquisition of basic cartographic layers from IGN or LiDAR surveys data for detailed bathymetric monitoring.
The final users of the SDI developed and managed by the CRIGE-PACA are:

- Government agencies;
- Local governments as municipalities, Provinces, Region;
- Thematic public chambers;
- Non-profit making organizations;
- Universities and research laboratories.

As mentioned above, full access to the SDI is possible only for public bodies of the PACA Region that are members of the Regional Geomatic Network. Other public entities can join to the network after registration and verification by CRIGE-PACA. In the next section more information about the use of the system is provided. Some Cartographies, Studies or Data are accessible for general public.

**Experience with the implementation**

The CRIGE-PACA SDI is a point of reference for regional spatial data and thematic information and a tool to put thematic issues’ stakeholders in touch with each other.

The graph in Figure A3-48 shows the number of visits of CRIGE-PACA web site per month from 2002 to 2010. The statistics show an increasing use of the system, with a peak of more than 20,000 visits in March 2010.

![Figure A3-48 Number of visitors/month.](image)

At the time of writing this report, the SDI counts 3,193 members belonging to 1,424 organizations. The Marine and Coastal working group is composed of 91 organizations and pool around 164 persons sharing GI interests in Marine and Coastal Management. Historical requests of institutions to become member of the SDI are reported in the Table A3-3.
Table A3- 3 Requests of registration to the CRIGE-PACA SDI.

<table>
<thead>
<tr>
<th>Year</th>
<th>Accepted</th>
<th>Refused</th>
<th>Total requests</th>
</tr>
</thead>
<tbody>
<tr>
<td>before 2002</td>
<td>371</td>
<td>93</td>
<td>464</td>
</tr>
<tr>
<td>2003</td>
<td>240</td>
<td>121</td>
<td>361</td>
</tr>
<tr>
<td>2004</td>
<td>324</td>
<td>155</td>
<td>479</td>
</tr>
<tr>
<td>2005</td>
<td>401</td>
<td>166</td>
<td>567</td>
</tr>
<tr>
<td>2006</td>
<td>412</td>
<td>175</td>
<td>587</td>
</tr>
<tr>
<td>2007</td>
<td>209</td>
<td>93</td>
<td>302</td>
</tr>
<tr>
<td>2008</td>
<td>171</td>
<td>108</td>
<td>279</td>
</tr>
<tr>
<td>2009</td>
<td>223</td>
<td>84</td>
<td>307</td>
</tr>
<tr>
<td>2010</td>
<td>142</td>
<td>78</td>
<td>220</td>
</tr>
</tbody>
</table>

The main CRIGE aim is to investigate and make public the availability of information and expertise dealing with thematic issues, offering a platform to share data and information to support integrated and sustainable planning and stimulating stakeholders’ involvement in thematic networks. Coastal management is a major theme of the marine and coastal working group, but useful information for ICZM can be identified also in other clusters (urban planning, environment, etc.).

Concluding remarks

CRIGE is actually not only an entity that manages a data facility, but also a promoter of integrated planning. The establishment of a Spatial Data Infrastructure with dedicated working groups (included the coastal and marine one), coordinated by a reference person (the so called “Animateur”) and scheduled periodical meetings, represent a successful path to achieve this goal.

The CRIGE-PACA Regional Geoportal of next release is one of the first French regional web sites fully interoperable with national and European data management standards, providing modern tools for data visualization / download and e-participation between stakeholders.
Coastal and marine information system of Emilia Romagna Region

General Information

The Coastal and marine information system of Emilia Romagna Region has been mainly implemented within the EU CADSEALAND (Land-sea interaction: coastal state and evolution in CADSES, 2004-2006) project and it has been designed following the guidelines issued by European Commission within the EUROSION programme (EU commission, 2004). After the CADSEALAND project, Emilia Romagna Region (or RER) was involved in the EU funded PlanCoast project (2006-2008). Within the activities of that project, the CIS has been updated to further support coastal and marine spatial planning, too. PlanCoast also foresaw the use of the CIS to define a conceptual framework for the Ferrara coastal area (included in the Emilia Romagna Region) in order to identify and evaluate coastal vulnerability and to define criteria and objectives for territorial programming and planning.

The CIS is managed by the Geological, Seismic and Soil Survey (Servizio Geologico, Sismico e dei Suoli - SGSS) of Emilia Romagna Regional Government. Home page of the survey is [http://www.regione.emilia-romagna.it/wcm/geologia_en/index.htm](http://www.regione.emilia-romagna.it/wcm/geologia_en/index.htm); SGSS CIS coordinator is Ms. Luisa Perini, e-mail: lperini@regione.emilia-romagna.it.

The Coastal and marine information system contains data collected by different Institutions during the last 100 years and several GIS products resulting from survey activities and from studies recently carried out by the SGSS. The CIS refers to the whole Emilia-Romagna coastal zone and marine area, and is continuously updated in order to represent a fundamental support for decision makers and coastal planners dealing with ICZM.

Actually the Sea-Coast CIS is undergoing further implementation and upgrades within the EU project MICORE (Morphological Impacts and Coastal Risks induced by Extreme storms events, 2008 - 2011). The general aim of the project is to develop and test online tools for reliable predictions of the morphological impact of marine storm events in support to civil protection mitigation strategies.

The Sea-Coast CIS actually includes a web catalogue of metadata ([http://geo.regione.emilia-romagna.it/catalogo_web/catalogo](http://geo.regione.emilia-romagna.it/catalogo_web/catalogo)) and a Web-GIS application ([http://geo.regione.emilia-romagna.it/costa/viewer.htm](http://geo.regione.emilia-romagna.it/costa/viewer.htm)), enabling the on-line publication of validated spatial data. The web applications are aimed to share and distribute data among the peripheral structures of the Emilia Romagna Region, other public and private entities and general public.
Operational context and information content

The information content currently available in the CIS can be resumed in the following categories:

- Orthoimagery historical archive from 1946 to 2010;
- Land use layers from 1946 to 2010 and elaborations on land use change;
- Shoreline DTM;
- Shoreline DSM from LiDAR and multibeam surveys;
- Administrative boundaries;
- Geological, geomorphological and sedimentological static maps;
- Marine use DB;
- Off-shore infrastructures layers;
- Bathymetry;
- Coastal protection interventions catalogue;
- Submarine sands deposits DB;
- Dune steadiness layer;
- Coastal classification;
- Coastal risk and vulnerability.

Further information content is currently work in progress:

- Storms and exceptional events DB;
- Shoreline interventions DB (fine sand nourishments);
- Hydrodynamic;
- Demography;
- Cultural heritage;
- Laws and regulations DB.

Finally, the CIS managers have identified further useful data for ICZM currently not available and to be gathered or elaborated in the next future:

- Ports;
- Economic asset;
- Marine Authorizations.

All layers are provided with metadata stored in a dedicated Repository manager ISO 19115 compliant, currently being upgraded. The metadata repository will store all the information about GIS data contained in the regional data catalogue. Part of this metadata is distributed by the web catalogue.
Main data and information providers can be resumed as: Regional Agency for the Protection of the Environment (ARPA), Navy Hydrographical Institute (IIM), Military Geographic Institute (IGM), Hydrological Survey and other technical services of the regional government, Marine science institute (CNR - ISMAR), technical surveys of coastal local governments and universities. A specific agreement protocol has been signed with the Italian Integrated Energy Company (ENI) to support a gas reserves repressurization project aimed to mitigate land subsidence. ENI provides LIDAR and multibeam data. SGSS also carries out, supported by external companies, in-field geomorphological surveys and monitoring activities using GPS and LIDAR technologies to update shore profile, coast line and maximum sea ingression line data.

From 2007 to 2008 a partnership with Campania Regional Government has been activated in order to develop a CIS for Campania coasts using the expertise of Emilia Romagna case. This partnership can be reported as an example of the scalability and flexibility of the system. On the other hand, currently only few CIS applications are available in English, while the major part are only available in Italian language.

**Technological characteristics**

The Geological, Seismic and Soil Survey uses ESRI technology for data elaboration, image elaboration and coastal modelling. Oracle is used for data storage and ArcSDE technology links the Oracle database with ESRI GIS software.

System architecture is based on two servers: an internal server for processing, updating and validating data and another web server for data publication (see Figure A3- 49).

Personal applications are used to develop the metadata repository ISO 19115 compliant and the catalogue accessible from RER LAN and web.

![System architecture diagram](image-url)
The interoperability of the system is guaranteed by the use of standard protocols (INSPIRE) for data management and storage.

A model used by the Regional Agency for the Protection of the Environment (ARPA) is integrated with the CIS to provide sea-storm events modelling. This is the XBeach model developed by Delft Hydraulics, a two-dimensional model for wave propagation, long waves and mean flow, sediment transport and morphological changes of the near shore area, beaches, dunes and back barrier during storms. Operational models like SWAN and ROMS are also used to provide information regarding the forecast of sea state and circulation.

A specific database of historical data on storms, exceptional events and related meteorological data is currently under development by the SGSS within MICORE project, with dedicated fact sheets providing extended descriptions, newspaper articles and photos. The sea-storm DB will be integrated into the CIS.

The final aim of tools integration is to implement a more sophisticated "integrated information system", designed in CADSEALAND and MICORE projects, where the SGSS CIS and the information system of ARPA could melt together providing an adequate instrument for the purpose of prediction and prevention of coastal risks.

ICZM related functionalities

The system architecture analysed in the previous section provide a variety of information contents and functionalities specifically dedicated to different levels of use for ICZM.

The most extended information repository is the one managed by the SGSS in the internal server for data validation and updating. This information is managed and elaborated by SGSS GIS officers with desktop applications. Custom extensions have been developed to facilitate DB and metadata management (see Figure A3-50). A dedicated extension is also used to handle and analyse DSM LIDAR data.
SGSS staff elaborates coastal data with desktop GIS functionalities, producing new useful information for ICZM, like coastal risk and coastal vulnerability layers. Maps of coastal vulnerability to erosion are produced integrating information related to three main aspects: geomorphology, evolutionary trend and human impact (see Figure A3- 51).
Desktop applications have been provided also with the DSAS extension: Digital Shoreline Analysis System developed by the USGS, which allows computing rate-of-change statistics from GIS multiple historic shoreline positions.

Within the CADSEALAND project an integrated model of the Emilia Romagna coastal zone has been then elaborated. Model variables are: geomorphology, infrastructure, bathymetry, waves and currents. The model has been used to identify the historical evolution of coastal morphology, resulting in the multi-time layers of coast line evolution from 1946 to 2005.

Part of the information contained in the internal server is then transferred, after the validation process and the metadata definition, to the server dedicate to data distribution, data source of web GIS and metadata web catalogue.

The web GIS provides lots of multi-time data mainly referred to territory dimension, allowing easy and flexible multi scale analysis and data interrogation.

The database of coastal defence interventions and measures is also featured. The DB contains technical data about coastal defence infrastructure and data related to the assessment of the effects (or impacts) induced on the coastal morphology. Coastal vulnerability data, developed with the collaboration of the University of Ferrara within the MICORE project, is published in the web GIS as point and line layers referred to 3 different return times (T1, T10 and T100).
The web GIS features a powerful multilayer interrogation tool that allow to identify and compare the information of different layers on a spatial based query defined by the user (see Figure A3- 52). Interrogation outputs pop out in a new browser page report interactively linked to the main map page and printable in PDF format.

Figure A3- 52 Web GIS application: multilayer interrogation output based on custom spatial criteria.
Spatial information distributed by the SGSS can be consulted through the metadata catalogue online (see Figure A3-53). Metadata also contains information about data producers and distribution restrictions, as well a direct SGSS point of contact frequently used by stakeholders to request information or editable files.

Currently web applications do not allow spatial data downloading; this functionality will be implemented in the near future.

System development and management

The system has been developed by SGSS staff, with the contribution of an external company for web GIS design and in collaboration with the wider informative network of the Emilia Romagna Region.

SGSS manages the system, elaborate data and supply specific support (statistics, maps, etc.) to other entities internal or external to regional government (i.e. planning department, technical departments in charge of coastal interventions, policy makers, etc.). Five persons manage the system and other five persons provide technical support. Data management is in charge of SGSS and other cartographic RER surveys as well.

The main obstacles encountered in developing the system are related to data acquisition and standardisation; a big effort has been necessary to draw up an exhaustive list of all information available through the different surveys of the Emilia Romagna Region itself, and afterwards to define which was the missing information necessary to support ICZM processes.
Data validation and geoprocessing of non-GIS back data represented another expensive task. SGSS developed a standard protocol to check and validate incoming data from other institutions.

**Experience with the implementation**

The system is actually exploited by different kinds of users. LAN services are used by SGSS staff, personnel of technical services of Regional Government (like the ones in charge for interventions on the coast) and other regional departments (like local territorial planning).

The CIS is therefore interconnected with other entities that use it as a support system and provide data to improve it as well, like bathymetric and subsidence surveys carried out by the Regional Agency for the Protection of the Environment (ARPA), or technical surveys in charge of fine sand nourishments.

The CIS is also usefully exploited by the coastal defence survey of the regional government, in charge of coastal protection planning as defined by regional guidelines for ICZM approved in 2005.

Web applications of free access are widely used by universities and stakeholders to perform on-line territorial analysis and data requests. On the other hand, the online restricted area is used by operators belonging to the regional technical surveys to manage and implement data.

A new dedicated web application, currently under development, will be used by regional technical surveys to manage and update the database of coastal protection interventions (see Figure A3- 54).

**Figure A3- 54** Web application implemented to manage and update coastal interventions DB.
Finally, a further development of the CIS is planned, foreseeing the upgrade of vulnerability analysis of the coast, the integration of ARPA information system and their sharing with the Italian Civil Protection Service in order to provide an integrated system for coastal risk management. This task is already under development on a case study area within the MICORE project.

Concluding remarks

The Sea-Coast CIS of Emilia Romagna Region provide an effective support to ICZM programme carried out by Emilia Romagna government, and is an operational application of regional guidelines for ICZM that have been approved in 2005.

The CIS is also intended to become a decisional support system providing the needful knowledge for policy and planning actions, structuring a network of all subjects operating in coastal development, protection and defence and encouraging their cooperation.
GIS tools of the Information Service of the Venice Water Authority

General Information

SINFO CIS refers to a set of GIS-based and related (database, models, decision support systems) tools developed by the “Servizio Informativo” (Information Service) of the Venice Magistrato alle Acque di Venezia (Venice Water Authority - MAV), in order to support the management and safeguarding activities of the Venice Lagoon implemented by the same MAV through its concessionary Consorzio Venezia Nuova.

The Information Service was set up in February 1984, implementing the first convention signed between the Venice Water Authority and the Consorzio Venezia Nuova (in the context of the first Special Law no. 171/1973 which established the principle that safeguarding of Venice was a matter of "priority national interest"). Main tasks of the Information Service were and still are to generate, collect, classify and archive data and information on the lagoon environment and the related human activities. These data and information are used to support other bodies operating in the Venice Lagoon (mainly the Venice Water Authority) in dealing with the assessment of the state of the system and the causes of the environmental and morphological deterioration, as well as with the definition of safeguard plans of interventions (defence from high waters, defence from sea storms and environmental protection) and its monitoring.

Main purpose of the MAV Information Service is the organization of data and their integrated analysis in order to provide scientific-based information to support the management and safeguarding of the Venice Lagoon. Specifics objectives can be summarized as follows:

- Produce the knowledge base to define the state of the system, identify the causes of degradation and develop plan of actions for the Lagoon safeguard and related monitoring;
- Organise and make easily accessible and understandable the wide and complex set of data and information available on the Venice Lagoon and its territory;
- Standardize the used observation and measurement methodology;
- Facilitate the technical collaboration among different institutions.

All users can consult the data (and related metadata) at the Information Service and require them to MAV and the same Information Service. After the authorization from MAV, the Information Service provides the required data, maps, GIS layer, and meta-data to users. Data and information (such as historical maps, other static digital maps, some spatial layers, etc.) can be consulted at the Information Service through the SIGLA system showed in Figure A3-1. A second tool (Co.Op.) has been specifically developed to support the research of documents related to studies, project and interventions, etc (Figure A3-56).

The Information Service is located in the historical centre of Venice (S. Marco 2949) and can be contacted by phone (041-5203188) or by e-mail: servizioinformativo@magisacque.it.
Figure A3- 55 SIGLA tool; the system is currently available only for the intranet users of the Information Service of the Water Venice Authority.

Figure A3- 56 Co.Op. tool for the research of studies and projects realized by the Water Authority of Venice and its metadata (e.g. title, date, location of consultation).
Operational context and information content

SINFO CIS has gradually evolved in time, since 1984, progressively acquiring new data and developing new information and tools.

First period of activity mainly focused on collection and quality check of available documentation and creation of the Geographic Information System of the Venice Lagoon territory. The second period (started approximately in 1990) started addressing Venice Lagoon problems. This implied the further development of the GIS tools as well as of other integrated tools, including models, specific software and various decision support systems. The third period (relative to recent years) is characterized by an operational dimension, directly serving institutions, where the activities are part of the production processes. The results of these activities were complementary and mutually reinforced by those reached by MAV through its concessionary the “Consorzio Venezia Nuova”.

Several institutions have collaborated with the MAV Information Service in the acquisition of data included in the SINFO CIS; e.g.:

- Veneto Regional Authority;
- Provincial and municipal Authorities of the Veneto Region;
- Universities of the Veneto Region;
- The Italian National Research Council (CNR);
- The National Institute of Statistics (ISTAT).

The SINFO CIS mainly addresses four of the five considered information dimensions. The environment and the territory dimensions are in depth addressed. The economic (e.g. data on the industrial area of Porto Marghera, close to the Venice Lagoon) and the social dimension (e.g. population density, urban structure) are considered, too. The SINFO CIS includes several information which refers to the following main topics:

- Base maps
  - Historical maps, remote sensed data, including a wide collection of satellite images and aerial photographs;
  - Physical and morphological environment of the Venice Lagoon (canals, tidal flats, mudflats, salt marshes) and its drainage basin;
  - Administrative boundaries.

- Morphology (bathymetry and digital elevation model, channels, elevation of salt marshes, surface of shallow water, salt marshes and tidal flats, evolution of lagoon morphology, granulometry of sediments, geotechnical characteristics, subsidence, pedology of the drainage basin, morphological interventions in the Venice lagoon);

- Hydrodynamic (current, tide, waves, meteorological data, discharge, flows, hydrographic network and drainage basins, database of flooding events and flooding risk for lagoon urban systems);

- Biology and biodiversity (macroalgae and seagrass distribution and ecological characteristics, and more in general lagoon vegetation, zoobenthos, birds);

- Quality (water and sediments quality, drainage basin, residence time);
- Socio-economy (water traffic, hunting, fish and fish farming, land use, road infrastructure population density, industrial activities; archaeology, sewerage discharges in Venice lagoon).

Data and information contained in the set of GIS tools of the MAV Information System have been used, also through models, to support many integrated analysis related to the Venice Lagoon management. Results of these analysis have been often included in the SINFO CIS, e.g.:

- database of flooding events and of urban area affected by flooding risk;
- pollution loads (and relative budget) from the drainage basin;
- maps of the morphological evolution of the Venice Lagoon, also including areas subjected to sedimentation or erosion;
- map of the archaeological risk.

Above ones are just some examples of integrated analysis results included in the SINFO CIS.

**Technological characteristics**

SINFO CIS is developed with Geomedia Intergraph (Licensed software). Geomedia area interfaced with numerous Oracle database to manage all the alphanumeric data. The main themes (e.g. elevation type and attribute, transport, channel, administrative boundary) provide complete interoperability in full compliance with the INSPIRE directive. This is going to be extended to all spatial data.

SINFO CIS is directly or indirectly (for example providing data and acquiring outcome) integrated with a relevant number of other tools (database, models and decision support systems), including for example:

- BDMA; Oracle database for the collection, management and diffusion (currently thought Intranet) of environmental data and document on the Venice Lagoon
- SAMANET; a specific software for the acquisition and management of data (water chemical and physical parameters) continuously measured by fixed monitoring stations;
- CRUP; decision support system, providing integrated information for licensing discharges into lagoon generated by production activities. CRUP is integrated with a dispersive mathematical model able to evaluate the effects of pollutants discharged into the lagoon;
- Specific systems used to manage large dataset, such as: GESCOM supporting licensing for private water uses of the lagoon; SITAR related to archaeological sites in the Venice lagoon; COSS supporting quick visualisation of documents and reports related to studies; MODEL supporting the use of various hydrodynamic models of the Venice Lagoon.

Particularly relevant is the integration of INFO-CIS with the CIS of the Veneto Region coast (SIT della Fascia Costiera Veneta), realized by the Information Service of the Water Authority and the Veneto Region in order to collect all the data and information produced and made available by these two entities about the Veneto coastal system. Data and information are related to the coast from Bibione in the north and Scardovari in the south and are organized in two sections: Veneto coast and coastal hinterland (Figure A3- 57). The system is still not...
available on-line at the moment and it is going to be soon published as a fully interactive Web-GIS.

Figure A3- 57 Web interface for the access to the CIS of the Veneto Region coast.

Main topics addressed in the Veneto coast section (Figure A3- 58) are:

- Base maps (collection of satellite images and aerial photographs; raster maps at different scale, nautical maps, administrative boundaries, bathymetry);
- Fisheries and aquaculture (fish zones, activities of 2005);
- Navigation (port system, network navigation);
- Habitat (localization of marine outcrops);
- Environmental monitoring (bathing quality data, meteo-marine data, benthos community, turbidity, phytoplankton, temperature);
- Littoral (coastline evolution 1997-2009, erosion and nourishment, dredging);
- Services and tourism;
- Archaeology;
- Sediment characteristics;
- Restrictions to fisheries and wildlife protection areas;
- Infrastructures and technological networks.
Main topics addressed in the hinterland section are:

- Base maps (collection of satellite images and aerial photographs; raster maps at different scale, nautical maps, administrative boundaries, bathymetry);
- Protected areas (Important Bird Area, Special Protection Area and Site of Community Importance);
- Infrastructures and technological networks;
- Territorial plan.

Metadata are provided for all layers included in the CIS of the Veneto Region coast. In particular a specific tool enables to visualise a metadata form including the detailed description of the data source and provider, as well as hyperlinks to detailed information related to the layer (such as data tables, documents, web-sites with real-time data, etc.).

**ICZM related functionalities:**

SINFO CIS provides some of the ICZM knowledge related functionalities considered by the analysis, specifically:

- Integration among different information sectors this functionality is widely developed;
- Operation at the different spatial scale; great part of the available spatial data can be re-scaled according to the considered spatial extent; thus enabling to visualize more details at a higher scales.
- The data and information collected at the local level allows a more general inclusion in a larger scale, thus providing an adequate cooperation between different levels.
It is particularly important to stress wide availability of multi-timer layers and data. A very interesting example is the exhaustive and comprehensive set of historical maps and survey of the Venice Lagoon morphology, enabling to evaluate the long term evolution of the system. Historical maps can be directly consulted through the SIGLA tool, that enables to focus the analysis on a specific lagoon area of interest (see an example in Figure A3- 59).

![Historical Maps Example](image)

**Figure A3- 59 Example of historical map search and visualisation.**

Important time series are also available for environmental quality data of various matrixes. These data are contained in a specific database; BDMA (Environmental Monitoring Database) is a tool for Internet search and consultation of environmental data on the Venice lagoon and surrounding areas (drainage basin and the coastal marine area). Other really important historical datasets are related to the coastline evolution (including quantitative data on erosion, sedimentation and nourishment processes) of the Venice littorals (see an example in Figure A3- 60) and the morphological evolution of the lagoon system, including in particular bathymetric data on shallow waters, tidal flats and salt-marshes. These two set fully support the assessment of coastal and lagoon dynamics and the definition of related plans of interventions.
SINFO CIS, and related tools of the Information Service (models, decision support systems, databases), specifically aims to provide scientifically-base information to local decision makers, planners and managers (Venice Water Authority and its concessionary Consorzio Venezia Nuova) dealing with the sustainable management of the Venice Lagoon. Use of the system is therefore strictly connected to plans (e.g. the morphological plan of intervention), interventions and monitoring in the Venice Lagoon system, in the perspective of the ICZM process. Actually it is possible to say that SINFO CIS, and all the integrated tools, fully support various phases of the integrated management of the Venice Lagoon (starting from problem understanding and structuring and ending with evaluating and adaptive planning).

Furthermore, developed decision support systems, directly or indirectly integrated with GIS information and tools, enable to generate thematic scenarios and assess related alternatives.

Furthermore, the newly developed CIS of the Veneto Region coast (see Figure A3- 57) has been properly designed and implemented in order to support the Regional Authority in dealing with the elaboration of the Coastal Plan (Piano Coste) within an ICZM perspective.

SINFO CIS (the GIS and related tools) does not provide specific participation tools; actually the GIS systems are currently not available on-line. However, all users can consult the information at the Information Service and require them to the Venice Water Authority and the same Information Service.

Moreover many summary data and information are diffused through the “Puntolaguna” initiative. Puntolaguna is a multimedia information point on activities related to the safeguard of Venice and its lagoon undertaken by the Venice Water Authority through the “Consorzio Venezia Nuova”. A vast and diverse range of informative tools are available for visitors to consult the material in a multi languages support (multimedia support, consultation on paper and on video).
Puntolaguna information point offers presentations on the safeguarding activities and "virtual" visits to the lagoon. Puntolaguna is also used to organise the following initiatives:

- Visit to the lagoon and the work sites of main interventions;
- Training courses for technicians from the public administration in particular focusing on data management and safeguarding activities of the Venetian lagoon ecosystem;
- Technical seminars;
- Educational laboratory.

**System development and management**

The complete set of GIS and other tool collectively included in the SINFO CIS has been progressively developed, since 1984, by the Information Service of the Venice Water Authority. These activities also implied the collaboration with other public and private entities, in particular the Consorzio Venezia Nuova and other ones such as the Veneto Regional Authority and Thetis, an engineering company based in Venice. Data contained in the SINFO CIS tools have been produced by a remarkable high number of studies, project and monitoring activities involving a wide variety of subjects working in the Venice Lagoon. A great part of funds used to develop tools and acquire data have been directly provided by the Venice Water Authority through its concessionary Consorzio Venezia Nuova. Indeed it is very difficult to provide a figure of costs related to this remarkable development effort.

Initial difficulties were mainly related to technological aspects of tools development. Afterwards, main obstacles were represented by data collection; a huge effort was implemented to acquire raw data from the original producers and to standardise these data to common formats.

SINFO-CIS is today managed and operated by the staff of the Information Service of the Venice Authority. Particular attention is given to maintain all part of the system and related dataset updated to the last available data and technologies (both software and hardware). About twelve full-time persons are currently involved in the management, updating and progressive development of this complex system of systems. In particular:

- All staff persons are involved in the operative management and use of the GIS tools, including all the various phase of the production and analysis of spatial information; such as: data digitalisation, editing, spatial analysis and output production;
- Five of the twelve persons are specifically also dedicated to software development, including web aspects.

Due to the operative orientation of the SINFO CIS, target users mainly include the following ones:

- Policy-makers and decision-makers, in particular those working for the Venice Water Authority. Moreover, data have been provided to support decision making of various other institutions;
- Coastal planners and coastal managers, in particular technicians working for the Consorzio Venezia Nuova;
- Internal experts and specialised and expert users;
Representative of private sectors that can be in particular interested in understanding constrains and opportunities related to the lagoon environment for their economic activities.

Data and information contained in GIS and database are useful for everybody that may require them to the MAV and Information Service. Other target users are represented by citizens, in particular in relation to the Puntolaguna initiative.

**Experience with the implementation**

SINFO CIS is constantly used by the Venice Water Authority and its concessionary Consorzio Venezia Nuova as the main data source for studies, projects and interventions related to the safeguard of the Venice lagoon in the context of the Italian special law. The implemented studies, projects and monitoring activities generate data and information that are progressively archived in and managed through the same SINFO CIS’s systems.

The consultation and distribution of the information allows and guarantees support to management of coastal data, data sharing, communication, coastal monitoring, coastal planning and management. The system is continuously implemented and is used for the ongoing safeguarding activities, in particular related to: the protection of the historical city of Venice and its lagoon from high water events, morphological and environmental requalification, and defence of littorals.

**Conclusive remarks**

SINFO CIS is a system of different tools, including GIS-based tools, databases, models and DSS. It archives and manages an incredibly rich and wide amount of information of the Venice Lagoon.

This system is strictly integrated within its main final users, the Venice Water Authority and the related concessionary Consorzio Venezia Nuova, that actually utilize tools and data as the scientific base of studies, projects, interventions, plans, monitoring activities. All these activities are implemented in a holistic vision aiming to the overall safeguarding of the Venice lagoon system, including a relevant natural heritage and the related human component. It is possible to conclude that SINFO-CIS fully supports the implementation of an ICZM-like process. In this perspective it is relevant to mention some rather new studies promoted by the Venice Water Authority focusing on the sustainable development of the Venice Lagoon, the assessment of climate change vulnerability and the development of adaptation strategies to the same climate change impacts.
Annex 4 – Information sources for the in-depth analysis
HELCOM Map and Data Service

17/02/2011 Beginning of in-depth analysis from results of the overview assessment.
18/02/2011 Email to Manuel Frias and Minna Pyhala (not reply).
28/02/2011 Email to joni.kaitaranta@helcom.fi and minna.pyhala@helcom.fi.
28/02/2011 Email from Joni Kaitaranta, data administrator in HELCOM and also in charge of updating and development of the map service. Data requests can be diverted to him.
08/03/2011 Mail to Joni Kaitaranta asking for further information and phone / skype interview arrangement.
08/03/2011 Additional information and documentation received via email by Joni Kaitaranta. Availability on 15 or 16 March for skype interview.
16/03/2011 Skype conference call.

Attendants:
Thetis Marco Zanetto, Chiara Castellani;
HelCom Joni Kaitaranta (Data administrator).

Discussed issues:
- information contents and knowledge functionalities;
- development and actual management of the system;
- use and users of the system;
- experiences with the implementation;
- potentialities as DSS in ICZM dimensions.
22/03/2011 Additional information about system development and implementation received via email by Joni Kaitaranta.
01/04/2011 In-depth analysis completed; draft version sent to Joni Kaitaranta.
04/04/2011 Comments and integrations received by HelCom Secretariat.
05/05/2011 In-depth analysis completed.
Coastal Information System Oder Estuary

04/02/2011  Beginning of in-depth analysis from results of the overview assessment.

09/02/2011  Beginning of further information collection via e-mail by Gerald Schemewski
            that indicates Inga Haller and Susanne Schumacher as contact points of CIS
            management (EUCC-D).

11/02/2011  Further information requested via e-mail to Inga Haller
            (haller@eucc-d.de) and Susanne Schumacher (schumacher@eucc-d.de).

21/02/2011  Availability for a meeting requested via e-mail to Inga Haller
            (haller@eucc-d.de) and Susanne Schumacher (schumacher@eucc-d.de).

21/02/2011  Availability for face to face meeting from Nardine Stybel.

28/02/2011  Information request to Nardine Stybel via email
            (nardine.stybel@io-warnemuende.de) and proposal for skype conference to 7 March.

07/03/2011  Phone conference call (+49 381 5197279).

            Attendants:

            Thetis    Marco Zanetto, Angiola Fanelli;
            EUCC-D    Nardine Stybel,
                      EUCC-D CIS developers.

            Discussed issues:
            • ICZM related functionalities;
            • development and actual management of the system;
            • experiences with the implementation.

14/03/2011  Further information about coastal indicators, steering group, stakeholder
            involvement and implementation phase received via email by Nardine Stybel.

06/04/2011  Draft in depth analysis completed and sent to Nardine Stybel.

15/04/2011  Suggestions for improvement received from Nardine Stybel.

15/04/2011  In depth analysis completed.
<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>08/02/2011</td>
<td>Beginning of in-depth analysis from results of the overview assessment.</td>
</tr>
<tr>
<td>09/02/2011</td>
<td>Further information requested via e-mail at <a href="mailto:noordzeeloket@rws.nl">noordzeeloket@rws.nl</a>.</td>
</tr>
<tr>
<td>10/02/2011</td>
<td>Phone call with Elly Kleis (+31 70 3366600) and email at <a href="mailto:elly.kleis@rws.nl">elly.kleis@rws.nl</a> to have a direct contact with CIS managers.</td>
</tr>
<tr>
<td>14/02/2011</td>
<td>Phone call with Elly Kleis and new mail asking for CIS information contact.</td>
</tr>
<tr>
<td>14/02/2011</td>
<td>Information contacts received by Elly Kleis: 1st contact is Ad Stolk (+31703366787), 2nd contact Rob Vransen (+31703366648).</td>
</tr>
<tr>
<td>16/02/2011</td>
<td>Beginning of further information collection via email by Ad Stolk.</td>
</tr>
<tr>
<td>16/02/2011</td>
<td>Phone interview with Ad Stolk. Discussed issues: ICZM related functionalities, technologies used, updating and use of the Atlas.</td>
</tr>
<tr>
<td>14/04/2011</td>
<td>Phone call: Ad Stolk is out of office for the whole week.</td>
</tr>
<tr>
<td>14/04/2011</td>
<td>Draft analysis sent to Ad Stolk and Rob Vransen.</td>
</tr>
<tr>
<td>18/04/2011</td>
<td>In depth analysis completed.</td>
</tr>
<tr>
<td>22/04/2011</td>
<td>Comments received by Ad Stolk.</td>
</tr>
<tr>
<td>26/04/2011</td>
<td>In depth analysis completed.</td>
</tr>
</tbody>
</table>
KustAtlas – Belgian Coastal Atlas

04/02/2011 Beginning of in-depth analysis from results of the overview assessment.

09/02/2011 Beginning of further information collection via e-mail by Kathy Belpaeme:
- Information about new updated and upgraded version of the Atlas, with more interactive maps and links to sustainability indicators, to be published in May 2011.

14/02/2011 Kathy Belpaeme indicates Sofie Vanhooren as point of contact to achieve extra information requested about new features that will update and upgrade the Atlas.

23/02/2011 Beginning of further information collection via e-mail by Sofie Vanhooren (sofie.vanhooren@kustbeheer.be).

28/03/2011 Phone call with Sofie Vanhooren (+3259340166) asking for missing information about system development and management.

28/03/2011 As agreed, email to Sofie Vanhooren asking for missing information about system development and management.

01/04/2011 Further information received via email from Sofie Vanhooren about system development and management.

04/04/2011 In depth analysis completed; draft version sent to Sofie Vanhooren and Kathy Belpaeme.

06/04/2011 Comments and integrations received by Sofie Vanhooren and Kathy Belpaeme.

06/04/2011 In depth analysis completed.
MIDA – The Marine Irish Digital Atlas

08/02/2011  Beginning of in-depth analysis from results of the overview assessment.

10/02/2011  Beginning of further information collection via e-mail by Ned Dwyer (co-chair of ICAN and project manager of the MIDA, n.dwyer@ucc.ie).

21/02/2011  Phone talk with Ned Dwyer to organize meeting.

25/02/2011  Mail from Ned Dwyer.

25/02/2011  Phone talk with Ned Dwyer: meeting arranged for 11 March.

07/03/2011  Mail to Ned Dwyer with overview analysis and indication of further information needed for in-depth analysis.

11/03/2011  Meeting c/o CMRC.

Attendants:
Thetis  Marco Zanetto, Angiola Fanelli;
CMRC  Ned Dwyer.

Discussed issues:
- origin, initial aim and development of the system;
- management arrangements;
- experiences with the implementation;
- technological solutions;
- ICZM related functionalities;
- planned upgrades of the system.

01/04/2011  In depth analysis completed; draft version sent to Ned Dwyer.

07/04/2011  Comments and integrations received by Ned Dwyer.

08/04/2011  In-depth analysis completed.
Dorset Coastal Explorer

17/02/2011  Beginning of in-depth analysis from results of the overview assessment.
18/02/2011  Email to j.feaver@dorsetcc.gov.uk.
22/02/2011  Information received from James Feaver (Marine and Coastal GIS Officer): the CIS is not operational yet and has more than a year to run.
04/03/2011  Phone call trial (+441305221697).
04/03/2011  Mail to James Feaver explaining why the system could be included in the in-depth analysis even if pre-operational, asking for further information and phone interview arrangement.
10/03/2011  Phone call with James Feaver (+441305221697), remote interview agreed for 23 March.
23/03/2011  Phone interview with James Feaver.
   Discussed issues:
   • Operational systems developed by the Dorset Coast Forum;
   • State of the art of the new CIS;
   • knowledge functionalities;
   • use and users of the systems;
   • experiences with the implementation;
   • tool for ICZM policy tracking.
23/03/2011  New documentation collection by email from James Feaver.
06/04/2011  In depth analysis completed; draft version sent to James Feaver.
07/04/2011  Comments, integrations and further information received by James Feaver.
08/04/2011  In depth analysis completed.
Cork Harbour Geographic Information System

11/02/2011  Beginning of in-depth analysis from results of the overview assessment.
21/02/2011  Phone talk with Ned Dwyer to organize meeting with CIS responsible (Cathal O’Mahony, c.omahony@ucc.ie).
25/02/2011  Mail from Ned Dwyer.
25/02/2011  Phone talk with Ned Dwyer: meeting arranged for 11 March.
07/03/2011  Mail to Ned Dwyer and O’Mahony with overview analysis and indication of further information needed for in-depth analysis.
11/03/2011  Meeting c/o CMRC.

Attendants: 
Thetis Marco Zanetto, Angiola Fanelli; 
CMRC Cathal O’Mahony.

Discussed issues:
• information contents;
• actual management of the system;
• use and users of the system;
• experiences with the implementation;
• potentialities as DSS in ICZM dimensions.

24/03/2011  Email to Vicki O’Donnell (GIS officer, v.odonnell@ucc.ie) asking for specific information.
25/03/2011  Email from Vicki O’Donnell with clarifications about data licence agreements.
28/03/2011  Exhaustive CIS information content requested by phone to Cathal O’Mahony.
28/03/2011  Additional specification of CIS information content received by Vicki O’Donnell.
07/04/2011  In-depth analysis completed; draft version sent to Cathal O’Mahony and Vicki O’Donnell.
07/07/2011  Integrations received by Vicki O’Donnell.
08/04/2011  In-depth analysis completed.
**GEOIDD - Litto**

08/03/2011  Beginning of in-depth analysis from results of the overview assessment.

08/03/2011  Email to sebastien.colas@ifen.ecologie.gouv.fr (returned).

10/03/2011  Email to sebastien.colas@ifen.fr (returned).

10/03/2011  Phone call with operator of the French Environment Agency (+33 2 38797878).

10/03/2011  As agreed with operator, mail sent to cgdd-soes-orleans@developpement-durable.gouv.fr for the attention of Sébastien Colas.

15/03/2011  Phone call with operator of the French Environment Agency. Sébastien Colas will answer email today after talking with his boss.

15/03/2011  Beginning of further information collection via e-mail by Sébastien Colas (CIS manager).

15/03/2011  Email to sebastien.colas@developpement-durable.gouv.fr asking for remote interview on 24 or 25 March.

22/03/2011  Email to sebastien.colas@developpement-durable.gouv.fr asking for remote interview on 24 or 25 March and additional documentation.

24/03/2011  New documentation collection via Email by Sébastien Colas. Availability for phone talk.

14/04/2011  Phone call trial at +33238797806.

14/04/2011  Draft analysis sent to Sébastien Colas.

15/04/2011  Further information about system development and management collected via mail by Sébastien Colas.

15/04/2011  Phone call with Sébastien Colas. Discussed issues: system management and implementation.

15/04/2011  In depth analysis completed and sent to Sébastien Colas.

18/04/2011  Comments received by Sébastien Colas.

18/04/2011  In depth analysis completed.
REDIAM – Environmental Information Network of Andalusia

13/01/2011  Beginning of in-depth analysis from results of the overview assessment.
14/01/2011  Beginning of further information collection via e-mail (mainly by Jose Enrique Frieyro de Lara).
25/01/2011  Phone talk with Jose Enrique Frieyro de Lara about integration of SIGLA in REDIAM system, REDIAM actual functionalities and use, next upgrades.
31/01/2011  Meeting c/o Junta de Andalucia, Consejeria de Medio Ambiente (CMA).

Attendants:
- Thetis Marco Zanetto;
- CMA Jose Ramón Guzmán Álvarez (Belonging to “Dirección General de gestión del Medio Natural”);
- Egmasa Jose Enrique Frieyro de Lara (Technical manager of Coastal and marine subsystem of REDIAM).

Discussed issues:
- information contents;
- management arrangements;
- use and users of the system;
- technology used;
- experiences with the implementation;
- next functionalities for ICZM to be implemented in the REDIAM.

07/02/2011  Beginning of further information acquisition via e-mail (by Jose Enrique Frieyro de Lara) about CIS members and new tool for ICZM to be integrated in the REDIAM.
10/03/2011  Draft in depth analysis completed and sent to Enrique Frieyro.
10/04/2011  In depth analysis completed.
CRIGE-PACA Spatial Data Infrastructure

21/02/2011  Beginning of in-depth analysis from results of the overview assessment.
21/02/2011  Beginning of further information collection via e-mail by Corine Lochet.
22/02/2011  Email to Corine Lochet for interview arrangement.
25/02/2011  Email from Corine Lochet (meeting arrangement).
28/02/2011  Email to Corine Lochet: proposed 21, 22, 23 March for face to face interview.
02/03/2011  Further information from Corine Lochet by email. Face to face interview arranged for 21 March.
21/03/2011  Meeting c/o CRIGE.

Attendants:
Thetis       Marco Zanetto;
CMRC         Romain Buchaut, Clément Mahoudeau;
PACA Region  Corine Lochet.

Discussed issues:
• operational context: ICZM in France and in PACA region;
• experiences with the implementation;
• technological solutions;
• ICZM related functionalities;
• planned upgrades of the system.

05/04/2011  Mail to Romain Buchaut asking for additional information about the new regional geoportal.
06/04/2011  Further information received by Romain Buchaut via email.
08/04/2011  In-depth analysis completed; draft version sent to Corine Lochet, Romain Buchaut, Clément Mahoudeau.
13/04/2011  Comments and integrations received on common work between PACA region Maritime affairs office and CRIGE organization.
13/04/2011  In-depth analysis completed.
Coastal and marine information system of Emilia-Romagna Region

17/01/2011 Beginning of in-depth analysis from results of the overview assessment.

19/01/2011 Phone talk with Luisa Perini (CIS point of contact, Geological, Seismic and Soil Dept., Emilia Romagna Regional Government) about CIS actual functionalities and use.

19/01/2011 Beginning of further information collection via e-mail (by Luisa Perini).

03/02/2011 Received book “Il sistema Mare Costa dell’Emilia Romagna” from Luisa Perini.


Attendants:
- Thetis
  - Marco Zanetto,
  - Angiola Fanelli;
- SGSS
  - Luisa Perini (CIS point of contact);
  - SGSS CIS users;
  - SGSS CIS developers.

Discussed issues:
- origin and initial aim of the system;
- CIS development and management;
- actual use and users of the system;
- experiences with the implementation;
- ICZM functionalities;
- next upgrades to be implemented.

17/02/2011 Screenshots of the system received by Luisa Perini.

31/03/2011 In depth analysis completed; draft version sent to Luisa Perini.

04/04/2011 Comments and integrations received by Luisa Perini.

04/04/2011 Phone talk with Luisa Perini.

04/04/2011 In depth analysis completed.
GIS tools of the Information Service of the Venice Water Authority

21/03/2011 Beginning of in-depth analysis from result of the overview assessment.

21/03/2011 Beginning of further information collection via phone by Roberto Rosselli.

30/04/2011 Meeting c/o Information Service (SIN) of the Venice Water Authority.

Attendants:

Thetis Claudia Cerasuolo;

SIN Roberto Rosselli.

Discussed issues:

- Operational context;
- Technological characteristics;
- ICZM related functionalities;
- System development and management;
- Experience with the implementation.

07/04/2011 Meeting c/o Information Service with Claudio Buzzino for consultation of SIGLA system and CIS of the Veneto Region coast.

14/04/2011 further information received by Gianni Biotto via phone and email.

15/04/2011 In depth analysis completed; draft version sent to Roberto Rosselli.

18/04/2011 comments and integration received / draft version accepted by Roberto Rosselli.

18/04/2011 In depth analysis completed.
Annex 5 – List of identified stakeholders
<table>
<thead>
<tr>
<th>Institution</th>
<th>Name</th>
<th>E-mail</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>International level</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VASAB (Visions and Strategies around the Baltic Sea)</td>
<td>Talis Linkaits (Head of Secretariat)</td>
<td><a href="mailto:talis.linkaits@vasab.org">talis.linkaits@vasab.org</a>, <a href="mailto:info@vasab.org">info@vasab.org</a></td>
</tr>
<tr>
<td>EEAC (European Environment and Sustainable Development Advisory Councils)</td>
<td>Antonio Domingos Abreu co-chair (WG Marine and Coastal Zones)</td>
<td><a href="mailto:antoniodabreu@netmadeira.com">antoniodabreu@netmadeira.com</a></td>
</tr>
<tr>
<td></td>
<td>Marleen van Rijswijk (member of the Wadden Sea Council)</td>
<td><a href="mailto:h.vanrijswick@uu.nl">h.vanrijswick@uu.nl</a></td>
</tr>
<tr>
<td></td>
<td>Ingeborg Niestroy (EEAC Secretary General)</td>
<td><a href="mailto:Ingeborg.Niestroy@eeac-net.org">Ingeborg.Niestroy@eeac-net.org</a></td>
</tr>
<tr>
<td>Plan Bleau</td>
<td>Jean-Pierre Giraud</td>
<td><a href="mailto:jmgiraud@planbleu.org">jmgiraud@planbleu.org</a></td>
</tr>
<tr>
<td>UNEP-MAP PAP/RAC</td>
<td>Marko Prem</td>
<td><a href="mailto:marko.prem@ppa.t-com.hr">marko.prem@ppa.t-com.hr</a></td>
</tr>
<tr>
<td>UNEP-MAP MEDPOL</td>
<td>Saverio Civili</td>
<td><a href="mailto:fscivil@unepmap.gr">fscivil@unepmap.gr</a></td>
</tr>
<tr>
<td>PSBSC – Black Sea Commission</td>
<td>Mamuka Gvilava</td>
<td><a href="mailto:MGvilava@ICZM.ge">MGvilava@ICZM.ge</a></td>
</tr>
<tr>
<td></td>
<td>Ahmet Kideys</td>
<td><a href="mailto:Ahmet.Kideys@blacksea-commission.org">Ahmet.Kideys@blacksea-commission.org</a></td>
</tr>
<tr>
<td>OSPAR – Oslo and Paris Commission</td>
<td>David Johnson</td>
<td><a href="mailto:david.johnson@ospar.org">david.johnson@ospar.org</a></td>
</tr>
<tr>
<td>HELCOM – Helsinki Commission</td>
<td>Anna-Stiina Heiskanen</td>
<td><a href="mailto:anna-stiina.heiskanen@ympariso.fi">anna-stiina.heiskanen@ympariso.fi</a></td>
</tr>
<tr>
<td>UNESCO IOC (ICAM Programme)</td>
<td>Julien Barbiere</td>
<td><a href="mailto:j.barbiere@unesco.org">j.barbiere@unesco.org</a></td>
</tr>
<tr>
<td>EEA</td>
<td>Andrus Meiner</td>
<td><a href="mailto:andrus.meiner@eea.eu.int">andrus.meiner@eea.eu.int</a></td>
</tr>
<tr>
<td>ETC-SIA</td>
<td>Alejandro Campos</td>
<td><a href="mailto:aiglesias.rediam@gmail.com">aiglesias.rediam@gmail.com</a>, <a href="mailto:aiglesias@egmasa.es">aiglesias@egmasa.es</a></td>
</tr>
<tr>
<td>ETC CCA</td>
<td>Sergio Castellari</td>
<td><a href="mailto:castellari@bo.ingv.it">castellari@bo.ingv.it</a></td>
</tr>
<tr>
<td>ETC ICM</td>
<td>Giovanni Coppini</td>
<td><a href="mailto:coppini@bo.ingv.it">coppini@bo.ingv.it</a></td>
</tr>
<tr>
<td><strong>European Commission</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC DG CLIMA</td>
<td>Meropi Paneli</td>
<td><a href="mailto:Meropi.PANELI@ec.europa.eu">Meropi.PANELI@ec.europa.eu</a></td>
</tr>
<tr>
<td>EC DG DEVCO</td>
<td>Alessandra Sensi</td>
<td><a href="mailto:Alessandra.SENSI@ec.europa.eu">Alessandra.SENSI@ec.europa.eu</a></td>
</tr>
<tr>
<td>EC DG ENER</td>
<td>Andrea Hercsuth</td>
<td><a href="mailto:Andrea.HERCSUTH@ec.europa.eu">Andrea.HERCSUTH@ec.europa.eu</a></td>
</tr>
<tr>
<td></td>
<td>Maria-Daria Taurisano</td>
<td><a href="mailto:Maria-Daria.TAURISANO@ec.europa.eu">Maria-Daria.TAURISANO@ec.europa.eu</a></td>
</tr>
<tr>
<td>EC DG ENV</td>
<td>Hugo De-Groof</td>
<td><a href="mailto:Hugo.De-Groof@ec.europa.eu">Hugo.De-Groof@ec.europa.eu</a></td>
</tr>
<tr>
<td></td>
<td>Jacques Delsalle</td>
<td><a href="mailto:Jacques.Delsalle@ec.europa.eu">Jacques.Delsalle@ec.europa.eu</a></td>
</tr>
<tr>
<td>Institution</td>
<td>Name</td>
<td>E-mail</td>
</tr>
<tr>
<td>-------------------</td>
<td>-------------------------------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>EC DG ENTR</td>
<td>Karen Fabbri</td>
<td><a href="mailto:Karen.Fabbri@ec.europa.eu">Karen.Fabbri@ec.europa.eu</a></td>
</tr>
<tr>
<td></td>
<td>Arno Kaschl</td>
<td><a href="mailto:Arno.KASCHL@ec.europa.eu">Arno.KASCHL@ec.europa.eu</a></td>
</tr>
<tr>
<td></td>
<td>Karin Zaunberger</td>
<td><a href="mailto:Karin.Zaunberger@ec.europa.eu">Karin.Zaunberger@ec.europa.eu</a></td>
</tr>
<tr>
<td></td>
<td>Alan Vella</td>
<td><a href="mailto:Alan.VELLA@ec.europa.eu">Alan.VELLA@ec.europa.eu</a></td>
</tr>
<tr>
<td></td>
<td>Michel Massart</td>
<td><a href="mailto:Michel.MASSART@ec.europa.eu">Michel.MASSART@ec.europa.eu</a></td>
</tr>
<tr>
<td></td>
<td>Herve Jean</td>
<td><a href="mailto:Herve.JEANJEAN@ec.europa.eu">Herve.JEANJEAN@ec.europa.eu</a></td>
</tr>
<tr>
<td></td>
<td>Katarzyna Kuske</td>
<td><a href="mailto:Katarzyna.KUSKE@ec.europa.eu">Katarzyna.KUSKE@ec.europa.eu</a></td>
</tr>
<tr>
<td></td>
<td>Patrick.O’Riordan</td>
<td>Patrick.O’<a href="mailto:Riordan@ec.europa.eu">Riordan@ec.europa.eu</a></td>
</tr>
<tr>
<td>EC DG MARE</td>
<td>Ian Shepherd</td>
<td><a href="mailto:iain.SHEPHERD@ec.europa.eu">iain.SHEPHERD@ec.europa.eu</a></td>
</tr>
<tr>
<td></td>
<td>Staffan Ekwall</td>
<td><a href="mailto:Staffan.Ekwall@ec.europa.eu">Staffan.Ekwall@ec.europa.eu</a></td>
</tr>
<tr>
<td></td>
<td>Hermina Busschbach</td>
<td><a href="mailto:Hermina.BUSSCHBACH@ec.europa.eu">Hermina.BUSSCHBACH@ec.europa.eu</a></td>
</tr>
<tr>
<td></td>
<td>Anne France Woestyn</td>
<td><a href="mailto:Anne-France.WOESTYN@ec.europa.eu">Anne-France.WOESTYN@ec.europa.eu</a></td>
</tr>
<tr>
<td>ED DG MOVE</td>
<td>Josep Casanovas</td>
<td><a href="mailto:Josep.CASANOVAS@ec.europa.eu">Josep.CASANOVAS@ec.europa.eu</a></td>
</tr>
<tr>
<td></td>
<td>Jose Fernandez Garcia</td>
<td><a href="mailto:Jose.FERNANDEZ-GARCIA@ec.europa.eu">Jose.FERNANDEZ-GARCIA@ec.europa.eu</a></td>
</tr>
<tr>
<td>EC DG REGIO</td>
<td>Michael Latsch</td>
<td><a href="mailto:Michael.LATSCH@ec.europa.eu">Michael.LATSCH@ec.europa.eu</a></td>
</tr>
<tr>
<td>EC DG RTD</td>
<td>Nicoleta Ariana Nastaseanu</td>
<td><a href="mailto:Nicoleta.Ariana.NASTASEANU@ec.europa.eu">Nicoleta.Ariana.NASTASEANU@ec.europa.eu</a></td>
</tr>
<tr>
<td></td>
<td>Waddah Saa</td>
<td><a href="mailto:Waddah.Saab@ec.europa.eu">Waddah.Saab@ec.europa.eu</a></td>
</tr>
<tr>
<td></td>
<td>Wolfram Schrimpf</td>
<td><a href="mailto:Wolfram.SCHRIMPF@ec.europa.eu">Wolfram.SCHRIMPF@ec.europa.eu</a></td>
</tr>
<tr>
<td></td>
<td>George-Eugeniu Predoiu</td>
<td><a href="mailto:George-Eugeniu.PREDOIU@ec.europa.eu">George-Eugeniu.PREDOIU@ec.europa.eu</a></td>
</tr>
<tr>
<td>JRC-ISPRA</td>
<td>Carlo Lavalle</td>
<td><a href="mailto:Carlo.LAVALLE@ec.europa.eu">Carlo.LAVALLE@ec.europa.eu</a></td>
</tr>
<tr>
<td></td>
<td>Vittorio Barale</td>
<td><a href="mailto:vittorio.barale@jrc.ec.europa.eu">vittorio.barale@jrc.ec.europa.eu</a></td>
</tr>
<tr>
<td>National level</td>
<td>Joanna Constantinidou</td>
<td><a href="mailto:jconstantinidou@environment.moa.gov.cy">jconstantinidou@environment.moa.gov.cy</a></td>
</tr>
<tr>
<td>Ministry of the Environment (Cyprus)</td>
<td>Joanna Constantinidou</td>
<td><a href="mailto:jconstantinidou@environment.moa.gov.cy">jconstantinidou@environment.moa.gov.cy</a></td>
</tr>
<tr>
<td>Federal Environment Agency, UBA (Germany)</td>
<td>Wulf Huelsmann</td>
<td><a href="mailto:wulf.huelsmann@uba.de">wulf.huelsmann@uba.de</a></td>
</tr>
<tr>
<td>National spatial planning agency (Denmark)</td>
<td>Helle Fischer</td>
<td><a href="mailto:hfi@nst.dk">hfi@nst.dk</a></td>
</tr>
<tr>
<td>Ministry of the Environment (Estonia)</td>
<td>Silver Vahtra</td>
<td><a href="mailto:silver.vahtra@envir.ee">silver.vahtra@envir.ee</a></td>
</tr>
<tr>
<td>Institution</td>
<td>Name</td>
<td>E-mail</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------</td>
<td>-------------------------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>Ministry for the Environment, Physical Planning and Public Works (Greece)</td>
<td>Athina Mourmouri</td>
<td><a href="mailto:a.mourmouri@dopk.minenv.gr">a.mourmouri@dopk.minenv.gr</a></td>
</tr>
<tr>
<td>General Directorate for Sustainability of the Coast - Ministerio Medio Ambiente (Spain)</td>
<td>Carlos Martínez Peña</td>
<td><a href="mailto:CPena@mma.es">CPena@mma.es</a></td>
</tr>
<tr>
<td>Ministry of the Environment (Finland)</td>
<td>Tiina Tihlman</td>
<td><a href="mailto:tiina.tihlman@ymparisto.fi">tiina.tihlman@ymparisto.fi</a></td>
</tr>
<tr>
<td>Délégation interministérielle à l'Aménagement et à la compétitivité des territoires – DIACT (France)</td>
<td>Xavier Chauvin</td>
<td><a href="mailto:xavier.chauvin@diact.gouv.fr">xavier.chauvin@diact.gouv.fr</a></td>
</tr>
<tr>
<td>Ministry of Ecology, Sustainable Development, transports and housing General Planning, Housing and Nature Directorate (DGALN) (France)</td>
<td>Xavier Fouquart</td>
<td><a href="mailto:Xavier.Fouquart@developpement-durable.gouv.fr">Xavier.Fouquart@developpement-durable.gouv.fr</a></td>
</tr>
<tr>
<td>Ministry of the Environment, Land and Sea (Italy)</td>
<td>Daniela Addis</td>
<td><a href="mailto:addis.daniela@minambiente.it">addis.daniela@minambiente.it</a></td>
</tr>
<tr>
<td>Ministry of Regional Development and Local Governments, Spatial Planning Department (Latvia)</td>
<td>Dace Granta</td>
<td><a href="mailto:dace.granta@varam.gov.lv">dace.granta@varam.gov.lv</a></td>
</tr>
<tr>
<td>Environment and Planning Authority MEPA (Malta)</td>
<td>Christina Mallia</td>
<td><a href="mailto:christina.mallia@mepa.org.mt">christina.mallia@mepa.org.mt</a></td>
</tr>
<tr>
<td>Ministry of Environment and Infrastructure (The Netherlands)</td>
<td>Joop Bakker</td>
<td><a href="mailto:joop.bakker@rws.nl">joop.bakker@rws.nl</a></td>
</tr>
<tr>
<td>Ministry of Environment and Infrastructure (The Netherlands)</td>
<td>Wim De Vries</td>
<td><a href="mailto:Wim.de.Vries@minvenw.nl">Wim.de.Vries@minvenw.nl</a></td>
</tr>
<tr>
<td>Maritime Office Gydnia (Poland)</td>
<td>Andrzej Cieslak</td>
<td><a href="mailto:cieslak@umgdy.gov.pl">cieslak@umgdy.gov.pl</a></td>
</tr>
<tr>
<td>Ministry of Infrastructure (Poland)</td>
<td>Krzywda Katarzyna</td>
<td><a href="mailto:kkrzywda@mi.gov.pl">kkrzywda@mi.gov.pl</a></td>
</tr>
<tr>
<td>National Water Agency (Portugal)</td>
<td>Maria Margarida Almodovar</td>
<td><a href="mailto:margarida@inag.pt">margarida@inag.pt</a></td>
</tr>
<tr>
<td></td>
<td>Lisa Sousa Pinto</td>
<td><a href="mailto:dulce@inag.pt">dulce@inag.pt</a></td>
</tr>
<tr>
<td>Institution</td>
<td>Name</td>
<td>E-mail</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>------------------------------------------------</td>
<td>-----------------------------------------------------</td>
</tr>
<tr>
<td>Ministry of Environment and Sustainable Development (Romania)</td>
<td>Mihail Costache</td>
<td><a href="mailto:mihai.costache@mmediu.ro">mihai.costache@mmediu.ro</a></td>
</tr>
<tr>
<td>Ministry of the Environment and Spatial Planning (Slovenia)</td>
<td>Mitja Bricelj</td>
<td><a href="mailto:mitja.bricelj@gov.si">mitja.bricelj@gov.si</a></td>
</tr>
<tr>
<td>Ministry of Sustainable Development (Sweden)</td>
<td>Sten Jerdenius</td>
<td><a href="mailto:sten.jerdenius@environment.ministry.se">sten.jerdenius@environment.ministry.se</a></td>
</tr>
<tr>
<td>Turkey</td>
<td>Aydin Mustafa</td>
<td><a href="mailto:mustafaaydin76@yahoo.com">mustafaaydin76@yahoo.com</a></td>
</tr>
<tr>
<td>Department for Environment, Food and Rural Affairs (United Kingdom)</td>
<td>Steve Collins</td>
<td><a href="mailto:stephen.t.collins@defra.gsi.gov.uk">stephen.t.collins@defra.gsi.gov.uk</a></td>
</tr>
<tr>
<td>Lithuania</td>
<td>D. Gudaitiene Holiman</td>
<td><a href="mailto:d.gudaitiene@am.lt">d.gudaitiene@am.lt</a></td>
</tr>
<tr>
<td>Croatia</td>
<td>Sandra Troselj Stanisic</td>
<td><a href="mailto:sandra.troselj-stanisic@mzopu.hr">sandra.troselj-stanisic@mzopu.hr</a></td>
</tr>
<tr>
<td>Ireland</td>
<td>Dick McKeever</td>
<td><a href="mailto:Dick.McKeever@environ.ie">Dick.McKeever@environ.ie</a></td>
</tr>
<tr>
<td>Bulgaria</td>
<td>Krasimir Gorchev</td>
<td><a href="mailto:GorchevK@moew.government.bg">GorchevK@moew.government.bg</a></td>
</tr>
</tbody>
</table>

**Sub-national level**

<table>
<thead>
<tr>
<th>Institution</th>
<th>Name</th>
<th>E-mail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secretary General of CPRM</td>
<td>Damien Perissé</td>
<td><a href="mailto:Damien.Perisse@crpm.org">Damien.Perisse@crpm.org</a></td>
</tr>
<tr>
<td>Atlantic Arc Commission (CPRM)</td>
<td>Fabien MESCLIER</td>
<td><a href="mailto:fabien.mesclier@crpm.org">fabien.mesclier@crpm.org</a></td>
</tr>
<tr>
<td>Balkan and Black Sea Regional Commission (CPRM)</td>
<td>Nicusor Daniel Constantinescu (President)</td>
<td><a href="mailto:presedinte@cjc.ro">presedinte@cjc.ro</a></td>
</tr>
<tr>
<td>Island Commission (CPRM)</td>
<td>Jean Didier Hache</td>
<td><a href="mailto:jdh@crpm.org">jdh@crpm.org</a></td>
</tr>
<tr>
<td>Inter-Mediterranean Commission (CPRM)</td>
<td>Josefina MORENO BOLARÍN</td>
<td><a href="mailto:jmorenocim.crpm@gmail.com">jmorenocim.crpm@gmail.com</a></td>
</tr>
<tr>
<td>Baltic Sea Commission (CPRM)</td>
<td>Janne Tamminen</td>
<td><a href="mailto:janne.tamminen@uudenmaanliitto.fi">janne.tamminen@uudenmaanliitto.fi</a></td>
</tr>
<tr>
<td>North Sea Commission (CPRM)</td>
<td>Lars Haukvik (Executive Secretary)</td>
<td><a href="mailto:lars.haukvik@t-fk.no">lars.haukvik@t-fk.no</a></td>
</tr>
<tr>
<td>Conference of Atlantic Arc Cities (CAAC)</td>
<td>Tamara Guirao</td>
<td><a href="mailto:tamara.guirao@crpm.org">tamara.guirao@crpm.org</a></td>
</tr>
<tr>
<td>KIMO Local Authorities International Environmental Organisation</td>
<td>Ryan d’Arcy Metcalfe</td>
<td><a href="mailto:rydm@varde.dk">rydm@varde.dk</a></td>
</tr>
<tr>
<td>CEMR – Council of European Municipalities and Regions</td>
<td>Marie Bullet</td>
<td><a href="mailto:marie.bullet@ccre-cemr.org">marie.bullet@ccre-cemr.org</a></td>
</tr>
<tr>
<td>Institution</td>
<td>Name</td>
<td>E-mail</td>
</tr>
<tr>
<td>-------------</td>
<td>------</td>
<td>--------</td>
</tr>
<tr>
<td>Union of the Baltic Cities</td>
<td>Elija Eloranta</td>
<td><a href="mailto:eija.eloranta@ubc.net">eija.eloranta@ubc.net</a></td>
</tr>
<tr>
<td>ECTP-CEU - European Council of Spatial Planners</td>
<td>Secretariat ECTP-CEU</td>
<td><a href="mailto:secretariat@ceu-ectp.org">secretariat@ceu-ectp.org</a></td>
</tr>
<tr>
<td>Local government association (United Kingdom) – coastal issues SIC</td>
<td>Rupert Clubb (Lead Officer of the Coastal SIC)</td>
<td><a href="mailto:rupert.clubb@eastsussex.gov.uk">rupert.clubb@eastsussex.gov.uk</a></td>
</tr>
<tr>
<td></td>
<td>Roger Thomas (Chairman of the Coastal SIC)</td>
<td><a href="mailto:cllr.roger.thomas@eastsussex.gov.uk">cllr.roger.thomas@eastsussex.gov.uk</a></td>
</tr>
<tr>
<td>Aberdeenshire Council (United Kingdom)</td>
<td>Ann Bell</td>
<td><a href="mailto:ann.bell@aberdeenshire.gov.uk">ann.bell@aberdeenshire.gov.uk</a></td>
</tr>
<tr>
<td>Sefton Council (United Kingdom)</td>
<td>Andrew Hall</td>
<td><a href="mailto:andrew.hall@planning.sefton.gov.uk">andrew.hall@planning.sefton.gov.uk</a></td>
</tr>
<tr>
<td>Scarborough Borough Council (United Kingdom)</td>
<td>Kate Masser</td>
<td><a href="mailto:katherine.masser@scarborough.gov.uk">katherine.masser@scarborough.gov.uk</a></td>
</tr>
<tr>
<td>Arc Manche (United Kingdom and France)</td>
<td>Rachel Williams</td>
<td><a href="mailto:rachel.williams@brighton-hove.gov.uk">rachel.williams@brighton-hove.gov.uk</a></td>
</tr>
<tr>
<td></td>
<td>Sylvie Couratin</td>
<td><a href="mailto:s.couratin@region-bretagne.fr">s.couratin@region-bretagne.fr</a></td>
</tr>
<tr>
<td></td>
<td>David Zaoui</td>
<td><a href="mailto:david.zaoui@cr-haute-normandie.fr">david.zaoui@cr-haute-normandie.fr</a></td>
</tr>
<tr>
<td>UK Environmental Agency - Flood Risk Mapping &amp; Data Management</td>
<td>Iain Baines</td>
<td><a href="mailto:iain.baines@environment-agency.gov.uk">iain.baines@environment-agency.gov.uk</a></td>
</tr>
<tr>
<td>Region PACA (France)</td>
<td>Corine Lochet</td>
<td><a href="mailto:clochet@regionpaca.fr">clochet@regionpaca.fr</a></td>
</tr>
<tr>
<td>Département de l'Hérault (France)</td>
<td>Philippe Carbonnel</td>
<td><a href="mailto:p-carbonnel@cg34.fr">p-carbonnel@cg34.fr</a></td>
</tr>
<tr>
<td>Dublin Regional Authority (Ireland)</td>
<td>Patricia Potter</td>
<td><a href="mailto:PPotter@dra.ie">PPotter@dra.ie</a></td>
</tr>
<tr>
<td>Cork County Council (Ireland)</td>
<td>Padraig Moore</td>
<td><a href="mailto:Padraig.Moore@CorkCoCo.ie">Padraig.Moore@CorkCoCo.ie</a></td>
</tr>
<tr>
<td>Zeeland (Netherlands)</td>
<td>Martin Wiersma</td>
<td><a href="mailto:m.wiersma@zeeland.nl">m.wiersma@zeeland.nl</a></td>
</tr>
<tr>
<td>Province of Zuid-Holland (Netherlands)</td>
<td>Lenneke Joosen</td>
<td><a href="mailto:hcm.joosen@pzh.nl">hcm.joosen@pzh.nl</a></td>
</tr>
<tr>
<td>Provincie West-Vlaanderen (Belgium)</td>
<td>Leo Declercq</td>
<td><a href="mailto:leo.declercq@west-vlaanderen.be">leo.declercq@west-vlaanderen.be</a></td>
</tr>
<tr>
<td>Ministry of Agriculture, Environment and Rural area of Schleswig-Holstein, Coast Protection Unit (Germany)</td>
<td>Jacobus Hofstede</td>
<td><a href="mailto:jacobus.hofstede@mlur.landsh.de">jacobus.hofstede@mlur.landsh.de</a></td>
</tr>
<tr>
<td>Institution</td>
<td>Name</td>
<td>E-mail</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>-------------------------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>Ministry for Transport, Building and Regional Development Mecklenburg-Vorpommern (Germany)</td>
<td>Lothar Säwert</td>
<td><a href="mailto:lothar.saewert@vm.mv-regierung.de">lothar.saewert@vm.mv-regierung.de</a></td>
</tr>
<tr>
<td>Regional Directorat of Environmental Protection in Szczecin (Poland)</td>
<td>Diana Czajkowska</td>
<td><a href="mailto:dianka83@yahoo.co.uk">dianka83@yahoo.co.uk</a></td>
</tr>
<tr>
<td>Maritime Office in Szczecin (Poland)</td>
<td>Chmura Grażyna</td>
<td><a href="mailto:gchmura@ums.gov.pl">gchmura@ums.gov.pl</a></td>
</tr>
<tr>
<td>Region Skåne (Sweden)</td>
<td>Carina Johnsson Sühnel</td>
<td><a href="mailto:carina.suhnel@skane.se">carina.suhnel@skane.se</a></td>
</tr>
<tr>
<td>Region Västerbotten (Sweden)</td>
<td>Sara Rahm</td>
<td><a href="mailto:sara.rahm@regionvasterbotten.se">sara.rahm@regionvasterbotten.se</a></td>
</tr>
<tr>
<td>Region Midtjylland (Denmark)</td>
<td>Harry Jensen</td>
<td><a href="mailto:harry.jensen@rr.rm.dk">harry.jensen@rr.rm.dk</a></td>
</tr>
<tr>
<td>Region Sjælland (Denmark)</td>
<td>René Lønnee</td>
<td><a href="mailto:renelo@regionsjaelland.dk">renelo@regionsjaelland.dk</a></td>
</tr>
<tr>
<td>Association of Finnish Local and Regional Authorities (Finland)</td>
<td>Hannele Häkkinen</td>
<td><a href="mailto:hannele.hakkinen@kuntaliitto.fi">hannele.hakkinen@kuntaliitto.fi</a></td>
</tr>
<tr>
<td>Regional Council of Itä-Uusimaa (Finland)</td>
<td>Jaakko Mikkola</td>
<td><a href="mailto:jaakko.mikkola@uudenmaanliitto.fi">jaakko.mikkola@uudenmaanliitto.fi</a></td>
</tr>
<tr>
<td>Baltic Sea Region Programme, JTS (Latvia)</td>
<td>Elena Kolosova</td>
<td><a href="mailto:elena.kolosova@eu.baltic.net">elena.kolosova@eu.baltic.net</a></td>
</tr>
<tr>
<td>Hiiumaa and Saaremaa (Estonia)</td>
<td>Hannes Maasel</td>
<td><a href="mailto:hannes.maasel@mv.hiiumaa.ee">hannes.maasel@mv.hiiumaa.ee</a></td>
</tr>
<tr>
<td>City of Tallin (Estonia)</td>
<td>Otto Popel</td>
<td><a href="mailto:otto.popel@tallinnly.ee">otto.popel@tallinnly.ee</a></td>
</tr>
<tr>
<td>UBBSLA – Union of Bulgarian Black Sea Local Authorities (Bulgaria)</td>
<td>Mariana Ivanova</td>
<td><a href="mailto:mariana@ubbsla.org">mariana@ubbsla.org</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td><a href="mailto:office@ubbsla.org">office@ubbsla.org</a></td>
</tr>
<tr>
<td>Danube Delta Biosphere Reserve Administration (Romania)</td>
<td>Grigore Baboianu</td>
<td><a href="mailto:gbaboianu@dabra.ro">gbaboianu@dabra.ro</a></td>
</tr>
<tr>
<td>Cantabria Region (Spain)</td>
<td>Inma Valencia</td>
<td><a href="mailto:inma.valencia@cantabria.be">inma.valencia@cantabria.be</a></td>
</tr>
<tr>
<td>Junta de Andalucia (Spain)</td>
<td>Josè Ramon Guzman</td>
<td><a href="mailto:joser.guzman@juntadeandalucia.es">joser.guzman@juntadeandalucia.es</a></td>
</tr>
<tr>
<td>ACC1Ó - Competitiveness for Catalonia, Delegació davant la Unió Europea</td>
<td>Xavier Castillejos</td>
<td><a href="mailto:ue@acc10.com">ue@acc10.com</a></td>
</tr>
<tr>
<td>Institution</td>
<td>Name</td>
<td>E-mail</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>-------------------------------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>Algarve Basin District Administration, Coastal Department (Portugal)</td>
<td>Sebastião Braz Teixeira</td>
<td><a href="mailto:steixeira@arhalgarve.pt">steixeira@arhalgarve.pt</a></td>
</tr>
<tr>
<td>Tagus River Basin District Administration, Coastal Department (Portugal)</td>
<td>Celso Aleixo Pinto</td>
<td><a href="mailto:celsoaleixopinto@gmail.com">celsoaleixopinto@gmail.com</a></td>
</tr>
<tr>
<td>Kouklia Community Council (Cyprus)</td>
<td>Valia Miltiadous</td>
<td><a href="mailto:valiamiltiadous@hotmail.com">valiamiltiadous@hotmail.com</a></td>
</tr>
<tr>
<td>Ipiros Region (reece)</td>
<td>Yannis Houliaras</td>
<td><a href="mailto:ipiregio@otenet.gr">ipiregio@otenet.gr</a></td>
</tr>
<tr>
<td>Prefecture of Kavala - Planning Department (reece)</td>
<td>Grigoris Papadopoulos</td>
<td><a href="mailto:gpap@pref-kavala.gr">gpap@pref-kavala.gr</a></td>
</tr>
<tr>
<td>Regione Emilia-Romagna (Italy)</td>
<td>Katia Raffaelli</td>
<td><a href="mailto:KRaffaelli@regione.emilia-romagna.it">KRaffaelli@regione.emilia-romagna.it</a></td>
</tr>
<tr>
<td>Regione Lazio (Italy)</td>
<td>Paolo Lupino</td>
<td><a href="mailto:paololupino@beachmed.eu">paololupino@beachmed.eu</a></td>
</tr>
<tr>
<td>Regione Liguria (Italy)</td>
<td>Stefano Coppo</td>
<td><a href="mailto:stefano.coppo@regione.liguria.it">stefano.coppo@regione.liguria.it</a></td>
</tr>
<tr>
<td>Regione Liguria (Italy)</td>
<td>Ilaria Fasce</td>
<td><a href="mailto:ilaria.fasce@regione.liguria.it">ilaria.fasce@regione.liguria.it</a></td>
</tr>
<tr>
<td>Regione Liguria (Italy)</td>
<td>Corinna Artom</td>
<td><a href="mailto:corinna.artom@regione.liguria.it">corinna.artom@regione.liguria.it</a></td>
</tr>
<tr>
<td>Agenzia della Conservatoria delle Coste Regione Sardegna (Italy)</td>
<td>Alessio Satta</td>
<td><a href="mailto:alesatta@regione.sardegna.it">alesatta@regione.sardegna.it</a></td>
</tr>
<tr>
<td>Regional Development Centre Koper (Slovenia)</td>
<td>Giuliano Nemarnik</td>
<td><a href="mailto:guiliano.nemarnik@rrc-kp.si">guiliano.nemarnik@rrc-kp.si</a></td>
</tr>
<tr>
<td></td>
<td>Tamara Ristic</td>
<td><a href="mailto:tamara.ristic@rrc-kp.si">tamara.ristic@rrc-kp.si</a></td>
</tr>
</tbody>
</table>

**Economic sector**

<table>
<thead>
<tr>
<th>Institution</th>
<th>Name</th>
<th>E-mail</th>
</tr>
</thead>
<tbody>
<tr>
<td>European Network of Maritime Clusters - ENMC</td>
<td>Niko Wijnolst (Chairman)</td>
<td><a href="mailto:info@dutch-maritime-network.nl">info@dutch-maritime-network.nl</a></td>
</tr>
<tr>
<td>IVEAEMPA and the Cluster of the Balearics Island (ENMC – European Network of Maritime Clusters partner)</td>
<td>Iolanda Piedra</td>
<td><a href="mailto:iolanda@empaweb.com">iolanda@empaweb.com</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td><a href="mailto:federacion@iveaempa.org">federacion@iveaempa.org</a></td>
</tr>
<tr>
<td>MIF – Marine Industry Forum</td>
<td>Paris Sansoglu (Environmental issues WG)</td>
<td><a href="mailto:paris.sansoglu@euda.be">paris.sansoglu@euda.be</a></td>
</tr>
<tr>
<td>European Union of Tourist Officers</td>
<td>Liz Buchanan</td>
<td><a href="mailto:Liz.Buchanan@visitscotland.com">Liz.Buchanan@visitscotland.com</a></td>
</tr>
<tr>
<td>Institution</td>
<td>Name</td>
<td>E-mail</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>-------------------------------------------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>Europeche - Association of National Organisations of Fishery Enterprises in the European Union</td>
<td>Javier Garat Perez (President)</td>
<td><a href="mailto:javiergarat@cepesca.es">javiergarat@cepesca.es</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td><a href="mailto:europeche@europeche.org">europeche@europeche.org</a></td>
</tr>
<tr>
<td>European Association of Fish Producers Organisations</td>
<td>Jacques Pichon (Secretary)</td>
<td><a href="mailto:info@eapo.com">info@eapo.com</a></td>
</tr>
<tr>
<td>EAFPA - European Association of Fishing Ports and Auctions</td>
<td>Pim Visser (President)</td>
<td><a href="mailto:president@eafpa.org">president@eafpa.org</a></td>
</tr>
<tr>
<td>FEAP - Federation of European Aquaculture Producers</td>
<td>Jean-Yves Collette (Environmental Commission)</td>
<td><a href="mailto:secretariat@feap.info">secretariat@feap.info</a></td>
</tr>
<tr>
<td>ESPO- European Sea Ports Organisation</td>
<td>Antonis Michail</td>
<td><a href="mailto:Michail.antonis@espo.be">Michail.antonis@espo.be</a></td>
</tr>
<tr>
<td>FEPORT - Federation of European Private Port Operators</td>
<td>Diego Teurelincx (Secretary General)</td>
<td><a href="mailto:diego.teurelincx@feport.be">diego.teurelincx@feport.be</a></td>
</tr>
<tr>
<td>PIANC – World Association for Waterborne Transport Infrastructure</td>
<td>Harald Köthe (Chairman of the Environmental Commission)</td>
<td><a href="mailto:harald.koethe@bmvbs.bund.de">harald.koethe@bmvbs.bund.de</a></td>
</tr>
<tr>
<td>CESA – Community of European Shipyards Associations</td>
<td>Lanfranco Benedetti (Technical Director)</td>
<td><a href="mailto:lb@cesa.eu">lb@cesa.eu</a></td>
</tr>
<tr>
<td>IACS – International Association of Classification Societies Ltd.</td>
<td>Derek Hodgson (Permanent Secretary) and Colin Wright (Principal Technical Officer)</td>
<td><a href="mailto:permsec@iacs.org.uk">permsec@iacs.org.uk</a></td>
</tr>
<tr>
<td>ECSA European Community Shipowner’s Associations</td>
<td>Alfons Guinier (Secretary General)</td>
<td><a href="mailto:guinier@ecsa.eu">guinier@ecsa.eu</a></td>
</tr>
<tr>
<td>EuDA – European Dredging Association</td>
<td>Eugen Jansen (Chairman of the Environmental Committee)</td>
<td><a href="mailto:info@euda.be">info@euda.be</a></td>
</tr>
<tr>
<td>OGP – International Association of Oil &amp; Gas Producers</td>
<td>Annabel Holroyd (EU Affairs Manager)</td>
<td><a href="mailto:annabel.holroyd@ogp.be">annabel.holroyd@ogp.be</a></td>
</tr>
<tr>
<td>EU-OEA European Ocean Energy Association</td>
<td>Alla Weinstein (President)</td>
<td><a href="mailto:aweinstein@eu-oea.com">aweinstein@eu-oea.com</a></td>
</tr>
<tr>
<td>ECMAR – European Council for Maritime Applied R&amp;D</td>
<td>Graham Clarke (Director)</td>
<td><a href="mailto:graham.clarke@ecmar.eu">graham.clarke@ecmar.eu</a></td>
</tr>
<tr>
<td>Institution</td>
<td>Name</td>
<td>E-mail</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>----------------------------------------------------------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>EWEA – European Wind Energy Association</td>
<td>Elke Zander (Communication Department)</td>
<td><a href="mailto:ez@ewea.org">ez@ewea.org</a></td>
</tr>
<tr>
<td><strong>Experts</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Universitat Autonoma de Barcelona</td>
<td>Françoise Breton</td>
<td><a href="mailto:Francoise.breton@uab.es">Francoise.breton@uab.es</a></td>
</tr>
<tr>
<td>Plan4All (Inspire project)</td>
<td>François Salgé (Ministry of Ecology, Sustainable Development, transports and housing from France)</td>
<td><a href="mailto:francois.salge@developpement-durable.gouv.fr">francois.salge@developpement-durable.gouv.fr</a></td>
</tr>
<tr>
<td>Universidad de Sevilla</td>
<td>José Ojeda Zujiar</td>
<td><a href="mailto:zujar@us.es">zujar@us.es</a></td>
</tr>
<tr>
<td>University College Cork</td>
<td>Jeremy Gault</td>
<td><a href="mailto:J.Gault@ucc.ie">J.Gault@ucc.ie</a></td>
</tr>
<tr>
<td>Université de Nice-Sophia Antipolis</td>
<td>Samuel Robert</td>
<td><a href="mailto:srobert@unice.fr">srobert@unice.fr</a></td>
</tr>
<tr>
<td>Universidad de Cantabria</td>
<td>Raúl Medina Santamaria</td>
<td><a href="mailto:medinar@unican.es">medinar@unican.es</a></td>
</tr>
<tr>
<td>ICZM Expert – PAP/RAC consultant</td>
<td>Brian Shipman</td>
<td><a href="mailto:brian.shipman@ppa.t-com.hr">brian.shipman@ppa.t-com.hr</a></td>
</tr>
<tr>
<td>Universidad Pablo de Olavide</td>
<td>Gonzalo Malvarez</td>
<td><a href="mailto:gcmalgar@upo.es">gcmalgar@upo.es</a></td>
</tr>
<tr>
<td>MARIS - Marine Information Services</td>
<td>Dick Schaap</td>
<td><a href="mailto:dick@maris.nl">dick@maris.nl</a></td>
</tr>
<tr>
<td>Cardiff University</td>
<td>Tim Stojanovic</td>
<td><a href="mailto:timothy.stojanovic@st-andrews.ac.uk">timothy.stojanovic@st-andrews.ac.uk</a></td>
</tr>
<tr>
<td>Aberdeen University</td>
<td>David Green</td>
<td><a href="mailto:d.r.green@abdn.ac.uk">d.r.green@abdn.ac.uk</a></td>
</tr>
<tr>
<td>Hellenic Network on Coastal Research</td>
<td>Andreas Papatsiotosos</td>
<td><a href="mailto:papatsi@civil.auth.gr">papatsi@civil.auth.gr</a></td>
</tr>
<tr>
<td>VLIZ - Vlaams Instituut voor de zee</td>
<td>Simon Claus</td>
<td><a href="mailto:simon.claus@vliz.be">simon.claus@vliz.be</a></td>
</tr>
<tr>
<td>Wageningen University</td>
<td>Pier Vellinga</td>
<td><a href="mailto:pier.vellinga@wur.nl">pier.vellinga@wur.nl</a></td>
</tr>
<tr>
<td>Istituto Nazionale di Geofisica e Vulcanologia (I.N.G.V.)</td>
<td>Simona Simoncelli</td>
<td><a href="mailto:simona.simoncelli@bo.ingv.it">simona.simoncelli@bo.ingv.it</a></td>
</tr>
<tr>
<td>Istituto Nazionale di Geofisica e Vulcanologia (I.N.G.V.)</td>
<td>Antonio Guarneri</td>
<td><a href="mailto:guarnieri@bo.ingv.it">guarnieri@bo.ingv.it</a></td>
</tr>
<tr>
<td>ICES – International Council for the Exploration of the Sea</td>
<td>Andreas Kannen (chair of ICES ICZM working group)</td>
<td><a href="mailto:Andreas.Kannen@gkss.de">Andreas.Kannen@gkss.de</a></td>
</tr>
<tr>
<td>CNR – ISMAR</td>
<td>Fabio Trincardi</td>
<td><a href="mailto:fabio.trincardi@ismar.cnr.it">fabio.trincardi@ismar.cnr.it</a></td>
</tr>
<tr>
<td>Institution</td>
<td>Name</td>
<td>E-mail</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------</td>
<td>-------------------------------------------</td>
<td>-----------------------------------------</td>
</tr>
<tr>
<td>Bulgarian Academy of Sciences - Institute of Water Problems</td>
<td>Emil Bourmaski</td>
<td><a href="mailto:bourmaski@aim.com">bourmaski@aim.com</a></td>
</tr>
<tr>
<td>IFREMER</td>
<td>Yves Henocque</td>
<td><a href="mailto:Yves.Henocque@ifremer.fr">Yves.Henocque@ifremer.fr</a></td>
</tr>
<tr>
<td>University of Brest</td>
<td>Denis Bailly</td>
<td><a href="mailto:Denis.Bailly@univ-brest.fr">Denis.Bailly@univ-brest.fr</a></td>
</tr>
<tr>
<td>University College Cork</td>
<td>Ned Dwyer</td>
<td><a href="mailto:n.dwyer@ucc.ie">n.dwyer@ucc.ie</a></td>
</tr>
<tr>
<td>New University Lisbon</td>
<td>José Carlos Ferreira</td>
<td><a href="mailto:jcrf@fct.unl.pt">jcrf@fct.unl.pt</a></td>
</tr>
<tr>
<td>University of Szczecin</td>
<td>Kazimierz Furmanczyk</td>
<td><a href="mailto:kaz@univ.szczecin.pl">kaz@univ.szczecin.pl</a></td>
</tr>
<tr>
<td>Tour du Valat</td>
<td>Lisa Ernoul</td>
<td><a href="mailto:ernoul@tourduvalat.org">ernoul@tourduvalat.org</a></td>
</tr>
<tr>
<td>IDDRI – Institut du développement durable et des relations internationales</td>
<td>Julien Rochette</td>
<td><a href="mailto:julien.rochette@sciences-po.fr">julien.rochette@sciences-po.fr</a></td>
</tr>
<tr>
<td>HCMR – Hellenic Centre for Marine Research</td>
<td>Panayotis Panayotidis</td>
<td><a href="mailto:ppanag@ath.hcmr.gr">ppanag@ath.hcmr.gr</a></td>
</tr>
<tr>
<td>Civil society</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WWF</td>
<td>Gemma Parkes</td>
<td><a href="mailto:gparkes@wwfmedpo.org">gparkes@wwfmedpo.org</a></td>
</tr>
<tr>
<td>North Yorkshire and Cleveland Coastal Forum</td>
<td>Robin Siddle</td>
<td><a href="mailto:robin.siddle@scarborough.gov.uk">robin.siddle@scarborough.gov.uk</a></td>
</tr>
<tr>
<td>AKTI (Part of the Cyprus Environmental Stakeholder Forum, Sustainable Coastal Development Group)</td>
<td>Xenia I. Loizidou</td>
<td><a href="mailto:xenia@isotech.com.cy">xenia@isotech.com.cy</a></td>
</tr>
<tr>
<td>Seas at Risk</td>
<td>Monica Verbeek (Executive Director)</td>
<td><a href="mailto:mverbeek@seas-at-risk.org">mverbeek@seas-at-risk.org</a></td>
</tr>
<tr>
<td>Surfrider Foundation Europe</td>
<td>Cendrine Templier (Environment &amp; Local Actions Manager)</td>
<td><a href="mailto:ctemplier@surfrider.eu">ctemplier@surfrider.eu</a></td>
</tr>
<tr>
<td>Greenpeace</td>
<td>Saskia Richartz (Ocean and fishery)</td>
<td><a href="mailto:saskia.richartz@djala.greenpeace.org">saskia.richartz@djala.greenpeace.org</a></td>
</tr>
<tr>
<td>IUCN – International Union for Conservation of Nature</td>
<td>Alain Jeudy</td>
<td><a href="mailto:alain.jeudy@iucn.org">alain.jeudy@iucn.org</a></td>
</tr>
<tr>
<td>European Environmental Bureau – Federation of Environmental Citizens Organisation</td>
<td>Pieter De Pous (Policy Director)</td>
<td><a href="mailto:pieter.depous@eeb.org">pieter.depous@eeb.org</a></td>
</tr>
<tr>
<td>Marine Conservation Society</td>
<td>Sam Fanshawe (Director)</td>
<td><a href="mailto:sam@mcsuk.org">sam@mcsuk.org</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td><a href="mailto:info@mcsuk.org">info@mcsuk.org</a></td>
</tr>
<tr>
<td>Institution</td>
<td>Name</td>
<td>E-mail</td>
</tr>
<tr>
<td>-------------------------------------------------</td>
<td>-----------------------------</td>
<td>---------------------------------------</td>
</tr>
<tr>
<td>De Waddenvereniging (Wadden sea society)</td>
<td>Ester Kuppen</td>
<td><a href="mailto:kuppen@waddenvereniging.nl">kuppen@waddenvereniging.nl</a></td>
</tr>
<tr>
<td></td>
<td>Paddy Walker</td>
<td><a href="mailto:walker@waddenvereniging.nl">walker@waddenvereniging.nl</a></td>
</tr>
<tr>
<td>Stichting De Noordzee (The North Sea Foundation)</td>
<td>Joop Coolen (Spatial planning)</td>
<td><a href="mailto:j.coolen@noordzee.nl">j.coolen@noordzee.nl</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td><a href="mailto:info@noordzee.nl">info@noordzee.nl</a></td>
</tr>
<tr>
<td>Sea First Foundation</td>
<td>Judith Wouters (President)</td>
<td><a href="mailto:judithwouters@seafirst.eu">judithwouters@seafirst.eu</a></td>
</tr>
<tr>
<td>Corila (Venice Platform)</td>
<td>Pierpaolo Campostrini</td>
<td><a href="mailto:campostrini@corila.it">campostrini@corila.it</a></td>
</tr>
<tr>
<td>EUCC International</td>
<td>Alan Pickaver</td>
<td><a href="mailto:pickaver@eucc.nl">pickaver@eucc.nl</a></td>
</tr>
<tr>
<td>EUCC Germany</td>
<td>Gerald Schernewski</td>
<td><a href="mailto:gerald.schernewski@io-warnemuende.de">gerald.schernewski@io-warnemuende.de</a></td>
</tr>
<tr>
<td></td>
<td>Nardine Stybel</td>
<td><a href="mailto:stybel@eucc-d.de">stybel@eucc-d.de</a></td>
</tr>
<tr>
<td>Gov2U – Government to you</td>
<td>Evika Karamagioli</td>
<td><a href="mailto:evika@gov2u.org">evika@gov2u.org</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td><a href="mailto:info@gov2u.org">info@gov2u.org</a></td>
</tr>
<tr>
<td>PoCoast</td>
<td>Francisco Taveira Pinto</td>
<td><a href="mailto:fpinto@fe.up.pt">fpinto@fe.up.pt</a></td>
</tr>
<tr>
<td>MerTerre</td>
<td>Isabelle Poitou</td>
<td><a href="mailto:isabelle.poitou@mer-terre.org">isabelle.poitou@mer-terre.org</a></td>
</tr>
<tr>
<td>MIO-ECSDE - Mediterranean Information Office for Environment, Culture and Sustainable Development</td>
<td>Iro Alampei</td>
<td><a href="mailto:alampei@mio-ecsde.org">alampei@mio-ecsde.org</a></td>
</tr>
<tr>
<td>Coalition Clean Baltic</td>
<td>Gunnar Norén</td>
<td><a href="mailto:gunnar.noren@ccb.se">gunnar.noren@ccb.se</a></td>
</tr>
<tr>
<td>Environmental Protection Club of Latvia</td>
<td>Ojars Balcers</td>
<td><a href="mailto:ojars@vak.lv">ojars@vak.lv</a></td>
</tr>
<tr>
<td>Mediterranean SOS Network</td>
<td>Natalia Roumeliotis</td>
<td><a href="mailto:coasts@medsos.gr">coasts@medsos.gr</a></td>
</tr>
<tr>
<td>MAREAMICO</td>
<td>Daniela Addis</td>
<td><a href="mailto:mareamico@mareamico.it">mareamico@mareamico.it</a></td>
</tr>
<tr>
<td>Natuurpunt</td>
<td>Bart Slabbinck</td>
<td><a href="mailto:bartslabbinck@yahoo.com">bartslabbinck@yahoo.com</a></td>
</tr>
<tr>
<td>Stichting Duinbehoud (Dune Conservation Foundation)</td>
<td>Arnoud van der Meulen</td>
<td><a href="mailto:arnoud@duinbehoud.nl">arnoud@duinbehoud.nl</a></td>
</tr>
</tbody>
</table>
Annex 6 – Workshop report
Client: European Commission – DG Environment

Subject: Option for coastal information systems

Doc. title: Workshop Report

Stakeholder Workshop - 6th May 2011, Marseille
1 Workshop objective and structure

The project “Options for coastal information systems” mainly aims to identify a set of policy requirements for coastal information systems (CIS), i.e. requisites that can be concretely implemented in order to improve the use of the same CIS in supporting the diffusion and implementation of the ICZM process at various scales (international, national, sub-national – regional and local). The project is structured in three technical tasks: (i) task 1 deals with the analysis of illustrative cases of existing coastal information systems; (ii) task 2 specifically focuses on the definition of policy requirements and their assessment in terms of expected policy impacts; (iii) task 3 deals with stakeholder involvement and participation in supporting the CIS analysis and the definition and assessment of policy requirements.

Stakeholder involvement and participation in particular included the realisation of a 1-day stakeholder workshop, held in Marseille on the 6th of May (list of workshop participant in Annex I). The workshop enabled to discuss preliminary project results and gather related stakeholder feedbacks. In particular the workshop was structured in a morning and an afternoon session (workshop agenda in Annex II). The morning session aimed to:

- Illustrate preliminary results of the project, also to support the afternoon discussion;
- Illustrate some examples of concrete uses of coastal information system in supporting the ICZM process and related future expectations and development.

The afternoon session was entirely dedicated to a guided discussion aiming to provide feedbacks and suggestions on the following main issues:

- Preliminary identified policy requirements;
- Impact assessment of preliminary identified policy requirements;
- Identification of policy options, i.e. integrated set of relevant policy requirements.

The following materials supported the workshop discussion:

- A Discussion Paper distributed to the participants before the workshop;
- Presentations given in the morning session, including in particular the specific presentation on preliminary project results (i.e. analysis of illustrative cases, policy requirements identification, policy requirement impact assessment);
- The results of a questionnaire previously distributed to the workshop participants, specifically asking their contribution to the:
  - Validation and priority definition of the preliminary identified policy requirements, described in the Discussion Paper;
  - Impact assessment of preliminary identified policy requirements, according to the methodology described in the Discussion Paper.
2 Questionnaire results

Before the workshop, a questionnaire was distributed to all participants (including invited speakers) by e-mail (see Annex III). Firstly, workshop participants were invited to evaluate the relative importance of each policy requirement with a score from 1 to 10 (where 1 stands for “not relevant at all” and 10 stands for “extremely important”). The following table summarises the results (in terms of mean score, standard deviation and ranking) of the policy requirement evaluation based on 21 filled questionnaires.

<table>
<thead>
<tr>
<th>Policy requirements</th>
<th>Mean score</th>
<th>Standard deviation</th>
<th>Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ensure data and metadata availability</td>
<td>8,5</td>
<td>2,1</td>
<td>1</td>
</tr>
<tr>
<td>Establish strict link and cooperation between the structure responsible for the CIS management and operation and the structure responsible for the implementation of the ICZM process</td>
<td>8,4</td>
<td>1,9</td>
<td>2</td>
</tr>
<tr>
<td>Address different user expectations and needs</td>
<td>8,3</td>
<td>2,2</td>
<td>3</td>
</tr>
<tr>
<td>Improve economic and in particular social and governance information within CISs</td>
<td>8,2</td>
<td>1,1</td>
<td>4</td>
</tr>
<tr>
<td>Continue and strengthen the effort in matching the INSPIRE Directive</td>
<td>8,1</td>
<td>1,1</td>
<td>5</td>
</tr>
<tr>
<td>Include end-user in the system design</td>
<td>8,1</td>
<td>2,2</td>
<td>5</td>
</tr>
<tr>
<td>Adopt an ecosystem-based approach in the definition of the CIS’s context and geographic area of application</td>
<td>7,6</td>
<td>1,1</td>
<td>7</td>
</tr>
<tr>
<td>Improve availability of information resulting from the integrated analysis of data related to different topics</td>
<td>7,6</td>
<td>0,9</td>
<td>7</td>
</tr>
<tr>
<td>Improve availability of geospatial data and CIS functions related to climate change</td>
<td>7,5</td>
<td>0,9</td>
<td>9</td>
</tr>
<tr>
<td>Improve availability of multi-time data</td>
<td>7,3</td>
<td>1,9</td>
<td>10</td>
</tr>
<tr>
<td>Improve the use of protocols facilitating geo-spatial data sharing</td>
<td>7,3</td>
<td>1,7</td>
<td>10</td>
</tr>
</tbody>
</table>
Each participant to the questionnaire selected the ten most important policy requirements according to the expressed higher rates. Afterword, each one evaluated direct impacts (using the matrix included in Annex III) of these ten identified policy requirements through the definition of qualitative scores expressed by the following possibilities: ---; --; ; 0; +; ++; ++++. It is important to stress that negative values express a negative interpretation of the expected effect (for example decrease in civil society participation in ICZM or increase in costs), whereas positive values express an expected positive impact (e.g. increase in civil society participation in ICZM or decrease in costs).

Seventeen questionnaires included the definition of qualitative scores expressing direct impacts of defined policy requirements. Results of these questionnaires are summarised in the following table. In particular this table shows the most frequent score or scores indicated for each policy requirement – direct impact combination.

<table>
<thead>
<tr>
<th>Policy requirements</th>
<th>Mean score</th>
<th>Standard deviation</th>
<th>Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improve functionalities directly supporting ICZM decision making in a short and long term perspective</td>
<td>7,3</td>
<td>1,6</td>
<td>10</td>
</tr>
<tr>
<td>Improve diffusion and innovation of e-participation tools</td>
<td>7,2</td>
<td>2,2</td>
<td>13</td>
</tr>
<tr>
<td>Participate to CIS and/or ICZM networks</td>
<td>7,1</td>
<td>1,5</td>
<td>14</td>
</tr>
<tr>
<td>Develop and implement a common ontology for coastal and marine information</td>
<td>6,8</td>
<td>2,0</td>
<td>15</td>
</tr>
<tr>
<td>Develop on-line tools to measure the real use of CIS</td>
<td>6,7</td>
<td>1,7</td>
<td>16</td>
</tr>
<tr>
<td>Integrate 3D data and develop 3D tools</td>
<td>6,1</td>
<td>2,1</td>
<td>17</td>
</tr>
<tr>
<td>Requirements for the system</td>
<td>Increase number of votes expressed in the ICZM process</td>
<td>Improving the structure of the ICZM process with the support of stakeholders</td>
<td>Supporting the implementation of ICZM in coastal areas through the integration of knowledge and information processes</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>------------------------------------------------------</td>
<td>----------------------------------------------------------</td>
<td>----------------------------------------------------------</td>
</tr>
<tr>
<td>Include end-user in the system design</td>
<td>11</td>
<td>0</td>
<td>++</td>
</tr>
<tr>
<td>Address different user expectations and needs</td>
<td>13</td>
<td>0</td>
<td>++</td>
</tr>
<tr>
<td>Adopt an ecosystem-based approach in the definition of the ICZM context and geographic area of application</td>
<td>8</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td>Continue and strengthen the effort in matching the INSPIRE Directive</td>
<td>13</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td>Improve economic and in particular social and governance information within CISs</td>
<td>15</td>
<td>+++</td>
<td>++</td>
</tr>
<tr>
<td>Improve availability of information resulting from the integrated analysis of data related to different topics</td>
<td>10</td>
<td>+++</td>
<td>++</td>
</tr>
<tr>
<td>Improve availability of multi-time data</td>
<td>12</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td>Develop and implement a common ontology for coastal and marine information</td>
<td>6</td>
<td>+++</td>
<td>++</td>
</tr>
<tr>
<td>Improve functionalities directly supporting ICZM decision making in a short and long term perspective</td>
<td>8</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td>Improve diffusion and innovation of e-participation tools</td>
<td>8</td>
<td>+++</td>
<td>+; +++</td>
</tr>
<tr>
<td>Integrate 3D data and develop 3D tools</td>
<td>5</td>
<td>++</td>
<td>0; +</td>
</tr>
<tr>
<td>Ensure data and metadata availability</td>
<td>15</td>
<td>+</td>
<td>0</td>
</tr>
<tr>
<td>Improve availability of geospatial data and CIS functions related to climate change</td>
<td>9</td>
<td>+</td>
<td>0</td>
</tr>
<tr>
<td>Establish strict link and cooperation between the structure responsible for the CIS management and operation and the structure responsible for the implementation of the ICZM process</td>
<td>11</td>
<td>0</td>
<td>++; +++</td>
</tr>
<tr>
<td>Improve the use of protocols facilitating geospatial data sharing</td>
<td>8</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Develop on-line tools to measure the real use of CIS</td>
<td>6</td>
<td>0</td>
<td>++</td>
</tr>
<tr>
<td>Participate to CIS and/or ICZM networks</td>
<td>8</td>
<td>++</td>
<td>+</td>
</tr>
</tbody>
</table>
3 Workshop main feedbacks

Main workshop feedbacks are below organised accordingly to the three key issues addressed by the discussion:

- Preliminary identified policy requirements;
- Impact assessment of preliminary identified policy requirements;
- Identification of policy options, i.e. integrated set of the most relevant identified policy requirements.

Main workshop feedbacks related to the preliminary identified policy requirements can be summarised as follows:

- Workshop participants agreed on the preliminary identified policy requirements described in the Discussion Paper. Questionnaire results enabled to relatively rank the policy requirements in terms of perceived importance (see previous chapter 2).
- Some policy requirements should be included in the “baseline scenario” to be used to relatively assess the proposed policy options. This can be defined as the scenario that does not include the implementation of new policy requirements for coastal information systems, also implying the fulfilment of already set legislative requirements in particular related to implementation of the INSPIRE Directive. In this perspective it was suggested to include in the baseline scenario the following two identified policy requirements:
  - Continue and strengthen the effort in matching the INSPIRE Directive;
  - Ensure data and metadata availability, policy requirement strictly related to the previous one.

- Workshop participants also agreed on the four categories used to organise the policy requirements: (i) scope, (ii) contents, (iii) functions, (iv) mechanisms.

Other two possible category structures were proposed. According to the first one, policy requirements can be grouped in two categories: (i) data availability, (ii) user needs. The second one proposes to organise and summarise policy requirements in the following five categories: (i) availability (including functionality), (ii) user needs, (iii) interoperability, (iv) integrated analysis, (v) ecosystem approach.

Main workshop feedbacks related to the impact assessment of preliminary identified policy requirements can be summarised as follows:

- Workshop participants agreed on the proposed direct impacts described in the Discussion Paper.
- Policy impacts assessment should be based on an integrated evaluation of expected benefits and costs. Considered direct impacts already attempt to assess both aspects; expected benefits are those related to the improvement in the CIS’s support to key ICZM issues (such as for example cooperation among different institutions and institutional levels or involvement of stakeholders in the ICZM process). The same evaluation of “cost related to the maintenance and updating of the CIS” tries to consider also
cost reduction (i.e. benefits) induced by the implementation of a specific requirement, for example in relation to data search and acquisition;

- It was suggested to include some other “costs or expected negative effects” in the list of direct impacts. Some examples can be: development cost, learning cost or difficulties related to factors external to the specific CIS context. For example the policy requirement “Adopt an ecosystem-based approach in the definition of the CIS’ context and geographic area of application” needs an important cooperation effort among different administrations that is not strictly related to the CIS development.

Main workshop feedbacks related to the policy options (integrated set of relevant policy requirements) definition can be summarised as follows:

- Baseline scenario must be better defined, in particular including those policy requirements that are related to the fulfilment of already set legislative demands, as previously argued;

- It was suggested to use all the identified policy requirements for the formulation of the policy options;

- Policy options must be clearly differentiated. In this perspective, categorizations used or proposed to group the policy requirements can support the formulation of properly differentiated policy options;

- Furthermore, it was also agreed that policy options definition could also be based on an additive criteria, i.e. the second policy option shall include (all or most) first policy option’s requirements and the third policy option shall include (all or most) first and second policy options’ requirements;

- Identified direct impacts will be also used to assess the formulated policy options that will be also evaluated in terms of indirect (or derived) impacts.
### Annex I: List of participants

<table>
<thead>
<tr>
<th>Participant</th>
<th>Institution</th>
<th>E-mail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Archias Christine</td>
<td>CRIGE PACA (France)</td>
<td><a href="mailto:christine.archias@crige-paca.org">christine.archias@crige-paca.org</a></td>
</tr>
<tr>
<td>Artom Corinna</td>
<td>Regione Liguria (Italy)</td>
<td><a href="mailto:corinna.artom@regione.liguria.it">corinna.artom@regione.liguria.it</a></td>
</tr>
<tr>
<td>Barale Vittorio</td>
<td>Joint Research Centre, European Commission</td>
<td><a href="mailto:vittorio.barale@jrc.ec.europa.eu">vittorio.barale@jrc.ec.europa.eu</a></td>
</tr>
<tr>
<td>Blanken Wim</td>
<td>Geon bv (Netherlands)</td>
<td><a href="mailto:w.blanken@geon.nl">w.blanken@geon.nl</a></td>
</tr>
<tr>
<td>Carceller Pauline</td>
<td>Provence Alpes-Côte d'Azur Region (France)</td>
<td></td>
</tr>
<tr>
<td>Cieslak Andrzej</td>
<td>Maritime Office in Gdynia (Poland)</td>
<td><a href="mailto:cieslak@umgdy.gov.pl">cieslak@umgdy.gov.pl</a></td>
</tr>
<tr>
<td>Claus Simon</td>
<td>Flanders marine institute – VLIZ (Belgium)</td>
<td><a href="mailto:simon.claus@vliz.be">simon.claus@vliz.be</a></td>
</tr>
<tr>
<td>Copitet Alenpa</td>
<td>Provence Alpes-Côte d'Azur Region (France)</td>
<td></td>
</tr>
<tr>
<td>Dal Forno Elisa</td>
<td>Commissario Delegato per l'emergenza socio-economico ambientale determinasi nella Laguna di Marano e Grado (Italy)</td>
<td><a href="mailto:e.dalforno@cldlaguna.regione.fvg.it">e.dalforno@cldlaguna.regione.fvg.it</a></td>
</tr>
<tr>
<td>Delaney Eugenia</td>
<td>Thetis S.p.A. (Italy)</td>
<td><a href="mailto:eugenia.delaney@thetis.it">eugenia.delaney@thetis.it</a></td>
</tr>
<tr>
<td>Desrentes François</td>
<td></td>
<td><a href="mailto:francois.desrentes@gmail.com">francois.desrentes@gmail.com</a></td>
</tr>
<tr>
<td>Dessy Claudia</td>
<td>Agenzia Regionale Conservatoria delle Coste – Regione Sardegna (Italy)</td>
<td><a href="mailto:pvargiu@regione.sardegna.it">pvargiu@regione.sardegna.it</a></td>
</tr>
<tr>
<td>Dwyer Ned</td>
<td>Coastal &amp; Marine Resources Centre, University College Cork (Ireland) and International Coastal Atlas Network</td>
<td><a href="mailto:n.dwyer@ucc.ie">n.dwyer@ucc.ie</a></td>
</tr>
<tr>
<td>Ernoul Lisa</td>
<td>Tour du Valat (France)</td>
<td><a href="mailto:ernoul@tourduvalat.org">ernoul@tourduvalat.org</a></td>
</tr>
<tr>
<td>Participant</td>
<td>Institution</td>
<td>E-mail</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>-------------------------------------------------</td>
</tr>
<tr>
<td>Feddema Piet</td>
<td>Interwad (Netherlands)</td>
<td><a href="mailto:feddema@waddenzee.nl">feddema@waddenzee.nl</a></td>
</tr>
<tr>
<td>Fiorito Marino</td>
<td>Datasiel – Regione Liguria (Italy)</td>
<td></td>
</tr>
<tr>
<td>Iglesias Campos Alejandro</td>
<td>Junta de Andalucía (Spain) and ETC/SIA</td>
<td><a href="mailto:aiglesias@egmasa.es">aiglesias@egmasa.es</a></td>
</tr>
<tr>
<td>Kaitaranta Joni</td>
<td>HELCOM</td>
<td><a href="mailto:joni.kaitaranta@helcom.fi">joni.kaitaranta@helcom.fi</a></td>
</tr>
<tr>
<td>Lochet Corine</td>
<td>Provence Alpes-Côte d'Azur Region (France)</td>
<td><a href="mailto:clochet@regionpaca.fr">clochet@regionpaca.fr</a></td>
</tr>
<tr>
<td>Maignan Carole</td>
<td>Thetis S.p.A. (Italy)</td>
<td><a href="mailto:carolejuliette@yahoo.it">carolejuliette@yahoo.it</a></td>
</tr>
<tr>
<td>Meiner Andrus</td>
<td>European Environmental Agency - EEA</td>
<td><a href="mailto:andrus.meiner@eea.europa.eu">andrus.meiner@eea.europa.eu</a></td>
</tr>
<tr>
<td>Meola Bruno</td>
<td>MedPAN - Network of Managers of Marine Protected Areas in the Mediterranean</td>
<td><a href="mailto:bruno.meola@medpan.org">bruno.meola@medpan.org</a></td>
</tr>
<tr>
<td>Nunes Carlos</td>
<td>Advantis Solutions (Portugal)</td>
<td><a href="mailto:joao.vila-luz@advantis.pt">joao.vila-luz@advantis.pt</a></td>
</tr>
<tr>
<td>Parera Joan</td>
<td>IVEAEMPA - Federación Nacional de Empresarios del Mar (Spain)</td>
<td><a href="mailto:federacion@iveaempa.org">federacion@iveaempa.org</a></td>
</tr>
<tr>
<td>Perisse Damien</td>
<td>Conference of Peripheral Maritime Regions of Europe (CPMR)</td>
<td><a href="mailto:damien.perisse@crpm.org">damien.perisse@crpm.org</a></td>
</tr>
<tr>
<td>Piedra Iolanda</td>
<td>IVEAEMPA - Federación Nacional de Empresarios del Mar and Maritime Cluster of Balearic Islands (Spain)</td>
<td><a href="mailto:federacion@iveaempa.org">federacion@iveaempa.org</a></td>
</tr>
<tr>
<td>Pintus Barbara</td>
<td>Agenzia Regionale Conservatoria delle Coste – Regione Sardegna (Italy)</td>
<td><a href="mailto:bpintus.coste@gmail.com">bpintus.coste@gmail.com</a></td>
</tr>
<tr>
<td>Poitou Isabelle</td>
<td>MerTerre – ODEMA (France)</td>
<td><a href="mailto:isabelle.poitou@mer-terre.org">isabelle.poitou@mer-terre.org</a></td>
</tr>
<tr>
<td>Potter Patricia</td>
<td>Dublin Regional Authority (Ireland)</td>
<td><a href="mailto:PPotter@dra.ie">PPotter@dra.ie</a></td>
</tr>
<tr>
<td>Participant</td>
<td>Institution</td>
<td>E-mail</td>
</tr>
<tr>
<td>-----------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>Prem Marko</td>
<td>UNEP-MAP PAP/RAC</td>
<td><a href="mailto:marko.prem@ppa.t-com.hr">marko.prem@ppa.t-com.hr</a></td>
</tr>
<tr>
<td>Queffelec Betty</td>
<td>Maritime Institute, Ghent University (Belgium)</td>
<td><a href="mailto:Betty.Queffelec@UGent.be">Betty.Queffelec@UGent.be</a></td>
</tr>
<tr>
<td>Santoro Francesca</td>
<td>IDEAS – Ca’ Foscari University of Venice (Italy)</td>
<td><a href="mailto:fsantoro@unive.it">fsantoro@unive.it</a></td>
</tr>
<tr>
<td>Serra i Raventós Jordi</td>
<td>EUCC-Med Center and Facultat de Geologia, Universitat de Barcelona (Spain)</td>
<td><a href="mailto:jordi.serra@ub.edu">jordi.serra@ub.edu</a></td>
</tr>
<tr>
<td>Snoeren Birgit</td>
<td>European Commission – DG Environment</td>
<td><a href="mailto:birgit.snoeren@ec.europa.eu">birgit.snoeren@ec.europa.eu</a></td>
</tr>
<tr>
<td>Suárez de Vivero Juan</td>
<td>Department Human Geography, University of Seville (Spain)</td>
<td><a href="mailto:vivero@us.es">vivero@us.es</a></td>
</tr>
<tr>
<td>Tonino Marco</td>
<td>IDEAS – Ca’ Foscari University of Venice (Italy)</td>
<td><a href="mailto:marco.tonino@unive.it">marco.tonino@unive.it</a></td>
</tr>
<tr>
<td>Vasselin Benoit</td>
<td>Provence Alpes-Côte d’Azur Region - Marine Office (France)</td>
<td><a href="mailto:bvasselin@regionpaca.fr">bvasselin@regionpaca.fr</a></td>
</tr>
<tr>
<td>Zanetto Marco</td>
<td>Thetis S.p.A. (Italy)</td>
<td><a href="mailto:marco.zanetto@thetis.it">marco.zanetto@thetis.it</a></td>
</tr>
</tbody>
</table>
Annex II: Workshop Agenda

Integrated Coastal Zone Management Workshop
Marseille, 6 May 2011

SALLE DE COMMISSION PERMANENTE
HOTEL DE LA REGION Provence -Alpes Côte d'Azur - 27 Place JULES GUESDE 13481
MARSEILLE

WORKSHOP AGENDA

Morning sessions

8.00 – 9.00  Workshop registration

Session 1 – Role of Coastal Information Systems in supporting ICZM implementation

9.00 – 9.15  Welcome to the Workshop
Mireille PEIRANO, Vice President Provence-Alpes-Côte d’Azur Region, Responsible for Sea, Fisheries and Coastal Affairs

9.15 – 9.30  State of ICZM policy at the EU level
Birgit Snoeren, European Commission, DG Environment

9.30 – 10.00 Options for coastal information system, preliminary results – key questions for the workshop
Marco Zanetto, Carole Maignan, Thetis s.p.a.

10.00 – 10.20 "Keynote"- Role of CIS in supporting ICZM: progress and challenges
Ned Dwyer, Coastal & Marine Resources Centre, University College Cork and International Coastal Atlas Network

Session 2 – Illustrative cases of Coastal Information System: Regional Sea, National and Regional/local cases (Moderator: Andrus Meiner, European Environmental Agency)

10.20 – 10.40 Role of CIS for ICZM implementation in Mediterranean Regional sea context
Marko Prem, UNEP-MAP PAP/RAC

10.40 – 11.00 Role of CIS for ICZM implementation in Baltic Regional sea context
Joni Kaitaranta, HELCOM
11.00 – 11.30 **Coffee Break**

11.30 - 11.50 **WATLAS (Wadden Sea Atlas) and North Sea Atlas**

Piet Feddema, Interwad; Wim Blanken, Geon bv

11.50 – 12.10 **CRIGE-PACA Spatial Data Infrastructure**

Corine Lochet, Christine Archi-as, Provence Alpes-Côte d'Azur Region

12.10 – 12.30 **KustAtlas of Belgium and Coastal wiki**

Simon Claus, Flanders marine institute (VLIZ)

12.30 – 12.50 **Red de Información Ambiental de Andalucía - REDIAM**

Alejandro Iglesias-Campos Jun-ta de Andalucia and ETC/SIA

12.50 - 13.00 Interim conclusions

Andrus Meiner, European Envi-ronmental Agency

13.00 – 13.20 **Questionnaire compilation**¹

13.20 – 14.20 **Lunch**

Buffet lunch offered by the Provence-Alpes-Côte d’Azur Region

---

### Afternoon session

Open discussion

14.20 – 14.50 **Objective of the afternoon sections and organisation**

Francesca Santoro, IDEAS Ca’ Foscari University

Open discussion on:

- **Policy requirements**
- **Policy options**
- **Expected impacts**

Francesca Santoro, Marco Tonino, IDEAS Ca’ Foscari University (moderators)

17.20 - 17.30 **Workshop Conclusions**

Birgit Snoeren, European Com-mission, DG Environment

---

¹ A short questionnaire was delivered to all participants, including a description of related ob-jectives and filling modalities. Twenty minutes before lunch break were dedicated to the ques-tionnaire completion. Results were analysed and used to guide the afternoon discussion.
Annex III – Questionnaire distributed to the workshop participants

EVALUATION OF DIRECT IMPACTS OF POLICY REQUIREMENTS

Dear participant, in order to concretely contribute to the results of the CIS project, you are kindly asked to fill the following matrix: the results of your contribution will be used to structure the afternoon discussion session of the workshop.

The following matrix includes 17 policy requirements (on rows) and 11 direct impacts (on columns).

A policy requirement is intended as a requisite that can be concretely implemented in a coastal information system in order to improve the use of the same CIS in supporting the diffusion and implementation of the ICZM process at various scales (international, national, sub-national – regional and local).

Impact assessment is a process that prepares evidence for political decision-makers on the advantages and disadvantages of possible policy requirements by assessing their potential impact. Direct Impacts are the initial, immediate consequences generated by a policy requirement on ICZM implementation.

Information included in the circulated Discussion Paper can support you in filling the following matrix. In particular Chapter 4 describes the identified policy requirements, while chapter 5 the impact assessment procedures also including an examples of a filled matrix.

Please proceed as follow:

1. Referring to the first column evaluate the relative importance of each policy requirement with a rate from 1 to 10 (where 1 stands for “not relevant at all”, and 10 stands for “extremely important”).

2. Select the 10 most important policy requirements according to the higher rates you addressed.

3. Evaluate the direct impacts of the 10 identified policy requirements through the definition of qualitative scores expressed by the following possibilities: ---; --; -; 0; +; ++; +++ (refer to Chapter 5 of the Discussion Paper for information and example).

Note: negative values express a negative interpretation of the expected effect (for example decrease in civil society participation in ICZM or increase in costs), whereas positive values express an expected positive impact (e.g. increase in civil society participation in ICZM or decrease in costs).

THANK YOU FOR YOUR PRECIOUS CONTRIBUTION!
| Include end-user in the system design |  |
| Address different user expectations and needs |  |
| Adopt an ecosystem-based approach in the definition of the CIS context and geographic area of application |  |
| Continue and strengthen the effort in matching the INSPIRE Directive |  |
| Improve economic and in particular social and governance information within CISs |  |
| Improve availability of information resulting from the integrated analysis of data related to different topics |  |
| Improve availability of multi-time data |  |
| Develop and implement a common ontology for coastal and marine information |  |
| Improve functionalities directly supporting ICZM decision making in a short and long-term perspective |  |
| Improve diffusion and innovation of e-participation tools |  |
| Integrate 3D data and develop 3D tools |  |
| Ensure data and metadata availability |  |
| Improve availability of geospatial data and CIS functions related to climate change |  |
| Establish strict link and cooperation between the structure responsible for the CIS management and operation and the structure responsible for the implementation of the ICZM process |  |
| Improve the use of protocols facilitating geo-spatial data sharing |  |
| Develop on-line tools to measure the real use of CIS |  |
| Participate in CIS and/or ICZM networks |  |