

ICZM-MED Subproject

Agreed actions, tools and criteria for the implementation of Mediterranean Integrated Coastal Zone Management (ICZM)



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Introduction

ICZM-Med subproject phase B has focused on identifying indicators that will characterise each site in order to facilitate the decision making process and choice of tools (for example GIS, financial interventions, etc.) when applying Integrated Coastal Zone Management (ICZM) to the pilot sites selected in Phase A. Partners have chosen indicators and tools based on their specialisations (biological or financial).

Nevertheless, partners shared some of the questionnaire related tasks in order to be familiar with users' and stakeholders' points of view on coastal management policies and the effects of erosion for every single site.

We carried out various types of activities during Phase C. FRI, ICCOPS and BRL (partners 1, 6 and 8 respectively) created GIS maps using new coastal zone management information related to the selected sites. Other information was also gathered, starting with on-site surveys of coastal management policies as

viewed by the stakeholders, carried out by FRI, DISTART, DIPTERIS, ICCOPS and UNIMOT teams (respectively partners 1, 2, 5, 6 and 7). In the summer period of July and August 2007, these same teams (FRI, DISTART, DIPTERIS, ICCOPS and UNIMOT, respectively partners 1, 2, 5, 6 and 7) questioned beach users for each of the pilot sites. On the one hand the aim was to assess what value was attached to these beaches, and on the other collect users' points of view on the types and methods of beach protection funding policies. Moreover, DISTART, Litorale SPA, DECOS and UMI partners were also looking at assessing the financial and social advantages created by the beaches. Analyses carried out by the ICCOPS team were also able to locate some critical sites and those with strong potential for sustainable development. Finally, the setting up of a control system along the coastal area was seen to be a clever move as it makes it easier to identify data which can help the authorities involved in coastal area integrated management to carry out their work.

Results: ICZM Activities and Tools

ICZM – Coastal Erosion – Perception of the Defence system (tools– questionnaires)

In order to analyse perception and levels of awareness relating to ICZM, two questionnaires were compiled and submitted to stakeholders and beach users at every pilot site, following a decision taken at the Geneva meeting (February 2007). The questionnaires centred on ICZM, coastal erosion and beach protection systems and were used by FRI, DISTART, DIPTERIS, ICCOPS and UNIMOT (partners 1, 2, 5, 6 and 7) in "one to one" interviews. The stakeholder questionnaire was submitted to key players involved in managing the coastal area between May and July 2007 (Phase B) whilst the beach users' one was used in July and August 2007 (Phase C). All the data received was processed during Phase C. A more detailed account of survey results is included in the extended Phase C report and is available at the Beachmed Operations website. The next paragraph describes the results integration process.

Coastal Operator Survey

Integration of stakeholder results

Results seem to indicate that an important increase in awareness concerning the need for Integrated Coastal Management and beach management schemes exists in Greece, Italy and France. The approach taken by stakeholders in the East Macedonia and Thrace Regions highlighted the fact that the awareness of management policies is still in the preliminary stage. Along the less developed coastal strips (like, for example, the Nestos Delta, Greece) the need for

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institutional frameworks and sustainable management policies is not high up on the agenda. Nevertheless, it should be noted that when questioned about the need for human intervention or change (new policies needed) the sites that were generally more aware were also unsure that these were in actual fact required (about 50% said yes and about the same percentage said no). This clearly illustrates of how these regions are at a crossroads, where they can choose whether to go down the development route or face the decline of their own coastal (social) system. Stakeholders in the East Macedonia and Thrace Region are optimistic. This is a scenario that is commonly seen in the early stages of tourism development. Similar answers to these, from sites that are more informed and developed (with regards to territorial planning) show that they are the ones that have greater demands and tend to be more satisfied, whilst developing sites (like the Nestos Delta, Greece) may give similar answers if the desire for change is not taken into account. In general, people expect more public action. However, a general wish for the beaches to receive more focus (as well as participating more) is clearly expressed by the demand for more cooperative policies to be devised. At sites like Tarquinia beach, the Lazio Region, the Riviera

del Beigua or the Liguria Region, people appeared sceptical that there was evidence of any effort and of results achieved (about 50% said yes and the same amount answered no). With regards to allocation of responsibilities (interventions by the authorities and/or private concerns) stakeholders in East Macedonia and Thrace Regions are once again very interested in becoming involved (despite not gaining any direct benefit) but those in saturated areas seem sceptical. This may be because they are asking public bodies to take responsibility for these problems and come up with the solutions. This would appear to be a considerable step forwards towards an executive governance system. This trend can also be seen in the answers to "According to you, which other parties (public or other) could play a role in ICZM in order to find an integrated "Solution" to the region's problems?" where stakeholders in the East Macedonia and Thrace Region express a wish for private concerns to become even more involved, and is in contrast with general feedback received from the Liguria Region concerning stakeholders' uncoordinated practices. Moreover, it is important to highlight the fact that no clear options are given by those sites that are requesting more involvement (Nestos Delta, Greece "How could this collaboration be

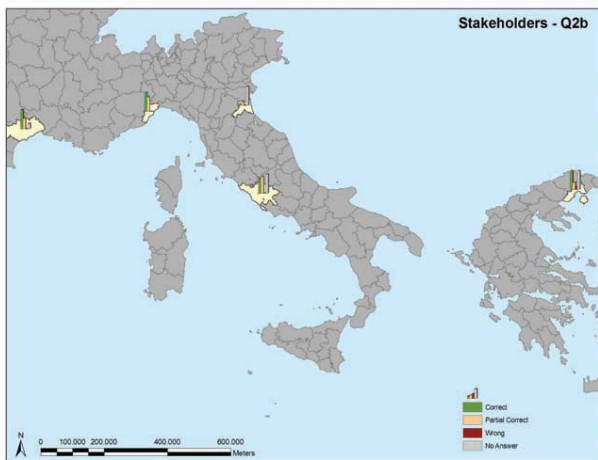


Fig. 3.2.1 - Spatial distribution of answers relating to general awareness of ICZM. Definitions of ICZM.

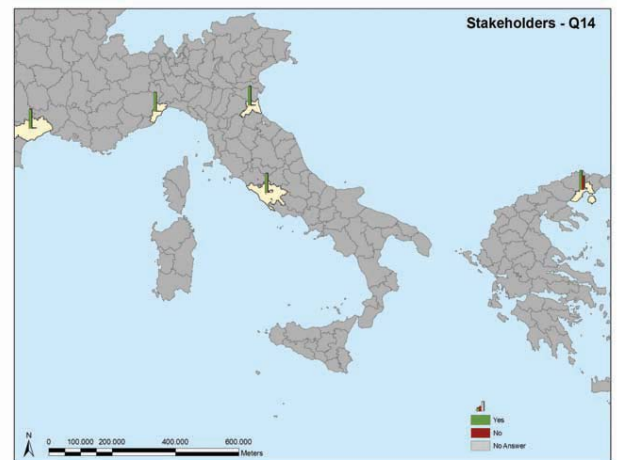


Fig. 3.2.2 - Awareness of erosion phenomenon (Question 14: Do you know if problems caused by coastal erosion exist in your region?).

improved?" and "Do you know what Coastal Erosion is?"). This shows that the experience of sites like Riviera del Beigua, Portovenere or the Liguria Region can play a key role in finding a means of implementing a totally partner based system. Coastal erosion is a well known problem throughout the world. However, it should be noted that some indicators of erosion (beaches that become reflective, or that either do not return or are slow to return to previous state following a sea storm, thickening of sediment, etc.) are often not properly identified at local level. Images of what constitutes erosion are common place but identification of erosion processes is not always easy. Stakeholders' opinions are of interest but it is warmly recommended that both stakeholder and public recommendations be guided by more informed users when the coastal strip is suffering from chronic and irreversible erosion (Figure 3.2.3). Of course, the answers to questions concerning awareness of coastal erosion issues depended quite a lot on the state of the beach for each site. Therefore, the flat coasts of the Nestos Delta (Greece), considered to be a natural site, are not considered to be heavily affected by erosion. Conversely perception in various parts of Italy (the beach

south of Riccione in the Emilia Romagna Region, Tarquinia Beach in the Lazio Region and Riviera del Beigua and Portovenere in the Liguria Region) and in France (Languedoc-Roussillon Region), has meant stakeholders are well informed and have a realistic view of the problem. However, it must be noted that stakeholders in the East Macedonia and Thrace Region are not sympathetic to or interested in these issues. Similarly, in the Lazio Region stakeholder answers to the question "Have you been informed of the state of the coastal area by authorities/organisations?" are surprising, as most of those interviewed seemed to be highly aware of erosion issues in the area.

Surprisingly, professional operators were not impressed and it is unlikely to be the result of local authorities divulging the wrong information (Figure 3.2.3).

Possible differences in the social, economic and environmental situation in the East Macedonia and Thrace Region may also affect results concerning awareness of the impact of different coastal protection measures. Answers to the simple question "Are you aware of the various coastal defence systems that your Region can adopt?" have shown that people are well informed and this was to be expected, with the exception of The East Macedonia and Thrace Regions. This may be due to a lack of involvement but is probably down to the fact that protection measures are not required as there is no coastal erosion, and that social and economic pressures on the coast (not fishing and other activities unrelated to coastal stabilisation – like urbanisation for example) are not that high. These factors suggest that the results concerning perception as a whole are difficult to compare, as the answers are implicitly affected by the level of awareness. Generally, moderate to mild protection methods are preferred (Figure 3.2.4) and it would seem that hard structures built in the past may have seriously polluted the area ("Do you know of any drawbacks to these methods?" for the Emilia Romagna Region). Pollution of coastal waters is a problem that is commonly found in artificial bays and is caused by waste or waste water being pushed along by stormy seas. It is not surprising that there is a high awareness of the consequences of beach nourishment policies on sea life as it entails the entrainment of huge amounts of sediment deposits, sometimes excessive amounts, from other areas. However, as the European Environment Agency has highlighted, a switch must be made from coastal defence and beach management to sediment management, which means managing beach nourishment and assessing surplus sediment deposits. Answers to questions about costs (and benefits) of implementing coastal protection schemes are interesting, as stakeholders' answers in the East Macedonia and Thrace Region can be interpreted to mean that stakeholders believe in the benefits brought about by

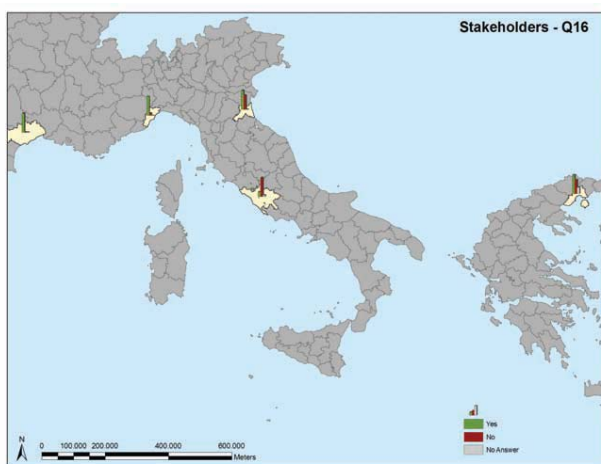


Fig. 3.2.3 - Spatial distribution of answers regarding awareness of effects (Question 16. Do you think that "coastal erosion" has consequences for business sectors for example, tourism)?

coastal protection. However in areas where considerable sums of money have been spent with limited success stakeholders appear more sceptical, such as the stakeholders in the Lazio Region.

Interviews with beach users

Integration of "beach users" results

A survey relating to beach users' preferences and opinions should provide useful information for coastal and beach management operators. However, caution is needed when interpreting these results, due to the different variables that can noticeably influence outcome, such as the time of year, proximity to a town or urban area, principal characteristics of the area in question (bathing areas or other) or the fact that territorial planning of the coastal areas cannot be judged just by any type of holiday maker (whether seasonal or owners of second homes). The survey has shown that beach users are mainly holiday makers, even if the Nests Delta site in Greece probably has (or potentially has) a larger amount of alternative users, due to its natural features and the fact that the environment is less developed.

Beach users often have the idea that coastal management is generally swayed by tourism and that the structures required are those that will improve beach facilities. Some of the suggestions are not always appropriate for those in charge of beach management. A similar scenario would be obtained if we analysed the points of view of road users who always want the shortest and quickest route. In spite of that, building a motorway through the middle of a nature park is not always the best option.

Awareness levels of Integrated Coastal Zone Management are rather poor (with exception of the beach south of Riccione in the Emilia Romagna Region) in regions where better results were expected (like the Languedoc-Roussillon Region). Taking this into consideration, as well as the answers on the definition of coastal zones (see figure 3.2.5), results show that most of the people interviewed in the Languedoc-Roussillon Region were neither local nor beach users (except for some tourists who were there to enjoy themselves for a few days). Similarly, beach users' low satisfaction levels for policies implemented by beach operators in Tarquinia, in the Lazio Region, contrasts with very satisfied users from the beach south of Riccione in Emilia Romagna. These differences

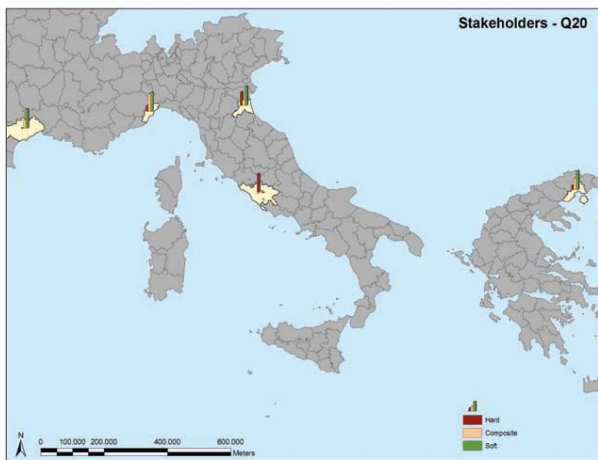


Fig. 3.2.4 - Spatial distribution of preferences for types of coastal protection. (Question 20. What type of coastal protection would you suggest?).

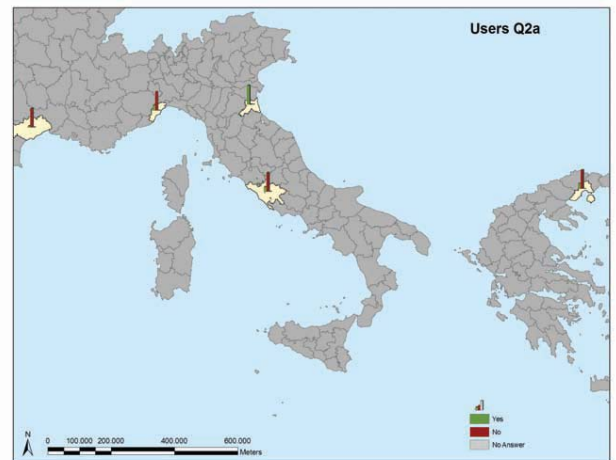


Fig. 3.2.5 - Spatial distribution of answers regarding ICZM awareness (Question 2a. Do you know what ICZM is?).

tend to show that there is a contrast in management policies adopted by the authorities that manage the sites. The level of complexity introduced by the principle of integrated management recommended by the EU in documents like the ESDP (European Spatial Development Perspective) make implementation difficult to apply if regional policies and local practices are to be co-ordinated. It is clear that, overall, stakeholders need to be organised and trained so that they can be totally involved in management policies.

As with coastal erosion, it appears that in spite of stakeholders' poor general awareness in the East Macedonia and Thrace Regions, beach users are however well aware of beach management concepts concerning their own coastline. Conversely, the answers to the question "Have you noticed any erosion issues along your region's coastline?" highlights the fact that levels of awareness are very different in the Nestos Delta, in Greece, and the Riviera del Beigua, in the Liguria Region, where users are badly informed (Figure 3.2.6). It could be argued that beach users do not know their beaches very well and that it should be the responsibility of the authorities and local operators to carry out information

campaigns to make people more aware of how to use beaches in a more responsible manner (like, for example, making fewer requests for resources).

As for policies used to fight coastal erosion or protect popular or well-known coastlines, it seems that the type of beach (natural state compared to urbanised) and the state of the beach (accretion or erosion) have a noticeable influence on answers. It would seem that protective structures are not necessary when users see no evidence of serious erosive phenomena such as in the Nestos Delta in Greece, Italy (beach south of Riccione, Emilia Romagna Region, Tarquinia beach, Lazio Region and Riviera del Beigua, Liguria Region) and France (Languedoc- Roussillon Region). Conversely users of the beach south of Riccione in Emilia Romagna are disheartened or sceptical about these schemes as 22% of interviewees chose the option "no coastal protection." It would seem logical to notice a difference in users' answers concerning the suggested choice of methods for fighting coastal erosion ("Which of the coastal defence systems suggested, do you prefer?") and this range of preferences reflects the variety of methods available. The costs of works and protection methods are seen as being too high, with some differences

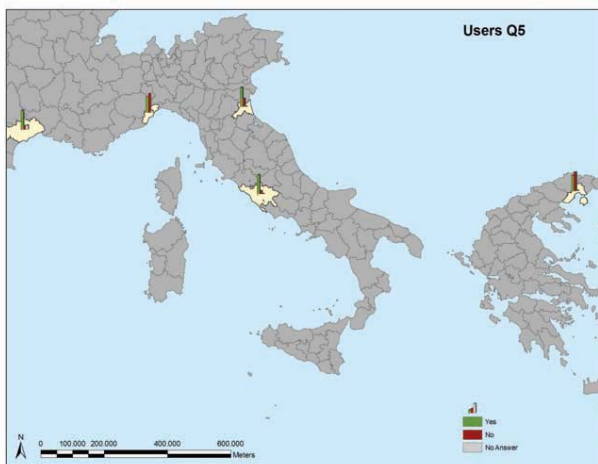


Fig. 3.2.6 - Distribution concerning awareness of problems linked to coastal erosion in the region (Have you already noticed coastal erosion problems in this region?).

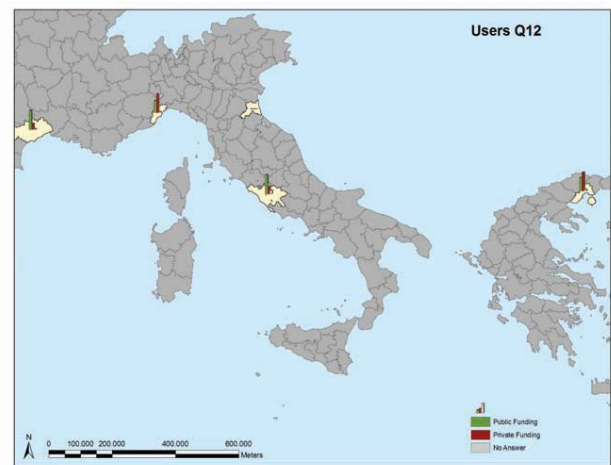


Fig. 3.2.7 - Replies relating to beach users paying towards coastal protection. (Question 12. According to you what sort of tax would beach users be prepared to pay as a contribution towards beach protection?).

between the sites. For example, at sites where the benefits of these works are visible (Tarquinia beach, Lazio Region) most of the users (80%) find these costs are justified whilst in nature conservation zones where awareness is low (Nestos Delta, Greece) the proportion of users that justify these costs is considerably lower (63%). With regards to user's willingness to pay, some of the agreements can be interpreted as recognition of beach operators' funding requirements (especially for the protection against coastal erosion). However, even though the Languedoc-Roussillon Region users seem to be realistic about what needs to be spent (more than 85% selected the box between 0.5 and 1.5 €), sites with experience in evaluating coastal management costs do not seem, in general, ready to spend any extra: More than 40% of people interviewed on the Tarquinia beach, Lazio Region and the Riviera del Beigua, Liguria Region, did not want to pay more. Strangely, however, when they were asked if they would contribute towards funding they did not refuse in any way. This contradiction could be taken as proof that the people interviewed were thinking of private organisations and not beach users, as the answers to the question "According to you what type of tax would beach users be prepared to pay to help protect the beaches?" 58% suggested private beach operators should be the ones paying. Additionally almost all or a part of the Languedoc-Roussillon beach users would prefer funding to come from public sources. In general, considerable differences can be seen between expectations and preferences regarding the funding that local operators and users need to provide.

Private stakeholder survey

Most of the Nestos Delta private stakeholders (57.1%) replied that they did know what ICZM was. In spite of this, most of those who declared they had heard of it (66.7%) defined it as only being concerned with environmental protection and only 33% were able to provide the correct definition. Moreover, most of the private stakeholders believe that all the measures taken in the ICZM field have been insufficient and 85.7% are unhappy with actions taken in their own region, both by the authorities and the private sector.

As far as coastal erosion is concerned, more than half the stakeholders interviewed (57.1%), had not noticed any problems relating to coastal erosion and most of them (71.4%), think that this does not affect their own business. It was also noted that more than half (57.1%) of stakeholders knows nothing about how to combat erosion. As regards to preferences in this field, it seems that 42.9% prefer hard parallel structures whilst each of the others methods only received a small percentage (about 14%). Moreover, none of the stakeholders

are aware of all the disadvantages and consequences linked to these different methods and think that the more than 1,000,000 €/km required, which is the financial cost of works and protection schemes, are unjustified.

Private stakeholders are unanimous, however, in assessing that protecting the beaches from erosion is a priority or important. Less than half of them (42.9%) consider that funding of beach protection works, which is currently a public concern, should remain so and that beach users should contribute to beach protection funding. Splitting the funding two ways, fifty percent public and fifty percent private, seems the best solution and would also allow beach users to be involved in management policies. 42.9% think both resident users and tourists should contribute whilst 14.3% think it should be mainly tourists and private stakeholders to bear the costs of implementing beach protection measures.

In the Emilia Romagna Region, the words "private operators" essentially means private beach operators and 28.3% of them correctly identified the coastal area, whilst 36.7% were able to explain how ICZM operates and 35.8% gave an adequate explanation of the beach erosion phenomena.

Most of the people interviewed (63.3%), were satisfied with the work carried out by the local and regional public authorities as part of coastal zone management programmes. With regards to coastal erosion, private stakeholders are fully aware of issues connected with erosion and agree that they mainly concern: disappearance of sand (56.7%), degradation of the natural habitat (36.7%) and loss of benefits for the local economy (35.8%). Half of them took into consideration effects of erosion such as sand disappearance (50.8%), whilst 30.8% also talked about deterioration of the coastal ecosystem and a very small percentage (5%), did not think there were any problems at all. Most people interviewed were familiar with protection structures (Marzetti, 2007): They mainly know about: emerged parallel breakwaters (92.5%), beach nourishment (95.8%), submerged parallel breakwaters (93.3%) and groynes (82.5%). Preferred structures are submerged parallel breakwaters (60%), in second place beach nourishment (20.8%) and lastly emerged breakwaters (10%). The reasons for these choices include their visual impact, ability to fight against beach erosion, the impact on water quality and safety of bathers. As far as the disadvantages of these methods are concerned, constraints differ according to the type of structure. We have compiled the following classification in descending order for soft methods: Effects on sand quality (71%), impact on flora and fauna (44.2%), pollution (40%), implementation costs (30.8%) and lastly, the aesthetic impact on landscape. Structure-wise, the aesthetic impact on the surrounding landscape is considered to be a major constraint (51.7%) followed by costs of implementation (39%),

pollution (30%), impact on flora and fauna (17.5%) and sand quality (12.5%). Most of those interviewed (79.2%) feel that costs for beach erosion protection are justified.

Improving ICZM: from surveys right through to the actual projects - The Liguria case study

On the 12th December DIP.TE.RIS. organised a one day meeting, which was coordinated by the Liguria Region, to interview operators from the various authorities using different approaches (e.g. focus groups, brainstorming, multi-criteria analysis, mental models and SWOT analysis).

The aim of the meeting was to highlight and discuss problem areas, propose and assess potential activities and alternatives that could contribute to the identification of new organisational strategies for the sustainable management of the Liguria coastline, and thus improve ICZM implementation at a regional level. The main outcome of this meeting was to establish the following: i) A strategic framework covering the whole of the ICZM situation in Liguria: definition of a framework using a participative approach and a SWAT analysis in order to facilitate the final summary and, ii) Six possible measures to be implemented in support of ICZM and the fight against coastal erosion in Liguria which were discussed and assessed by participants using a multi-criteria approach. A general classification of alternative measures resulting from the evaluation process can be construed as a "list of priorities" for ICZM in Liguria defined in accordance with the opinion of authorities involved. (Table 3.2.1).

Table 3.2.1 –Multi criteria assessment results for 6 alternative measures for the improvement of ICZM in Liguria.

Ranking	Alternative measures evaluated by institutional coastal stakeholders
1°	Definition of a regional protocol for coastal dynamic survey and monitoring, integrated with a plan for the exploitation of available deposits of nourishment material
2°	Institution of a regional "ICZM Board" and/or periodic "Technical Boards" on coastal issues
3°	Update of the Regional Coastal Plan, also including economical analysis of the coastal zone
4°	Map of regional coastal stakeholders, institutional and not, and identification of suitable stakeholders engagement techniques
5°	Definition of a regional plan for education and training to develop specific coastal expertises
6°	Regional Coastal Observatory for the assessment and analysis of coastal uses and the monitoring of anthropic impacts on the coast

Indicators

Identification of indicators for beach management assessments

This task was conducted by DIP.TE.RIS. It involved developing specific tools adopting an integrated approach; in particular there was a need for a scale of indicators for the beaches concerned. This required the adaptation of tools and indicators used for ICZM. The results of the previous survey highlighted a general lack of tools which could help coordinate and strengthen the effectiveness of beach management policies traditionally put into practice at pilot sites. On this basis, a list of specific indicators to be used to assess and monitor the effectiveness of beach management policies has been suggested. Focus has been placed on whether these indicators can be adapted to local operators' needs and their ability to take into consideration sustainable seaside activities which play a key role in this area. These indicators have been mainly chosen as a way to assess the existence and level of application of specific regulations, efforts to collect data and carry out controls, including tools for the physical, ecological and environmental management of beaches (e.g. erosion, conservation and pollution) but also economical factors (e.g. tourism).

In this final stage the list of proposed indicators has been simplified and transformed into a "check list" so as to define a specific tool that is easy to apply and meets local needs. Tests on the application of this assessment tool in the area in question has helped to highlight the existence of problems linked to the management of beaches at a local level, and has identified key actions which can encourage the development of local management policies. All in all, this tool can be used as an integrated assessment tool to be included in the environmental management system implemented by the municipalities (EMAS).

Environmental sustainability analysis

An environmental sustainability analysis was carried out in the RdB area using two methods: Emergetic analysis and ecological matrix.

Emergetic analyses have been used to assess the whole RdB coastal area. Results show that the land is dependant on non renewable external resources and is very vulnerable due to the absence of productive activities. It so happens that in the last few decades RdB has registered a considerable increase in tourism to the detriment of traditional sectors (oil and wine produce, fishing, small industry and small companies). This observation can be illustrated both by a qualitative/quantitative analysis of resources exploited and by values of the indicators that have transpired from the emergetic analysis. The fact is that these two methods of analysis produce converging results that highlight the misuse of

local and renewable resources and an inefficient system (Fig. 3.2.8). Moreover, a comparison with other Italian areas has highlighted RdB as a “hot spot” at a national level as it uses up a considerable quantity of resources compared to other areas assessed and is therefore considered a dissipative system. Since seaside tourism represents a key sector in RdB’s economy, sustainable levels for this industry have been specifically assessed by analysing the matrix of its ecological system. The assessment of this matrix on a pilot group of private beaches has achieved the following:

- The quantitative/qualitative assessment of land that is directly or indirectly exploited in order to maintain private beach enterprise.
- The portrayal of seaside tourism as a non independent process and heavily dependent on external forces. This conclusion was reached by assessing standard indicators (like Ecological Deficit, defined as the difference between the quantity of exploited land and bio capacity) and specific indicators adapted for that system.
- The creation of good practices was achieved by taking into consideration previous results and trying to reduce the industry’s impact on the local area by acting on hot spots (electricity and water consumption).
- Giving advice on sustainable management at a general level (relationship between private and public beaches and other potential uses) and in more detail at local level (management of establishments and private beaches).

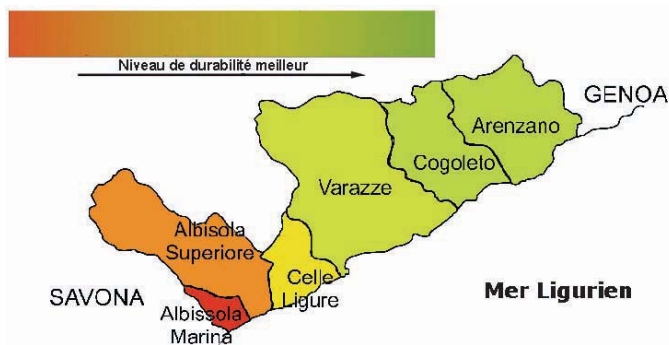


Fig. 3.2.8 - Results of RdB Emergent Analysis.

GIS and spatial planning

In order to show the present state of the area (west part of the Delta of the River Delta) normal maps were used which had been adapted by various public bodies as well as photo-maps. The maps were recorded in order to create several layers within the information system, such as the coastline, surrounding contours, the Nestos River, lagoons, urbanised areas, irrigation and hydrographic network, roads, Natura 2000 areas and Ramsar sites. A Greek coordinates system (EGSA Greco) was used to record and digitalise the maps - The scale of majority of maps used was 1 to 50,000. Photos were taken in six places along the beach (2 to the east and 5 to the west of the Nestos river) (Fig. 3.2.9). The areas were identified on the map using coordinates and the photos taken in each place were joined using these coordinates. A view of the whole area is shown in Figure 3.2.10. There are two municipalities in this area: Chrysosoupoli (16,000 inhabitants) and Keramoti (6,000 inhabitants). The Nestos River is situated along the Eastern border and the whole of the Nestos Delta and lagoon area are situated in the southern part of this zone. The Aegean Sea North borders this region to the North. A National Road (Egnatia) passes through this area (Fig. 3.2.11). Fertilizer and pesticide discharges and waste from the towns of Keramoti, Chrysosoupoli, and some bordering villages have polluted the water in the wetland. Although clothing and shoe industries, the food industry and those industries that use chemical products all have a waste treatment system these systems

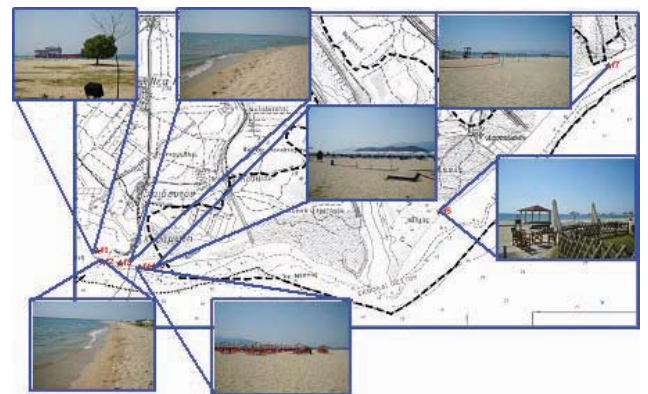
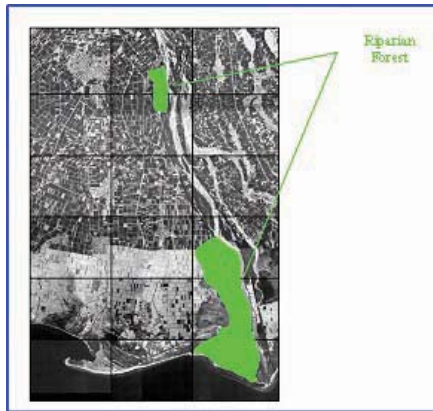


Fig. 3.2.9 - Location of 7 places on the beach where photos were taken.



do not always work properly and are therefore contribute to environmental pollution. Negative consequences for the environment are due to: intensive farming, the construction of a new hydroelectric dam on the river that will considerably alter the regime of the Delta waters, excessive exploitation of grazing land, fishing, illegal cutting down of trees, beach dredging, tourism and hunting. An important part of the Nestos Delta and the Keramoti lagoons has been converted into

Fig. 3.2.10 - General view of the area, east side. agricultural land thanks to an irrigation system that draws considerable amounts of water from the river. The main aim of this project is to apply ICZM principles to a case study area, bearing in mind all of the characteristics and constraints that apply. During earlier phases, ICCOPS did some research to identify the region's main characteristics, management policies and choice of tools. The assessment is very complex since there are numerous indicators for specific and strategic features which, however, differ according to the organism in question.

Different areas were also covered making it often difficult to be consistent. The main objective of this project was in actual fact to produce a method that did not



Fig. 3.2.11 - Irrigation and hydrographic network.

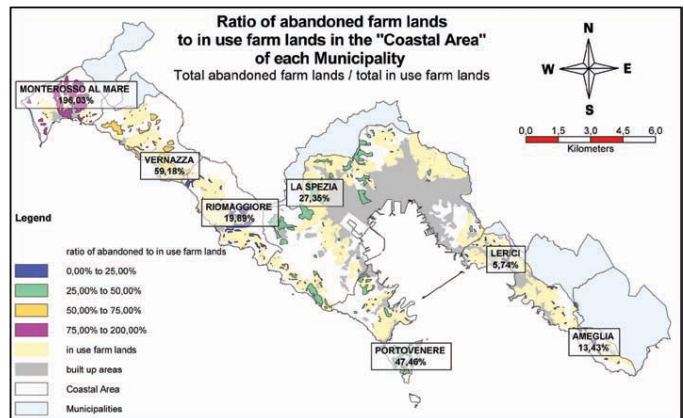


Fig. 3.2.12 - Example of a summary map of a "loss of arable land" indicator.

pose a burden to an already complex situation and, in any case, to help the spreading of ICZM principles. It was therefore decided to study the work begun during Phase B regarding the calculation of indicators in more detail (an output of the DEDUCE project) in order to establish a brief and integrated description in accordance with ICZM principles which could be recognised in the various Mediterranean coastal areas and create a set of "best practices".

Nineteen indicators were selected from various sources (the DEDUCE project, the Blue plan and IOC-UNESCO). They are currently being revised, starting with specifications and available local data. A series of maps and information charts will be compiled from the results that, for each indicator, as well as providing results, will explain: calculation criteria used, negotiation between specifications and available data, indicator application methods and possible interaction with other indicators. These indicators allow us to define the area being analysed, especially with regards to tourism and landscape management.

GIS is the information system's central tool used both to calculate selected indicators and to show results. It enables specific spatial operations (e.g. spatial aggregation, intersections and other operations) by creating thematic maps.

In order to make the results more user friendly for those, such as local administrators and stakeholders who have no experience of GIS systems, once the calculations are

finished, the cartographic data and relative alphanumeric attributes will be available on the Web Map Services site which means they can be read online with a geoviewer.

Development of coastal zone monitoring system

The aim is to create an observatory in the coastal area in order to obtain all the information needed to help the authorities to implement Integrated Coastal Zone Management. Phase C activities were as follows:

- Finalisation of system functionality,
- Creation of a permanent coastline atlas,
- Definition of ICZM indicators,
- Finalisation of system interface,
- Considerations on further development as required by the Inspire Directive.

Finalisation of system functionality

- Creation of the "Atlas" menu: Display of 74 atlas maps in .MXD and .PDF format. 10 ICZM specific themes were charted to scale for the Hérault department and Region.
- Creation of an "image" menu: Display of IGN raster maps and orthophoto maps by clicking on an overview of contents.
- Improvement of pop-down menu system: Improved use by adding menus and sub menus at all system levels. Complete re-writing of Visual.net source code.

Coastline atlas

The coastline atlas is a support tool for ICZM stakeholders in the Languedoc Region. It includes 74 maps that illustrate the following aspects:

- Physical environment: sedimentary cells,
- Heritage, landscape and natural environment: protected areas, sites under public domain, etc.
- Erosion risks along stretches of the coastline, sea flooding, risks of river flooding.
- Local area Population trends, urban development 1990-2000.
- Tourist facilities along the coast: accommodation capacity, number of boats per port.

Quality of water for swimming activities and waste water treatment plants.

- Water resources: Location and quantification of underground and surface extractions.

One side of the map it shows the region on a scale of 1/100 000 and the other side shows the Hérault department on a scale of 1/250 000. The atlas can be

updated by the GIS system and is easy to edit whilst still keeping the graphical semiology specified at the beginning. Full details of data updating methods are provided to facilitate the administration of data.

Indicators

Indicators enable the quantification of evolutionary phenomena to be assessed over time. An inventory of available indicators was firstly created: indicators drawn from the bibliography, Deduce indicators. The more relevant indicators, the easiest to implement and those that can be charted have been integrated into the system:

- Linear, growing or stable erosion based on the EuroSION model.
- Natural surface transformed into an artificial area.
- Pressure from water sports: boat moorings per municipality.
- Tourist accommodation capacity: Number of beds per municipality.
- Quality of water for swimming activities: water quality reported by local authorities.
- Biodiversity protection: part of municipality territory within protected zone.

Finalisation of coastal area monitoring system

Functions have been completely re-written in Visual.net language: they are now located in a menu within the Arcgis GIS application and use the Geo-databank created in phase B. In the final version, the sub menus are easier to access using a form so that the user can avoid repeating fiddly operations and save time.

These changes have taken place both at a geographical and document data level. Methods for updating the system stay the same and are within the capabilities of a GIS administrator.

Shared innovative methodology

There are currently a number of coastline observatories, but they



Fig. 3.2.13 - Permanent coastal atlas.

do not enable us to have a comprehensive picture of occurring phenomena. Above all, the view option for sedimentary cells and the management section was never implemented. Moreover, the observatory uses geographical information (map consultation, strata) as well as alphanumerical data (manipulation of papers and all types of documents). It is easy for the user to tailor the application by adding data and additional menus without being an information systems specialist. The observatory mainly applies to coastline managers as they can use this tool during the decision making process and to communicate relevant information to decision makers.

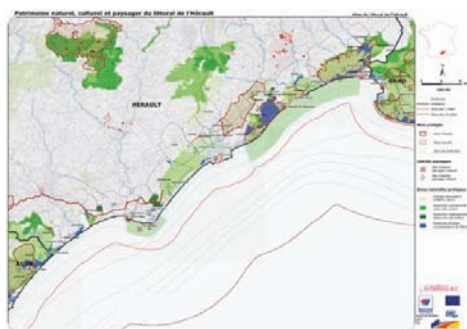


Fig. 32.14 - One of the 74 atlas maps.

Economic values: Advantages of beach nourishment schemes

The third part of the project proposes the social, financial and economical quantification of the advantages provided by the enlargement of Tarquinia beach. The coastline team has specifically suggested an analysis of the beach in the Tarquinia municipality. Only a summary of strong and weak points are shown here and detailed results are available in the full report. Weaknesses: Area for tourism and relaxation purposes needs to be improved. Beach capacity and temporal distribution. Insufficient social activities in winter months. Public system for beaches is poor. Limited knowledge of beach systems. Availability of leisure activities is poor. Strengths: Considerable environmental and tourist attractions. Expanse of coastline. Good customer satisfaction levels. Development policies. The aim of the project is to assess financial and social profitability of beach nourishment schemes using cost-benefit assessment indicators (CBA). This cost-benefits assessment was carried out for two possible scenarios. In the first case, beach nourishment is surveyed for 25 years, whilst in the second case three successive beach nourishment initiatives are carried out every 15 years, which brings the total for this project to 50 years. The cost-benefit analysis indicators, that is the net present value (discount rate of 6%) in cost-effective terms,

produces good results. Sensitivity assessment has highlighted the fact that the only sensitive benchmark in financial analysis is the cost of sand whilst for the economic analysis, which includes social costs, the results are not sensitive to variations in the price of sand.

Future activities

Planned ICZM activities in the Mediterranean area should take a greater look at demand and focus on the following aspects:

- Devise tools to assess ICZM implementation levels: Results of surveys carried out for this sub project have highlighted the difficulty in accurately assessing ICZM implementation levels and awareness levels regarding this issue, both with the public at large and with users. These problems are also linked differences between EU countries. The main aim of future activities should be the development of a common tool to be used in EU countries which would measure different aspects related to ICZM implementation (awareness, institutional framework, participative process, technical tools, etc.) in the different countries so as to integrate them together. A comprehensive assessment of all countries could then be carried out. Moreover tools should be considered which can assess results and the effects of ICZM on sustainability levels in coastal areas.
- Create an institutional framework for ICZM: The survey results on awareness levels carried out as part of the subproject show that the integration of skills and responsibilities at an administrative level is unsatisfactory and needs a more active participation of all parties involved. At the moment we do not have an efficient institutional framework for coastal zone management. This is why the attempts of our partner from Liguria to create an ICZM Regional Office should be encouraged. The setting up of a network should be encouraged and the financial resources to implement this network could come from another project.
- Education, training and awareness: Encouraging education, training and awareness is a key issue in the Mediterranean coastal areas. Many Mediterranean countries/regions should make an effort to train experts, educate children and create awareness in the public as a whole. The Coastal Day (24th October) has had a beneficial effect and could influence others to implement similar events.
- Identify local needs and implement specific studies, starting from demand: it is generally taken for granted that analyses and in-depth studies of coastal problems are required. However, in order to improve coastal management



effectiveness in the future (e.g. using a sub regional approach to land and sea planning), special attention should be paid to the relationship between local authorities and universities and to the link between manager and user needs, which can be identified through special studies.

- e) Integration and usage potential: integration needs to be the main focus of future operations. This can be achieved by placing the future ICZM sub project at the heart of the main project in order to guarantee integration, usage potential and the replication of results. One activity could be, for example, the implementation of an integration tool using resilience data (natural and socio-economic).
- f) Devise plans for funding of beach management operations. Studies on the key role of these beaches for the national economy should highlight the need for beach management. A starting point should be the assessment of the various trends concerning seaside tourism in the Mediterranean. A tool should be then be devised that will optimise funding for the most expensive tasks and create a model for prioritising beach maintenance work. Finally, the focus should if possible be on engaging with the private sector, especially if a public-private partnership can be set up. In order to do this, it will be necessary to develop surveys and directives. A spatial analysis based on the GIS system should complete the surveys and enable the results to be utilised.

- BELL F.W., (1986) - Economic policy issues with beach nourishment, *Policy studies reviews* 6, 374-381.
- BELL F.W., LEEWORTH V.R., (1990) - Recreational demand by tourists for saltwater beach days, *Journal of environmental economics and management* 18(3), 189-205.
- CICIN-SAIN, B. (1993) - Sustainable development and integrated coastal management. *Ocean and coastal management* 21: 11-43.
- COMUNE DI TARQUINIA. (2004) - P.U.A. - Piano di Utilizzazione degli Arenili di Tarquinia;
- DAHM C. (2003) - Beach user values and perception of coastal erosion. Report commissioned by the Environment Waikato, Technical Report 2003/03: 68 pp.
- DEFRA, (2005) - The benefits of flood and coastal risk management: a handbook of assessment techniques, Defra.
- DIPARTIMENTO TERRITORIO REGIONE LAZIO, (2006) - Attività di ricognizione della costa laziale, (recognition activity of Lazio coast) Regione Lazio.
- EU (2003a) - Economic and social valuation about European coastal sites, Environmental design of Low Crested Coastal defence Structures D28. Available at www.delos.unibo.it/menu.html Website consulted on June 2006.
- FOURRIER A. (2005) - Évaluation des méthodologies et des conditions d'une gouvernance efficace en matière de récupération de la bande côtière. Mémoire de Master 2 Professionnel « Gestion des Littoraux et des Mers », Université de Montpellier 3, Paul-Valéry. 125 p + Document annexe: 159 p.
- IFEN, Actes du séminaire technique « Les indicateurs et le suivi de la gestion intégrée des zones côtières » (Juillet 2006), dans le cadre du projet INTERREG IIIc DEDUCE, 68 p.
- INTERNATIONAL OCEAN INSTITUTE (2006) - Evaluation of Integrated Coastal Zone Management (ICZM) in Europe, Final Report, Rupprecht Consult – Forschung & Beratung GmbH.
- MARZETTI DALL'ASTE BRANDOLINI S. and LAMBERTI A. (2003) - 'Economic and Social Valuation of the Defence System of Venice and its Lagoon (Italy)', in Ozhan E. (Ed.), *Proceedings of the Sixth International Conference on the Mediterranean Coastal Environment, MEDCOAST 03*, 7-11 October 2003, pp. 307-18.
- MARZETTI S. (2007) - Visitors Preferences about Beach Defence techniques and Beach Materials. In: *Environmental Design Guidelines for Low Crested Coastal Structures*, eds H.F. Burcharth, S.J. Hawkins, B. Zanuttigh and A. Lamberti, Elsevier, Oxford, pp. 372-374.
- MEUR-FEREC C., BEAURAIN C., DEBOUDET P., DELDREVE V., FLANQUART H., HELLEQUIN A.-P., HERBERT V., LONGUEPEE J., MOREL V., TORRES E. (2002) - La vulnérabilité des territoires côtiers, approche méthodologique, synthèse du programme de recherche Programme National Environnement Côtier (PNEC), 7 p.
- MEUR-FEREC C., MOREL V. (2004) - L'érosion sur la frange côtière: un exemple de gestion des risques. *Natures Sciences Sociétés*, 12: 263-273.
- Mission Interministérielle d'Aménagement du Littoral (MIAL), BRL ingénierie (2005), « Etude préparatoire à l'élaboration du document de référence pour le développement équilibre et durable du littoral », 102 p
- PARSONS, G. R., (2003) – "The Travel Cost Model" Chapter 9 in *A Primer on Nonmarket Valuation*, edited by P. A. Champ, K. J. Boyle, and T. C. Brown, London: Kluwer Academic Publishing, 2003.
- POLOMÉ P., MARZETTI S. and VAN DER VEEN A. (2005) - 'Economic and social demands for coastal protection', *Coastal Engineering*, 52: 10-11, pp. 819-840.
- REGIONE LAZIO DGR n. 2816/1999 e n.1161/2001.