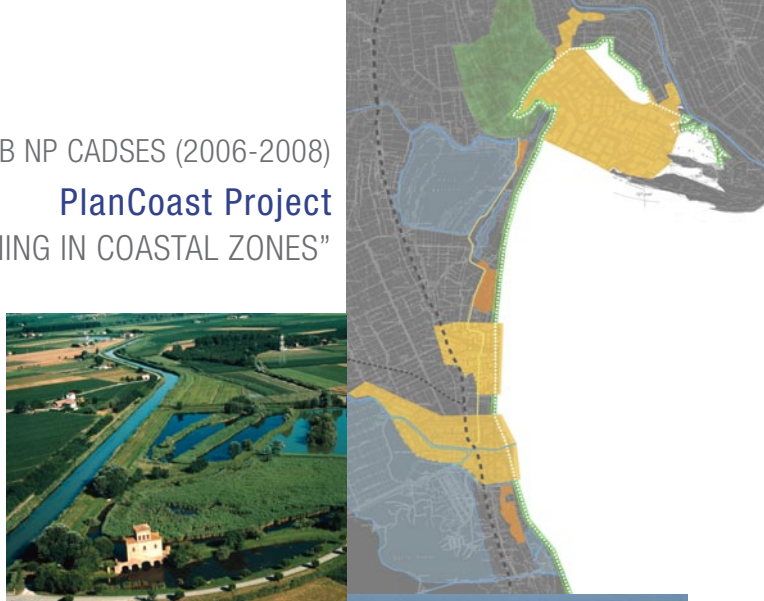
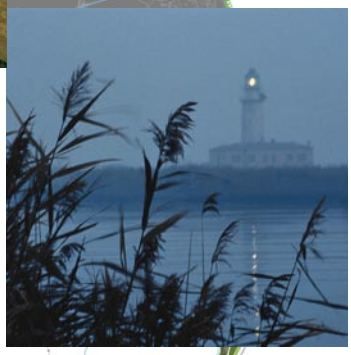
INTERREG IIIB NP CADSES (2006-2008)

PlanCoast Project

"SPATIAL PLANNING IN COASTAL ZONES"





IMPLEMENTATION OF THE "INTEGRATED COASTAL ZONE MANAGEMENT" (ICZM) GUIDELINES AT PROVINCIAL SCALE STUDY AREA: "FERRARA COAST"

WP2 ACTIVITY - "GIS Database"

WP4 ACTIVITY - "Proposal of Spatial Plan according to ICZM principles"

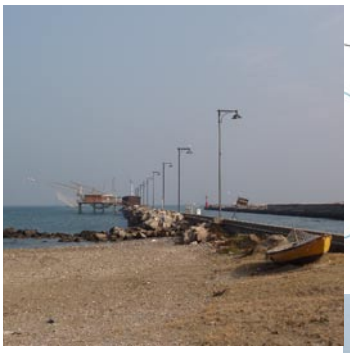


Foto archivio Parco del Delta del Po Emilia-Romagna

Provincia di Ferrara

Regione Emilia-Romagna

GESTIONE INTEGRATA ZONE COSTIERE

Project part-financed by the European Union

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INTERREG IIIB NP CADSES (2006-2008)

Progetto PlanCoast

"SPATIAL PLANNING IN COASTAL ZONES"

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ACTIVITY WP2 - "GIS Database"

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March 2008

Project part-financed by the
European Union

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Activity part-financed by the European Union - NP INTERREG IIIB CADSES PlanCoast Project (5D111).

INTRODUCTION
Pilot projects objectives and goals

As part of the strategic initiatives for coastal zones, the Emilia-Romagna Region has decided to take part in the PlanCoast project (Spatial Planning in Coastal Zones), financed by INTERREG III B CADSES (2006 – 2008) European Programme.
The aim of this European project is to outline tools and recommendations for all European countries with sea borders, useful for the effective planning in coastal and marine areas and in line with the Integrated Coastal Zone Management (ICZM) principles.
One of the main objectives of the project is to strengthen the role of spatial planning as driving force for the ICZM implementation.

The project comprises two general work packages (WP1 and WP5) and three more specific work packages (WP2, WP3, WP4), which are as follows:

- WP1 – involving all partners – **Trans-national studies and recommendations for spatial planning in coastal zones and marine areas;**
- WP2 – joint collaboration including the EMILIA-ROMAGNA REGION, Albanian coast, Bosnia & Herzegovina coast, Odessa area (Ukraine), Pomorskie (Poland), Romanian coast, Triest Bay (Slovenia) and Varna area (Bulgaria) – **Construction or update of GIS-oriented Information Systems** as a support tool for spatial planning in coastal zones and marine areas, in agreement with all participants about common technical basis and set of data. The target of Emilia-Romagna was the implementation of the Coastal Information System (SIC) previously developed;
- WP3 – joint collaboration including Boka Kotorska Bay (Montenegro), Constanta (Romania), Mecklenburg-Vorpommern (Germany), Odessa (Ukraine), Puck Bay (Poland), Trieste Bay (Slovenia), Varna (Bulgaria) – **Development of maritime planning pilot projects;**
- WP4 – coordinated by the EMILIA-ROMAGNA REGION – joint collaboration including Albanian coast, Constanta (Romania), Palombina Beach (Italy), Pomorskie (Poland), Piran (Slovenia), Tulcea/Danube Delta Biosphere Reserve (Romania), Varna (Bulgaria) – **Development of territorial and urban planning pilot projects in compliance with the ICZM principles.** Comparison of the various pilot projects to outline a set of commune directives and national and trans-national recommendations for the integrated coastal zone management implementation;
- WP5 – involving all partners – **Dissemination of results and experience.**

The Region's activities carried out in WP2 were predominantly geared towards up-dating of the Coast Information System (SIC) in order to meet spatial planning requirements and improving the vulnerability assessment of environmental threats to our coastal zone, experimenting in the Ferrara area the cartographic prototypes and analysis procedures to be used across the whole Region.

In WP4 the Region's involvement was mainly aimed at compiling a Cognitive Frame for the Ferrara coast which in turn aimed to develop a set of guidelines for the whole Province enabling the implementation of Integrated Coastal Zone Management (set down by the Regional Council Act n. 645 of 20 December 2005). This was followed by an inter-sector analysis aimed at defining pressures and interactions on the natural and anthropic system, with a view to implementing mitigation solutions, trend inversions or problem-solving; as well as evaluation methods to identify the most important overlaps of natural and man-made environmental systems with a view to outlining proposals and criteria for use in province-wide programming and planning.

1. TECHNICAL AND LEGAL FRAMEWORK IN THE REGIONAL CONTEXT

1.1 Integrated Coastal Zone Management (ICZM): main contents

1.1.1 Why the ICZM Guidelines?

Throughout history, coastal areas have been an important pole of attraction for civilisation, as a potential for exchanges and trade and availability of food resources and materials. Today, almost half of the European population live along the coast where it is produced the large part of the richness: fishing, sea shipping and tourism put at risk some of the most sensitive and precious habitats (groundwater levels subside and are encroached by sea water; erosion increases its pace; pollution worsens; fishing resources are being depleted), with negative social, economic and ecological consequences, often encompassing national borders. Human activities in coastal areas (industry, tourism, agriculture, fishing, aquiculture, energy production) tend to develop together in the narrow shoreline strip, thus coming into conflict with each other and with protection needs of natural habitats and landscapes. Strong seasonal variations of the tourist activity and related environmental pressures represent an additional complication for the sustainable development of coastal areas.
The density of population and human activities on coastal areas has drawn general attention on the need to arrange suitable legislation instruments on the subject; the peculiarity of coastal areas as "sensitive" and non-reproducible, shrinking resources has led to the creation of specific legislative tools and strategies.

Since the year 2000, the European Commission adopted a document series that still represents the main references of the European Union about the Integrated Coastal Zone Management:

- "Integrated Management of the Coastal Zones: one strategy for Europe" - Communication of the Commission to the Council and European Parliament (COM/00/547 of 27th September 2000).
- "Recommendation of the European Parliament and the relative Council to the performance of the integrated management of the coastal zones in Europe" - Adopted by the Council and the European Parliament on 30 May 2002 (2002/413/CE) and published on the GUCE n. L 148/24 of 6/6/2002.

The Recommendation invites the Member States to equip itself with one or more strategies for the integrated coastal zone management, through interactions with the regional and interregional authorities, and with the member countries that have jurisdiction on the same marine area. The European Union suggests to put into effect a strategic action, eventually supported with a series of guidelines, for the correct management of the coastal zones in a global and long-term geographic perspective, that considers primarily the interdependence and the diversities between the natural equilibriums and the anthropic activities.

Recent changes in the Italian legislative framework, which have involved a shift of the main coastal competences from the State to the Regions, identify in the Region the optimal level for the implementation of planning policies and integrated coastal management. However, the situation of coastal planning seems still characterised by fragmentation between the different authorities of State, Regions and Communes.
The fragmentation and low coordination between the planning instruments is a relevant problem to solve, especially referring to the juridical extension of the plan and the wide area affected by the plan chooses. These issues become more critical in the coastal and marine areas, which are environmental systems particularly sensitive in continuous development, requiring spatial planning instruments based on a systemic, integrated and cross-sector approach. This refers not only to horizontal relationships between diversified activity sectors, but also the articulation of policies with actions carried out at different levels of territorial competence (local, regional, national). Due to this lack of co-ordination, the complex relations between human activities and coastal areas are neglected (sometimes individual

measures do not reach their goal or even become an obstacle), by overlooking their complex features, affected by a plethora of interrelated forces and pressures (as is the case for hydro-geological, socio-economic, administrative, institutional and cultural systems), whose management necessarily requires a simultaneous attention being paid to the many systems interacting on coastal dynamics.
A good management of coastal areas is based on the understanding of natural dynamics and processes, in order to accompany rather than contrasting them, by widening long-term options, and making activities more sustainable from an environmental viewpoint and more remunerative on the long run, by recognising their uncertainty for the future, and promoting a system-based and flexible approach, while integrating all interested subjects in all planning processes, through an involvement which could engender shared commitment and responsibilities, exploit local know-how, contribute to the identification of real issues, and the drafting of feasible solutions, according to an approach based on shared consultation and participation.
The management of coastal areas focussed on sustainability can be successful only by adopting a complete set of juridical, economic tools, agreements, information delivery, technological solutions, research, education and training.

1.1.2 The ICZM GuideLines

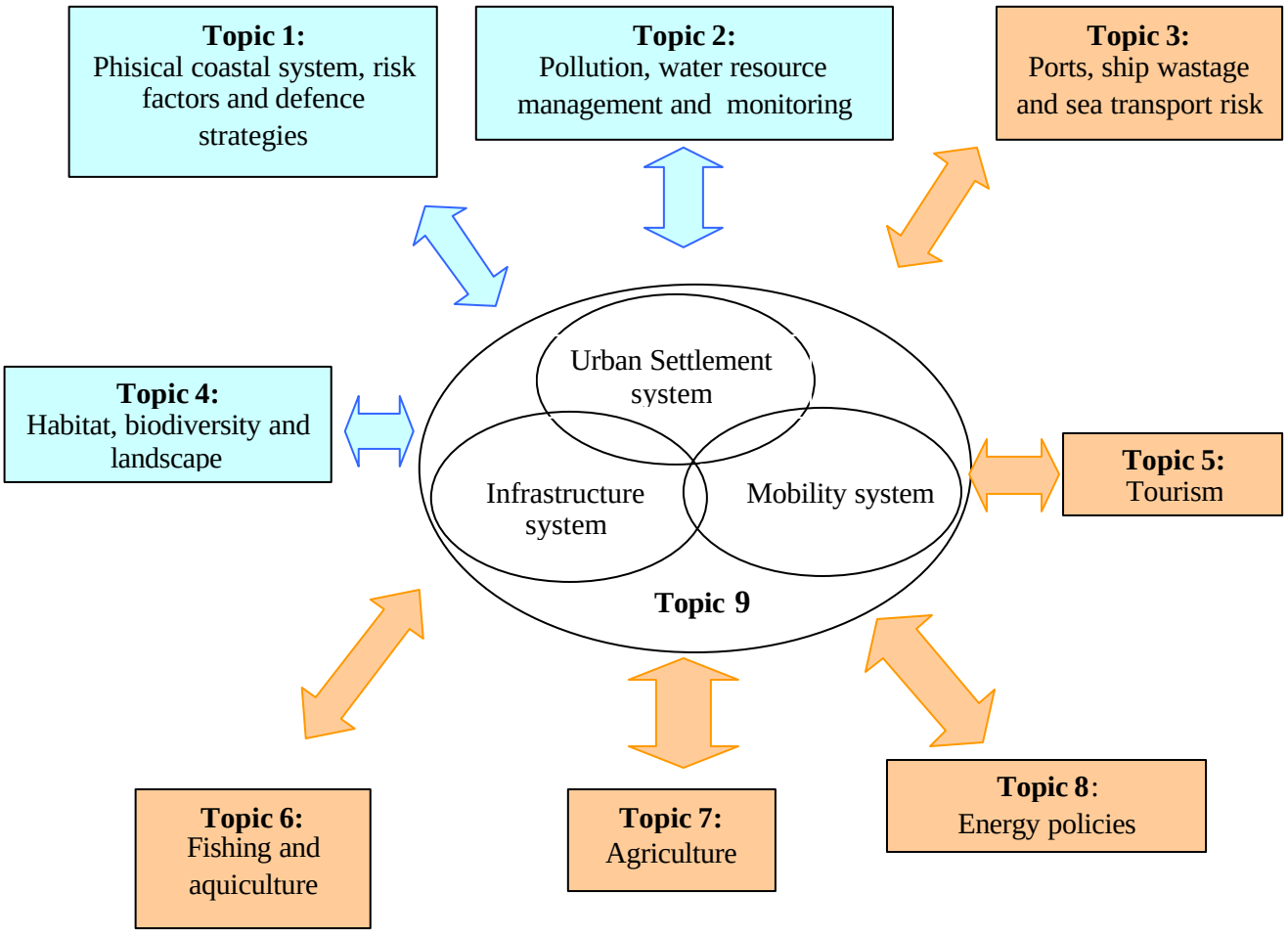
The Regional Council adopted the ICZM Guidelines, by Act n. 645 of 20th January 2005, following the Regional Government's proposal n. 2406 of 29th November 2004.
The ICZM Guidelines face the coastal issues privileging an integrated and cross-sector approach, with the aim to define principles for all the coastal activities and positively address the factors affecting this area, both land and sea side.
The issues involved in this integrated approach are articulated in nine thematic topics:

1. Physical coastal system, risk factors and defence strategies;
2. Pollution, water resource management and monitoring;
3. Ports, ship wastage and sea transport risk;
4. Habitat, biodiversity and landscape;
5. Tourism;
6. Fishing and aquiculture;
7. Agriculture;
8. Energy policies;
9. Urban settlement system and infrastructures (service and mobility).

"Urban settlement system" is identified by the Integrated Coastal Zone Management as being a strategic sector of interest in which administrative bodies and other organisations dealing with planning and programming can become involved.
Each thematic area in the ICZM Guidelines contains a list of items combine to produce a single reference document to be applied in the integrated management of our territory.
In order to make the Integrated Coastal Zone Management work more efficiently, we attempt to apply such items to coherent and congruous territorilal settings wich consitute a semplified and integrated aim for the different sector specific policies.
Such territorial structures therefore constitute a sort of front line in the application of sector-specific guidelines and local government organisations are the primary players in implementing the content of Integrated Coastal Zone Management.
The sector-specific guidelines thus promote a correct and positive interaction between planning and other sector-specific thematic areas of the Integrated Coastal Zone Management. They represent the criteria to be used in environmental and territorial assessment procedures and are particularly useful in defining those sectors sensitive to planning action.
What this implies is that the Integrated Coastal Zone Management guidelines provide a framework for Val.S.A.T. assessment procedures and help to render uniform assessments and therefore planning processes.

It is into this context that the pilot project is inserted together with the decision to elaborate on the guidelines by seeking to apply them experimentally to territorial planning.

Once the Regional Council had approved the Guidelines, the institutional phase was complete and the more complex and ambitious phase began, that is, their actual implementation by Regional authorities, provinces and towns, a process which demanded as *conditio sine qua non* that Local Organisations accept directives defined in the planning, consultation and institutional processes described above. In its resolution, the Regional Council states that "coastal towns and provinces acting as part of the Institutional Committee for Integrated Coastal Zone Management should adopt and approve the guidelines and their own institutional organs should put them into practice".
As a result, these towns and provinces committed themselves to use these guidelines as a reference in defining and assessing different plans involving the coastal area.
In the pilot project area, the provincial administration approved the Integrated Coastal Zone Management guidelines with resolution no. 5/103735/05 of 18.01.06 and stated that any revision or updating of territorial programming and planning instruments must be in line with the guidelines. The town of Codigoro also approved the guidelines with resolution no.71 of 31.06.2006.



1.2 Spatial planning system in the regional legislation framework

In regional law no. 20/2000 "General practice for territorial protection and use", the Emilia-Romagna region provided for the revision of current territorial practices.
Without losing sight of the region's planning exigencies, several innovative features have been introduced into the area of urban and territorial planning. These include: subsidiarity and cooperation between bodies, territorial and environmental sustainability, simplification of administrative procedures and improved administrative and planning efficiency.
Planning analysis revealed the importance of guaranteeing environmental and territorial sustainability and the efficiency and suitability of infrastructures when defining territorial change and drawing up ground use guidelines. Given that local planning initiatives sometimes produce criticality and limitations when applied to too vast an area, we decided not to disassociate the application of sustainability from that of subsidiarity in planning procedures.

1.2.1 Planning functions, objectives and effects in Regional Law 20/2000

Planning aims both to safeguard the territory and improve the quality of life and living standards in towns. More specifically (article 2), "territorial and urban planning has the following general objectives:
a) to promote an ordered development of the territory, its urban structures and systems of production;
b) to ensure that any building initiatives are compatible with safety measures and do not compromise the area's physical characteristics or its cultural identity;
c) to improve the quality of life and raise public health building standards;
d) to reduce the negative effect of buildings on nature and the environment, even via building reduction and mitigation, if necessary;
e) to promote the improved quality of urban environments, architecture and urban communities by reassessing the present urban context;
f) to only allow fresh countryside to be given over to building projects when no existing buildings can be refurbished or redesigned".
Furthermore, on the basis of Article 6 (planning effects), limitations and conditions must be applied to urban and territorial planning in the following cases:
a) where specific public interests are involved, promoted either by national or regional law and protecting areas of particular environmental, cultural or natural value;
b) where an area's morphological or geological characteristics make it unsuitable for development;
c) where elements of environmental risk are detected or where natural resources might be endangered.
With a view to safeguarding environmental sustainability, territorial and urban planning can relegate development and construction projects in the following cases:
a) where we find projects aimed at mitigating the risk of harmful production plants, or promoting the building of urban infrastructures, resources and collective spaces, projects favouring ecological issues or the environment in general, public transport infrastructures; or
b) only if specific conditions guaranteeing the sustainability of the building project, as outlined in the planning process, are fully met.
The choice of planning projects depends on the extent to which they improve areas of criticality and exclude the possibility of creating new instances of criticality. In short, planning projects must:

- guarantee the quality, quantity, availability and longevity of environmental and territorial resources over time;
- mitigate 'previous' risks affecting environmental and anthropic resources and eliminate the possibility of 'new' potential risks developing.

Given the objectives that must be reached and the various actions undertaken as stipulated in the planning process, the resulting context proves a highly suitable one for the application of ICZM regional laws. These planning objectives can very easily be integrated and/or expanded in line with suggestions highlighted in guidelines that form the basis of integrated territorial management policies.

1.2.2 Environmental and territorial sustainability in the planning process (Val. S.A.T. and V.A.S.)

Regional law 20/2000 provides for the introduction of elements promoting environmental and territorial sustainability in the development of planning instruments.

It states that territorial and urban planning proposals must be brought in line with the *sustainability criteria/objectives* laid down in that law and, in the development and approval phase, all involved bodies must produce an *estimated assessment of territorial and environmental sustainability* (Val.S.A.T.) of the effects of the plan's practical implementation.

What this means therefore is that the regional law recognises interaction between planning initiatives, environmental issues, building systems, public transport and infrastructure networks. Planning aims to determine *urban quality* in terms of the level of wellbeing, health and efficiency promoted by the above, as well as the implied health and safety *risk* factor that these activities and related construction work might have in the anthropic sphere, as well as the *pressure* that building structures put on the natural environment.

The law identifies methods of evaluating the interaction and impact of planning choices and of mitigating possible negative effects in its sustainability assessment procedures, and requires that the effects and efficiency of the plans be monitored and periodical reports issued.

The results of these assessments are an important part of the plan. All plans must therefore include sustainability assessment procedures (Val. S.A.T.) and the effects of these are classed as limits and conditions governing project implementation and act as normative guidelines.

The introduction of environmental and territorial assessment procedures are an integral part of the development of planning instruments and the sustainability objectives which plans must fulfil can (and must) borrow indications from the indications and objectives defined in the ICZM regional Guidelines. ICZM regional Guidelines and their implementation thus provide fertile ground for the application of sustainability assessments (Val.S.A.T.).

2. PILOT PROJECTS

2.1 Devolepment of a GIS database as planning instrument for coastal and maritime areas - Work Package 2: Geographical Information Systems (GIS)

2.1.1 Emilia-Romagna Coast Information System

Geographical Information Systems (GIS) are tools facilitating the reporting, management and exchange of territorial data and as such are indispensable to spatial planning and integrated coastal zone management. This form of good practice is already widespread in urban planning though often lacks thorough analysis especially where environmental factors and risks are concerned. The GIS can be further improved by building thematic databanks of different fields developed on a territorial scale.
The European Union has recently addressed this problem by providing operative tools such as the GIS database for European coasts (scale 1:100,000) and guidelines for the "implementation of local information systems for coastal erosion management" which were released by the European Commission's Environment Directorate-General as part of the EUROSION programme and published in 2004 (European Commission, 2004).
The Emilia-Romagna Region has also, since 2002, been involved in 'Integrated Coastal Zone Management' and quickly grasped the need for tool that would facilitate the management of data and enable an increased knowledge of coastal criticity. It therefore designed a Coastal Information System (SIC) project which quickly took off thanks to financing obtained via the European project CADSEALAND (2004-2006). This involved the collection, organisation and processing of a great deal of data relating to the physical aspects of the entire region's coastal environment. It also saw the carrying out of basic studies aimed at compiling a complete knowledge framework of the Emilia-Romagna coastal area.
In this regard, results obtained from the following were particularly useful: evolution analysis of shoreline and land use over the past 60 years and comparison with sea-weather climate change(Deserti et al., 2006; Cibin et al. 2007). Also of particular worth were the operative tools created, such as orthophotogrammetric catalogues and a coastal defence database (Perini et al. 2007).

Fig. 2.1 Example of orthophtographic mosaic (1943-1982-2005) of Rimini city in different time periods.

Currently available data and new data were collected and analysed in conjunction with various sector-members and external bodies.
The SIC structure is complex and is comprised of the following:

- a relational database containing various levels of information;
- the server as part of the Geological, Soil and seismic survey SGSS Informative System containing region-wide raster and vector data for use by all
- to the (SGSS) Information System which makes available
- operators affiliated with the SGSS who deal with coastal analysis and cartographic processing;
- software, mainly GIS and other packages for data processing, remote-sensing image management, coastal modelling and analysis;
- A GIS website allowing access to data via the internet, currently available at the SGSS website http://www.regione.emilia-romagna.it/wcm/geologia/canali/costa. This highly innovative

product will soon be updated with a component specifically dedicated to data management and the collection of fresh information from peripheral services employed in coastal defence.

For a definition of thematic fields, see the EUROSION guidelines, which suggest the following thematic fields:

TOPIC GROUPS
TP 1– ADMINISTRATIVE BOUNDARY
TP 2 – TOPOGRAPHY
TP 3 – GEOLOGY, GEOMORPHOLOGY AND SEDIMENTOLOGY
TP 4 – HYDRODINAMICS
TP 5 – LAND COVER
TP 6 – DEMOGRAPHY
TP 7 – HERITAGE
TP 8 – ECONOMIC ASSETS
TP 9 – COASTAL DEFENCES

The thematic fields highlighted in blue were not compiled during the CADSEALAND project. In the subsequent tables (Fig. 2.2 – 2.6), are listed all data collected or processed before the PLANCOAST project. Most of the data found in the SIC are cartographic-related, some of which had already been collected by the Region or other Institutions, and thus simply required digitalisation and/or geo-referencing; other data were obtained via a complex GIS analysis and processing. Examples include: land-use and geomorphological maps devrived from the interpretation of aerial images 1943-1982-1998 and high resolution digital terrain models of the seabed and of a coastal strip including beach and of the backshore (DTM).

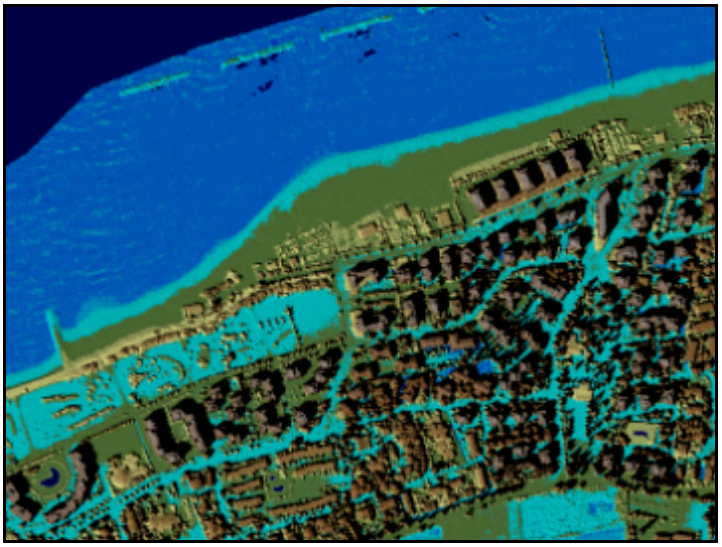


Fig. 2.2 Example of high resolution digital terrain models obtained through the remote sensing system- Lidar (Perini 2005).

SIC data can be sub-divided into two categories: vector and raster.

Vector data is based on simple information such as points, lines and polygons, encoded and memorised according to their specific coordinates. Each item is labelled alphabetically/numerically and inserted into a table.

Raster data falls into two separate categories:

- Aerial photos and maps;
- Pixel grids, where the separate cells contain information relating to specific sections of the terrain, e.g., digital terrain models.

THEMATIC GROUP 1: ADMINISTRATIVE BOUNDARY

Administrative boundary are fundamental in identifying competences, acquiring data and resolving conflicts.

Ref. group	Type	data
1.1	administrative boundary	Region boundary
1.1	administrative boundary	Province boundary
1.1	administrative boundary	boundary STB
1.1	administrative boundary	boundary ADB

THEMATIC GROUP 2: TOPOGRAPHY

This contains basic data to apply in studying terrain characteristics and evolution analysis.

For example, the first group, 2.1, contains orthophotographic mosaics, created through a long processing procedure starting from papery aerial images related to 8 flights. This forms the basis for much of the analyses carried out to produce the following thematic cartography of the coast.

Historical and present coastlines in 2.3 are the result of an in-depth interpretative analysis which required the drawing up of a specific method, described below.

Other fundamental items, especially in connection with coastal risk and vulnerability analyses, include the 3-D coast and seabed models (2.6 and 2.7) which were created using innovative techniques such as Lidar (light detection and ranging) (Ciavola et al 2006; Perini et al 2007, Calabrese and Lorito 2007).

Ref. group	Type	data
2.1	Ortophotographs	Costa Volo 2005
2.1	Ortophotographs	Volo IT 2000
2.1	Ortophotographs	Volo 1992-93 mareggiata
2.1	Ortophotographs	Volo 1991
2.1	Ortophotographs	Volo 1982
2.1	Ortophotographs	Volo 1976-78
2.1	Ortophotographs	Volo GAI 1953
2.1	Ortophotographs	Volo RAF 1943-45
2.1	Ortophotographs	Volo 1935 Area Ravenna
Ref. group	**Type**	**data**
2.2	Satellite Image	Volo ortosat_2003

Ref. group	Type	data
2.3	Historical and present coastlines	2005
2.3	Historical and present coastlines	2000
2.3	Historical and present coastlines	1996
2.3	Historical and present coastlines	1991
2.3	Historical and present coastlines	1982
2.3	Historical and present coastlines	1978
2.3	Historical and present coastlines	1943
2.3	Historical and present coastlines	1953
2.3	Historical and present coastlines	1893-1894

Ref. group	Type	data
2.4	Infrastructure	harbours
2.4	Infrastructure	Geodetic network IGM_95 coast
2.4	Infrastructure	Geodetic network lidar_2004cost

Ref. group	Type	data
2.5	Hydrography	Drain Basins
2.5	Hydrography	River network RER
2.5	Hydrography	River network Cost

Ref. group	Type	data
2.6	Terrestral elevation	DTM coast LIDAR-2004
2.6	Terrestral elevation	DSM coast LIDAR-2004
2.6	Terrestral elevation	DTM_RE
2.6	Seafloor elevation	DTM seafloor year 2000
2.6	Seafloor elevation	DTM seafloor year 1953
2.6	Terrestral elevation	Coastal Plain altimetric map

Ref. group	Type	data
2.7	Nearshore bathymetry	2000
2.7	Nearshore bathymetry	1994
2.7	Nearshore bathymetry	1994
2.7	Nearshore bathymetry	1984
2.7	Nearshore bathymetry	1968
2.7	Nearshore bathymetry	1953

Ref. group	Type	data
2.8	off-shore bathymetry	2000
2.8	off-shore bathymetry	1953

Ref. group	Type	data
2.9	Cross-shore profile	2000
2.9	Cross-shore profile	1994
2.9	Cross-shore profile	1984

Ref. group	Type	data
2.10	Topographyc maps	Carta Ferrarese 1814
2.10	Topographyc maps	Gran ducato-Toscana e Stato Pontificio 1851
2.10	Topographyc maps	Tavolette IGM 1892-94
2.10	Topographyc maps	CTR-RER

THEMATIC GROUP 3: GEOLOGY, GEOMORPHOLOGY AND SEDIMENTOLOGY

Geomorphological maps were specifically produced for the coastal area whilst geological and sedimentological data were taken from SGSS studies carried out for the CARG project (Geological cartography scale 1:50,000).

Ref. group	Type	data
3.1	Coastline geomorphology	Based on Foto-interpretation 1998
3.1	Coastline geomorphology	Based on Foto-interpretation 1982
3.1	Coastline geomorphology	Based on Foto-interpretation 1943-45
3.2	Coastline geology	Geologycal map RER 1:250000
3.2	Coastline geology	Geologycal map CARG 1:50000
3.2	Marine geology	Geologycal map 1:250000 CNR-ISMAR
3.3	Seafloor Sedimentology	Seafloor map - CNR 1988
3.3	Seafloor Sedimentology	Samples Idroser/1994
3.3	Seafloor Sedimentology	Samples Idroser/1984

THEMATIC GROUP 5: LAND USE

This study was produced specifically for coastal analysis and covered an area extending 1500 metres in-land from the shoreline. The aim of this study was to assess and monitor anthropic impact and changes occurring to the natural environment.

Ref. group	Type	data
5.1	Land-use	Based on Foto-interpretation 1998
5.1	Land-use	Based on Foto-interpretation 1982
5.1	Land-use	Based on Foto-interpretation 1943-45
5.2	Land-use dynamic	Statistic analysis

THEMATIC GROUP 9: COASTAL DEFENCES

Computerised catalogues are absolutely necessary both in the direct study of coastline dynamics and in connected fields, such as the planning of coastal defence.

To this end, various GIS catalogues on coastal defence were created using aerial images captured during several flights in order to support the following:

- the creation of an updated and complete record of the current state of coastal defences;
- an in-depth understanding of the levels of efficiency or criticity connected to different forms of defence, using records relating to different points in time;
- the availability of analytical records required in the application of numerical modelling for wave propagation in coastal zones (Perini et al 2007).

Ref. group	Type	data
9.1	GIS coastal defence	Based on Foto-interpretation 2005
9.1	GIS coastal defence	Based on Foto-interpretation 2000
9.1	GIS coastal defence	Based on Foto-interpretation 1982
9.1	GIS coastal defence	Based on Foto-interpretation 1943-45

Each analytical record contains the relevant metadata by which each record can be assessed in terms of its trustworthiness and specific history (e.g. type of data, origin, properties, qualities, processing methods, etc). This metadata was compiled and collected in accordance with ISO 19115 standard guidelines laid down in regional GIS regulations (Intesa GIS Stato Regioni).
All data was geo-referenced in the geographical referencing system adopted by RER (UTM-ED50 Fuso 32*) and in national systems (Gauss-Boaga and UTM ED 50). Newly acquired data were produced by the WGS84 system (or ETRS98) as outlined in EU directives (INSPIRE) and subsequently converted by the regional system. This data is therefore available in two systems of reference. Such a procedure is vital to the contextual analysis of data, thematism comparisons, comparison of data collected over time, as well as studies, systematic monitoring and defence planning.

2.1.2 Up-date of the Geographic Information System for the Emilia-Romagna coast (SIC) (Objective of WP2 of the Plancoast project)

As described in previous documents, the Coastal Information System, developed as part of the Cadsealand project, contained above all details relating to geological-geomorphological cartography and changes detected in the coast's physical system and required implementation via thematisms and other instruments designed specifically for territorial planning.
Participation in the Plancoast project enhanced this activity and allowed for comparison and exchange with other European structures involved in coastal and marine zone integrated management and planning.
The following WP2 objectives were successfully met during the PLACOAST project:
1. A SIC up-date project was launched across the various thematic areas of ICZM (integrated coastal zone management), involving different departments. New SIC thematic fields were created as were new analytical tools to be used in spatial planning of coastal zones;
2. New maps and statistical reports were produced with a view to creating a knowledge framework and general maps to be used in spatial planning of coastal zones across the whole region;
3. The Ferrara area was the subject of WP4 of the pilot project; here, analytical procedures to assess vulnerability levels of the Ferrara coast were fine-tuned and thematic maps to support the province's spatial programme (PTCP) were produced.

2.1.2.1 SIC development: Objective 1

Once the Guidelines for the Integrated Management of Coastal Zones were approved, the Emilia-Romagna region undertook to work towards harmonising all regulatory and economic factors relevant to this area, starting with territorial and sector plans. This means that reference databases have to be homogenous, updated and easily compared with other databases, and that all territorial analyses are carried out using GIS tools.
It was for this reason that when planning Plancoast WP2 activities (which dealt with the creation of GIS tools capable of supporting territorial planning of coastal and marine zones) we decided to up-date the Coastal Information System to cover all thematic areas linked to ICZM processes. Unfortunately, the time and resources available meant that this objective was incompatible with the Plancoast project, but we nevertheless set down an outline of the project (see Tab. 2.7; SIC development to cover all ICZM thematic areas) and launched the main activities.
The first objective dealt with the insertion into SIC of new thematic fields aimed at supporting activities connected with spatial- planning.
1. Thematisms relating to spatial-planning were identified;
2. A region-wide check of data was carried out to assess the availability and accessibility of useful data;
3. Projects promoting the production of missing information within SGSS were launched;
4. Those thematic sectors not included in Eurosion but identified as key items in the development of SIC were created.

Please note that these activities required the involvement of other regional departments, meaning that in some cases it has not been possible to obtain all the information needed in the time given.
The result obtained by thematic sector are as follows:

Tab 2.7 SIC UP-DATE TO COVER ICZM THEMATIC AREAS

Aims

1. To manage a single system containing all relevant data relating to the region's coastal and marine environment in order facilitate integrated analyses of different thematisms and parameters.
2. To make all data available via Web so that even those without GIS tools can gain access to the data.
3. To reduce the cost of obtaining and computerising data by administrative bodies. Indeed it is often the case that a single item of data is useful for various different sectors, though each sector often seeks to obtain that item separately, thus increasing costs.
4. To encourage dialogue regarding shared interests between different sectors involved in the planning and use of coastal areas (environment, fishing, tourism, etc).

Sectors involved

The 9 thematic areas identified for integrated management of the Emilia-Romagna coastline are as follows:
a. Physical coastal system, risk factors and defence strategies;
b. Pollution, water resources management, monitoring;
c. Ports, boat wastage, sea-transport risks;
d. Habitat, biodiversity, landscape;
e. Tourism;
f. Fishing and aquiculture;
g. Agriculture
h. Energy policies;
i. Urban settlement systems and infrastructures (services and mobility)

At least one regional department and a large number of associated bodies are involved in each of the above areas.
To facilitate goal attainment, we must make sure that principles and interests are shared among the whole group; each involved party must elect a representative with a view to improving research efficiency and assuring the availability of useful data.

Potential instrument of shared interest

Area of integration n° 4: Coastal Zone Integrated Management. Protection and use of water resources. Territorial and seismic safety.

Summary of launch procedures

- stoktacking of involved offices / bodies by thematic area
- stoktacking of available / formatted data (using already existing SIC files)
- data collection and validation
- updating of the SIC structure, creating new thematic areas respect to EUROSION proposals
- creation of specific databases
- internet uploading of databases for shared use

New thematic groups: phase one

During PlanCoast project we identified the main thematic fields shared by all (or many) ICZM sectors, on wich it could be possible to work:
Hydrodynamics, Heritage, Hydrographic basins, Coastal water-bearing layers, Sea –Use, Regulations and planning.

Hydrodynamics

Hydrodynamics is one of the thematic fields in the Eurosion project and contains all information relating to marine weather and climate (wind, wave activity, currents, etc).
This data is vital to the following areas:

- coastal risk analysis (erosion, flooding, etc)
- coastal defence planning
- design of coastal area buildings and offshore plants

- design of buildings for fisheries and aquaculture
- etc.

It is important that basic information relating to different areas of the region's coastline can be consulted and contextualised in reference to other information on the region. This task fell to ARPA-SIM, the region's hydrometeorological services department, which was also involved in the Cadsealand project. This department collected and analysed historical data in order to plot the sea-weather climate for the northern Adriatic, and since 2007 it has been monitoring sea-weather parameters for the region (using a buoy moored off the coast at Cesenatico, also part of the European Beachmed-e project).
Arpa-Sim's input has thus helped us to construct a profile of the coastal areas in the provinces of Ferrara, Ravenna, Forlì-Cesena and Rimini. The profile takes into account the following parameters: wind, wave activity and currents.
The data inserted into SIC include the following:

Type	data
Marine currents	Statistics related to intensity
Wind	Polar diagrams
Wave	Polar diagrams
Wave	Grid –forecasting critical events

Tab. 2.8

We hope in future to be able to update and improve the database with more timely and detailed information on littoral currents. However this would require more complex and time-consuming procedures which are unfortunately incompatible with the time and resource constraints of the present project.

Heritage

Heritage is another Eurosion thematic field and relates to areas of great ecological value. We obtained for this thematic field digital maps produced and published by the Emilia-Romagna region as part of the project entitled 'Rete natura 2000' (*nature network 2000*) viewable at http://www.regione.emilia-romagna.it/natura2000 (see fig 2.9). This project was set up as a result of EU Directive n. 43, 1992 which stated that member states must contribute to the creation of the nature network and identify areas of particular environmental value called **Site** of **Community** Interest, (SIC); to these were subsequently added Special Protection Zones (ZPS), provided for by Directive no. 409, 1979. Our coastal towns include 4 SICs, 5 ZPSs and 20 SIC+ZPS for a total surface area of approx 390 km^2 , or 22% of the total surface area of the towns. The digital administration development service and the geographical information service RER also provided maps and data for parks.

Type	Data
Protected area	**Site** of **Community** Interest (SIC)
Protected area	Special Protection Zones (ZPS)
Protected area	(SIC+ZPS)
Protected area	Parks

Tab. 2.9

Hydrographic basins

This field contains information about hydrographic basins. An in-depth knowledge of hydrographic basins along the coastline is an important factor in understanding coastal change. Various data belongs to this area, from geological-geomorphological information to river transportation. The aim here is in fact to extend information contained in the SIC to cover all hydrographic basins in the area. The data

currently available in this field was extracted from studies previously carried out by the Geological, Seismic and Soil Survey (SGSS).

Type	data
Hydrography	Drainage network
Hydrography	River Network
Hydraulic risk	Flooded areas

Tab. 2.10

Coastal aquifers

An in-depth understanding of coastal aquifers is an important factor in spatial planning for the exploitation of resources and the analysis of environmental vulnerability. A critical factor affecting underground water systems in Emilia-Romagna coastal area is the presence and diffusion of salt water in freshwater strata which represent an exploitable or potential strategic resource. At present most data on the quality of underground water is held in the regional water network database (575 wells, of which 112 have chemical process levels only, 143 have piezometric levels only and 320 have both levels). This database is run for the region by ARPA. Data relating to aquifers mainly resulted from studies carried out by the Geological, Seismic and Soil Survey. The following analyses are particularly relevant:

1. The salt water intrusion in deep aquifer systems (from between thirty and several hundred metres in depth). This phenomenon is a particularly important feature of the Ferrara coastal plains and is linked to huge water withdrawals and methaniferous well water that has characterised strata use over the last 50 years. This area saw the undertaking of a specific study which resulted with the publication of a volume entitled Underground water resources of the province of Ferrara (Molinari e al, 2007). This study produced data subsequently used in the production of maps detailing aquifer vulnerability. (fig. 2.11)
2. Salt distribution in phreatic water and confined surface water. This is particularly relevant to the Ravenna area and a specific ad hoc study was carried out on behalf of the Province authorities.

The data collected and processed in this study were connected to salt levels in aqueous layers measured in piezometers via studies carried out in the field or in labs, salt levels in surface water connected to underground water and geoelectric surveys carried out with a view to modelling the saltwater/freshwater strata interface. These are accompanied by maps and related studies such as reports on salt levels in phreatic aquifers and hydrogeological models showing underground layering.

Type	data
Isobath	Isobath confined aquiferous A1 & A2
Isohypse	confined aquiferous A1 & A2
Hydrographic sections	confined aquiferous A1 & A2
Hydraulic parameters	electrical conductivity A1 & A2
Well data	ARPA data A1 & A2
hydrochimica	phreatic aquiferous
hydrochimica	phreatic aquiferous

Tab. 2.11

Sea Use

Coastal zone integrated management and spatial planning for coastal and sea areas both require in-depth knowledge of all activities relating to these areas and the potential for resource exploitation. The creation of a sea-use database is a long and arduous task, involving many different regional and extra-regional bodies.

Offices and bodies contacted included:

- Emilia-Romagna Region: Fishery department; Tourism department; Infrastructure department
- Institute of marine hydrographics

- Eni SPA – Exploration and Production division – Unità geografica Italia
- ISMAR-CNR (Bologna)

What arose from this study is the fact that much of the data needed to create a sea-use databank is not available or would require lengthy processing.
The main data collected so far are found in the table.
Data currently being collected include information on harbours and underwater plants (cable and pipelines).

Type	data
Submarine sand deposits	Dimension of the stocks useful for nourishment
Submarine sand deposits	Location of extraction
Concession boundary	Marittime areas for fish and aquaculture
off-shore structures	Eni's plans
Restricted areas	Fishing Prohibited
Restricted areas	Anchoring Prohibited

Tab. 2.12

Regulations and planning

A further thematic area included regulations governing coastal defences and spatial planning.

Type	data
Normative	Laws and ordinance for coastal areas
Normative	Spatial plans normative
Cartography	PRG Maps
Cartography	PTCP Maps

2.1.2.2 Updating and development of new region-wide maps: Objective 2

The objective results highlighted in points 2 and 3 deserve greater attention because they constitute the most relevant part of the study, and also because they provide new information and new analytical methods, especially in relation to coastal zone vulnerability. It should be noted that these activities required greater funding than that made available by the EU, but we decided to take advantage of this project to launch experimental studies which the Region needed to develop independently of the project.
It became clear right from the beginning of the project that the point of intersection between the activities of the Geological, Seismic and Soil Survey and those of spatial planning would be the production of thematic maps which described the most important features characterising the state of the coast and the vulnerability levels of coastal environments.
Keeping in mind that the region's coastal area is characterised by a high level of anthropic pressure which has pushed urban areas right up to the coastline, it was decided that the analysis should focus on three critical areas: coastal erosion, rising sea-levels and growing salt levels in aquifers.
Objective 2 centred on the updating of the 2005 maps (the most recent flights over the coast dating back to this year) relating to the state of the region's coastline and the accompanying statistical analyses indispensable to spatial planning and management.
The qualitative and quantitative description of the physical features of the Emilia-Romagna coastline, required in updating existing records, are taken from two main cartographical sources: "Coastal Geomorphology" and "land use in coastal areas" relating to 2005.
The production of these maps involved combining georeferenced and orthorectified photo-interpretation techniques for GIS and the Coastal Flight 2005, and analysing altimetric and bathymetric dataset for the Emila-Romagna coastline. The general orthophotomosaic presents a level of accuracy of

planimetric positions referenced to CTR 1:5,000 equal to less than 3 metres. Estimates suggest that the average margin of error in polygonal traces is numerically less than 2 pixel (<2m).

Coastal zone land-use map

In order to obtain a clear picture of the physical and morphological characteristics of the Emilia-Romagna coastal zone, including the beach and the defences, it was necessary to create a Coastal zone land-use map.

Land use map at regional scale was last updated in 2003 (Regione Emilia-Romagna, 2003). Because of the map scale (1:25,000) and the specific aims of this particular document, several important thematisms have been grouped together (3.3.1.0 Beaches, dunes and shores). If we want to ensure a proper territorial management and planning for coastal zones, we must gain further details on items such as dune types and distribution, shoreface, beach, coastal and sea defences –items missing from the common land use maps. The map entitled Coastal zone land-use map 2005 is more detailed (scale 1:5,000) than the regional ones and covers a strip 1.5 km wide from the coastline and a 120 km stretch of land running between the towns of Goro and Cattolica. It was created using GIS technology and photointerpretation technique. Interpreting an aerial photography implies to examine the spatial features with the purpose of identifying them, define their category, limits and relationships with the environment. 26 elements were identified and mapped and can be grouped, following EU directives under 5 principle thematisms: artificial areas, agricultural land, pinewoods and semi-natural areas, water-logged areas and sea areas. The results of the 2005 study show that 29% of the territory is dedicated to agriculture, 33% is represented by urban areas, 31% is related to natural environments (wetlands, woodlands and parks) and only 5% is occupied by beaches and 2% by dunes.

The Emilia-Romagna coastline has undergone significant changes over time, both as a result of natural and anthropic causes. The most obvious of these is probably urbanisation, especially in the area between Cattolica and Rimini. It is for this reason that we decided to map the coastline and compare results in different periods of time, allowing us to carry out a qualitative and quantitative evaluation of the changes undergone. This territorial analysis was done with the help Geographical Information System (GIS) and aerial photographs of the coast belonging to the years 1945, 1982, 2000 and 2005. The results show how urban areas have grown over time, whilst land dedicated to agriculture has diminished over the last century.

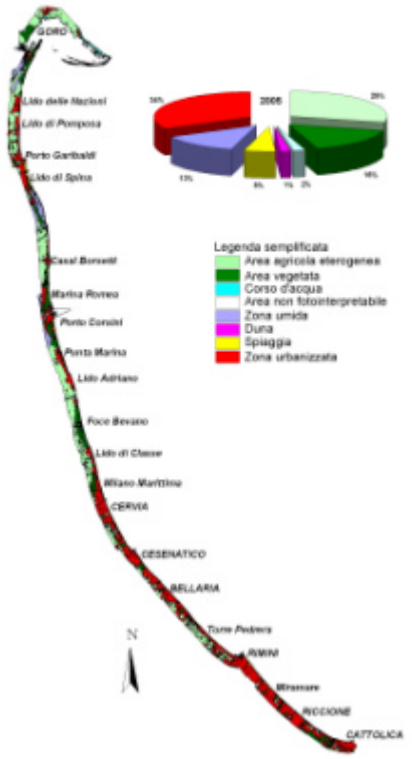


Fig.2. Coast main land –use classes (2005)

Urban expansion and anthropisation in general has triggered changes in beach systems, causing a progressive diminishing of dunes and a huge growth in beach exploitation, with recreational buildings and seafront structures being constructed all over the area. This has obviously had a great effect on the coastal environment and beach erosion.

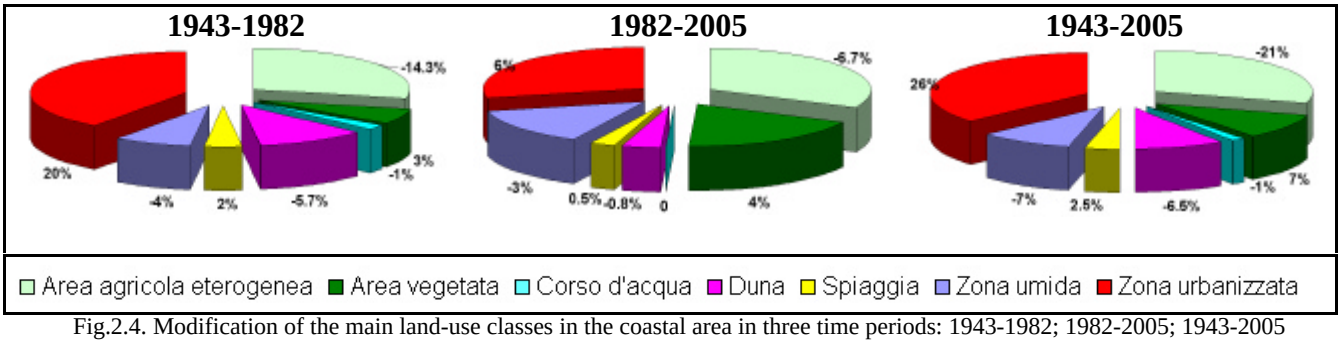


Fig.2.4. Modification of the main land-use classes in the coastal area in three time periods: 1943-1982; 1982-2005; 1943-2005

Coastal geomorphology

The Coastal Geomorphology map 2005 (CGC2005) was drawn up at the same time as the Coastal zone land-use map 2005 and the two are closely linked. CGC2005 is based on the geomorphological photointerpretation of the 2005 ortho-photomoasaic with high-resolution morpho-altimetric data, a digital terrain model (DTM) created using LIDAR technology (Emilia-Romagna Region 2004) and a digital bathymetric model (DBM) created by ENI-Agip in 2006 and made available by the Geological Services (SGSS). Other data used include topobathymetric profiles from the ARPA-IE 2006 report compiled on behalf of the Emilia-Romagna region.

CGC2005 describes the coastal zone on either side of the shoreline, from the dune to the shoreface since morphological element as detectable by aerial photographs, i.e., the external longitudinal bar, coastal and sea defences and shoals.

37 elements were identified and mapped and can be grouped under 6 principle thematisms:

dunes, beaches, coastal and sea defences, shorfaces, river mouths and the lagoon. Mapped coastal defences were taken from the SIC Catalogue of Defences (Perini et al 2007).

The table in figure 2.14 summarises the CGC2005 map legend.

Dune	Beach	Coastal defence	Shoreface	River mouth	lagoon
Active dune	Beach with infrastructures	detached longitudinal structures	Generic shoal	Fluvial bar	lagoon
Semi-stable dune	Free beach	adherent longitudinal structures	Shoal with bars	Mouth bar	Lagoonal inlet
Stable dune	Low tide terrace	transversal structures	Composite shoal	River mouth shoal	Tidal channel
	Washover fan	multiple structures	Shoal with scouring and rip-current	Beach ridge	Tidal delta
		Submerged multiple structures	Shoal in front of sea-wall		Tidal flat
		Submerged detached longitudinal structures	Shoal close to transversal structures		
		Submerged transversal structures	Shoal close to submerged defence		
		Sea-wall	Tombolo		
		Jetty	Backbarrier shoal		
		Armoured river mouth			
		Groynes			
		Minor infrastructures			

CGC2005 and the land use map together constitute the general tools for studying the Emilia-Romagna coastal zone. Indeed, it was from these latter that we extracted data subsequently used in creating the specific thematic map used in describing the current state of the coast as well as in the coastal vulnerability analysis which referred particularly to the Ferrara coastal area.
Subsequent to an in-depth study of SIC information and the assessment of experience gained in this field both in Italy and abroad (DiSGAM-ARPA Friuli Venezia Giulia, 2003), these geo-indicator elements were selected as most suitable in terms of representing the physical characteristics of the coast and studying coastal vulnerability.
The main geo-indicators, analysed across the region as a whole and taken from CGC2005, were as follows:

- Shoreline
- Beaches
- Dunes
- Coastal Defences

We should emphasise the point that the CGC2005 has great potential as an instrument for territorial analysis and greater space will be attributed to these results in the section reporting on coastal vulnerability in the Ferrara area.

Shoreline

The 2005 shoreline was traced on the 2005 orthophotomosaic using the berm crest and where this was not visible, the wet/dry boundary (Moore, 2000, Calabrese and Lorito, 2007). This corresponds to the seaward limit of the beach mapped into CGC2005. This shoreline was subsequently subdivided according to the three categories outlined by APAT:

- protected
- false
- natural

The protected shoreline corresponds to the coastline where defences have been constructed, as reported in the CGC2005 and the SIC Catalogue of coastal defences 2005. The database contains information about the different types of coastal defences (groyne, jetty, sea wall and breakwater, either submerged or emerged).
By natural shoreline we mean the coastline not protected by coastal or sea defences.
By false shoreline we mean a not real coastline created as a result of openings which interrupt the shoreline in proximity to river-mouths and harbours. In the database the types of opening is indicated by “natural mouth” where the river mouth is natural and not man-made, “jetties” where the opening is a port.
Those parts of the coastline belonging to lagoon areas between Volano and Goro were also identified.
A quick and useful analysis of this data allowed us to plot the incidence and positions of the various different types of shoreline present along the Emilia-Romagna coast in 2005, and revealed that 57% of the shoreline was protected artificially.
The 2005 shoreline was also used to update the shoreline variation analysis which began in 1943; the results for the Ferrara coastline will be displayed below as part of the vulnerability analysis.

Fig 2.5.: Example of photo-interpretation of the shoreline and typology attribution

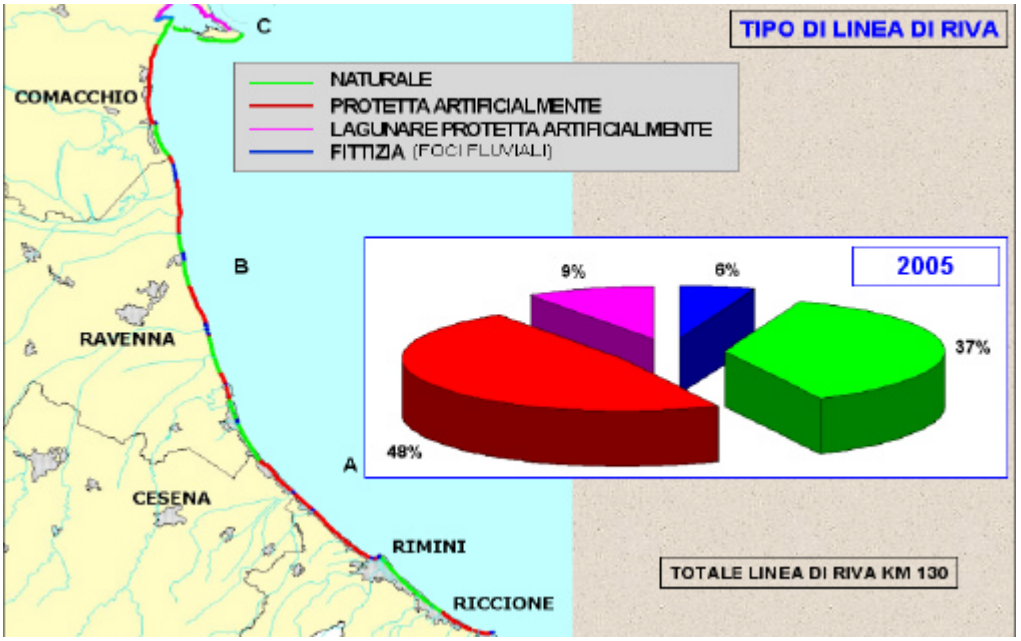


Fig 2.6. Shoreline typologies along the emilia-romagna littoral; the graphic indicates the total linear length, in percentage, of each typology

Beaches and shores

The beach is a prime factor in analysing the current state and vulnerability of the coastal zone.
Three factors were considered in this regard: use, width and altimetry.
For the item beach use we differentiated between free beaches and built-up beaches containing specific permanent infrastructures (restaurants, beach houses, car parks, etc).
The free beach refers to that stretch of beach exposed to morphodynamic coastal processes, whilst built-up beach areas containing infrastructures are often 'cemented' and thus are not exposed to natural coastal dynamics: 25% of the total area is covered by infrastructures and are mainly found in the Rimini area. The width and altimetry analyses provide data indispensable to vulnerability and coastal erosion assessments, and the analysis of sea ingression into the Emilia-Romagna coast.
Beach width was calculated using a GIS automatic process; transects were traced perpendicular to the shoreline and the beach was segmented into sections 20 metres apart and stretching from the shoreline to the land-edge of the beach.
Altimetric values for the beach were taken from the Digital Terrain Model (DTM) produced by the LIDAR analyses (RER-SGSS, 2004). Given that the beach profile displays a high level of variations, we decided to use as our altimetric reference the point where the beach ends, because this point seemed to be the least effected by seasonal, natural and man-made changes. The point where the beach ends was mapped onto each transect in order to draw up widths and hights for the whole beach area on the coastline.
The thematic beach map shows how this data is used to assess the beach characteristics along the Ferrara coast: 42% of the coast is covered by narrow beach areas or areas where there is no beach (from 0 to 20 m), whilst wide beaches (120 – 200 m) and very wide beaches (>200 m) account for only 15% of the total area.

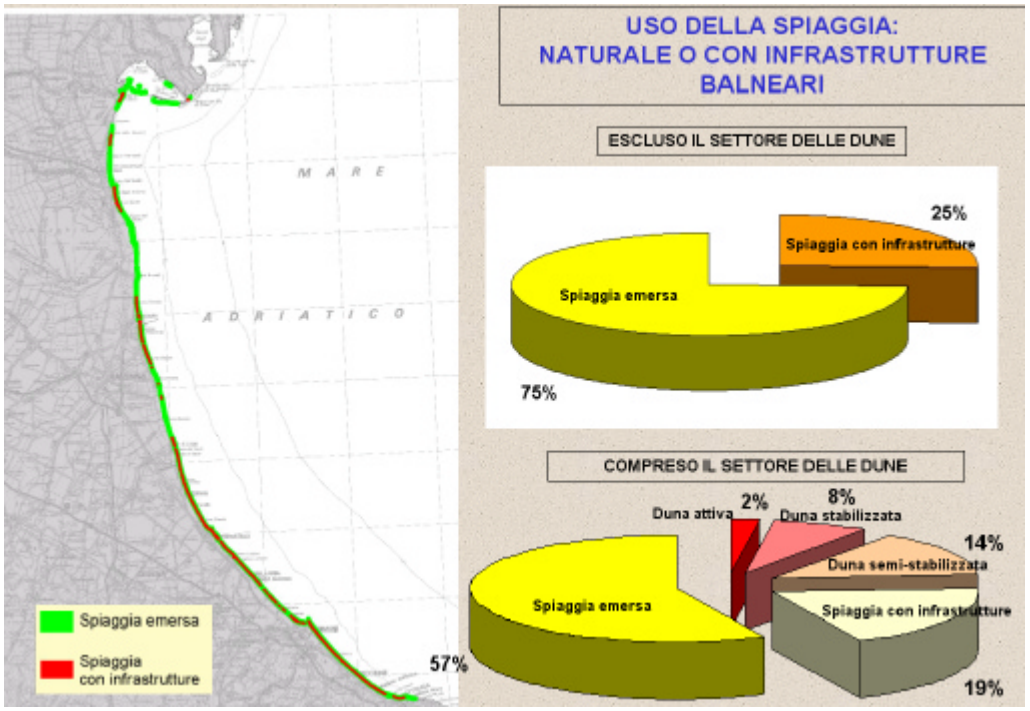


Figure 2.7 Percentages for the various elements constituting the dune/beach system of the Emilia-Romagna coastline. It also shows the distribution of built-up beaches along the coastline.

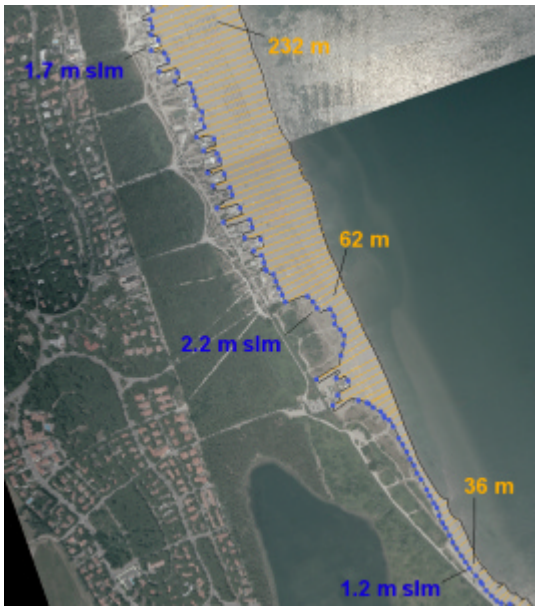


Fig. 2.8 example of the analysis undertaken for the beach: the orange transect measure the width whilst the blue dots show altimetric levels.

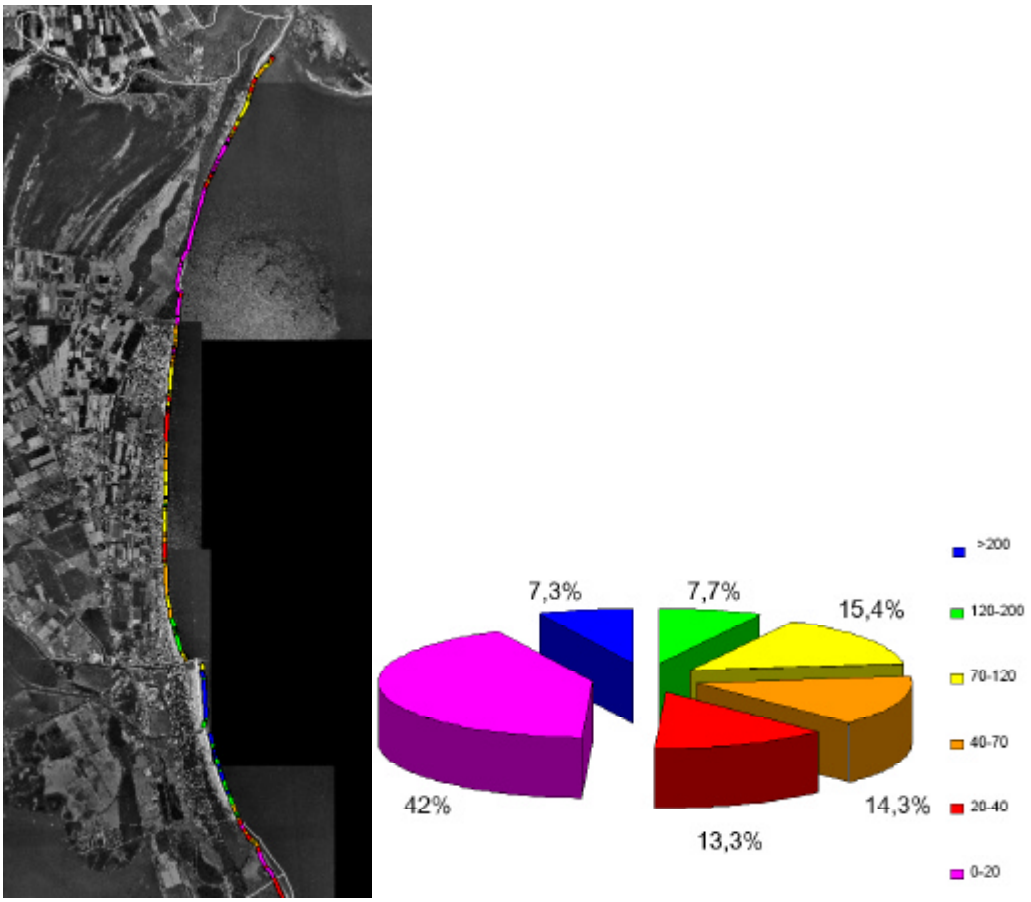


Figure 2.9. Distribution of beach width classes along the Ferrara coast accompanied by a diagram showing beach lengths for each class.

Dunes

Along with beaches, dunes are one of the most important geo-indicators as they provide direct information about the current state of the coastline and are one of the factors analysed in assessing coastal criticity. CGC2005 allows for dunes to be analysed in several ways, including their distribution along the coast, level of maturity (active dune, semi-stable, stable), continuity (possible presence of openings) and altimetry.

Dunes are concentrated around the Ravenna and Ferrara coasts and are absent from the Rimini coast; most dunes are in a stable state and a very low percentage are active (in 2005); the dune/beach relationship was analysed, taking into account the surface area occupied by dunes and that occupied by beaches.

We can also highlight the morphological characteristics of the dune/beach system using a DTM which identifies the dune crest and those areas where the dunes have been flattened to make way for infrastructures.

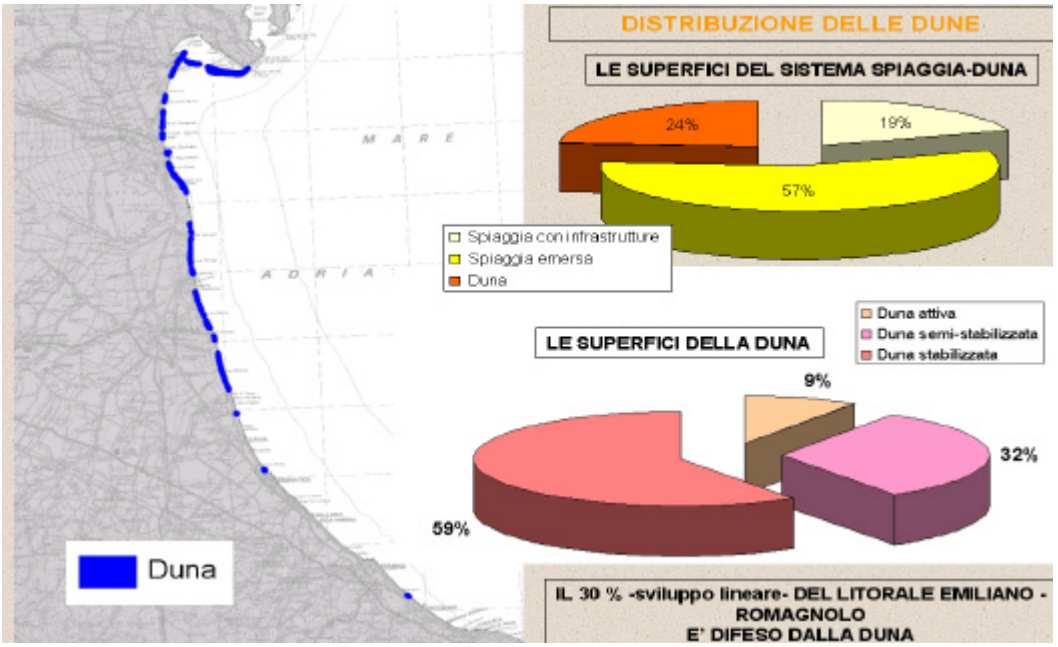


Figure 2.10. Distribution of the dunes along the Emilia-Romagna coast; the diagrams show the area occupied by the dunes in the dune/beach system and give percentages relating to the type of dune (active, semi-stable, stable).

Figure 2.11 shows a map illustration of the above sea-level beach and sand dunes; the dunes are shown to be either active, semi-stable or stable; we can highlight the morphological characteristics of the dune/beach system using a DTM which identifies the dune crest and those areas where the dunes have been flattened to make way for manmade infrastructures.

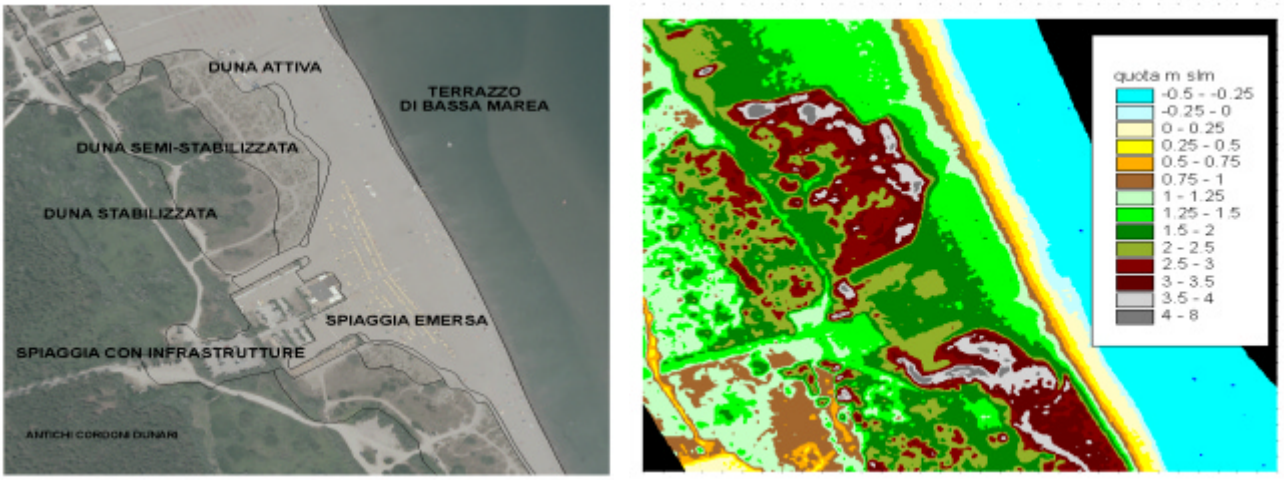


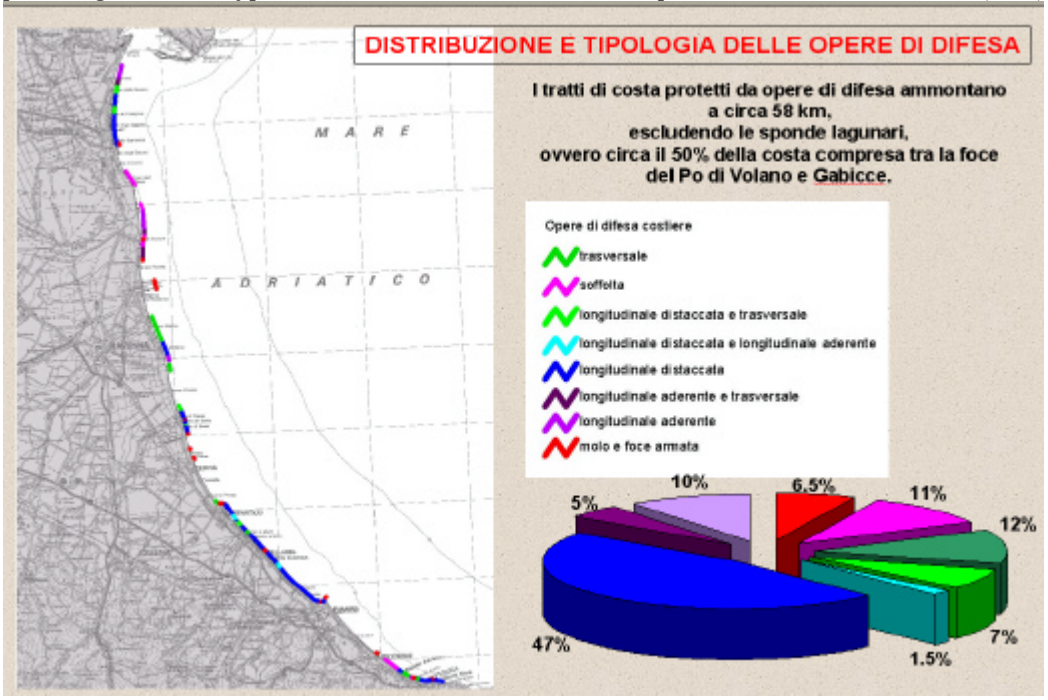
Figure 2.11. Photointerpretation of dunes and beach and comparison with DTM.

Coastal Defences

Coastal defences mapped by CGC2005 correspond to those appearing in the Catalogue of Coastal Defences 2005 which has already been referred to the discussion on the Coastal Information System (Thematic Group 9 – coastal defences).

It was necessary to include these defences in the CGC2005 because they play an important role in the coastal system, interacting with the coast's morphological processes and creating new marine ecosystems. Indeed, many of the mapped morpho-depositional elements, i.e. shoals, are closely linked to the presence of defences.

Figure 2.12. Distribution and type of defences along the Emilia-Romagna coastline in 2005; the diagram presents percentages for each type of structure and identifies the clear predominance of breakwaters (47%).



2.1.2.3 Cartographical instruments applied on a province-wide scale, application of SIC to the pilot project outlined in WP4: objective 3

Given that Work Package 4 provides for the application of ICZM guidelines to the PTCP for Ferrara, we decided to carry out an in-depth study of the environmental vulnerability of the coast, analysing vulnerability against insediative systems and PTCP objectives, with a view to identifying limitations or possible directions for the project.

The first step was to carry out an in-depth analysis of territorial criticity (see Information frame: Vulnerability of the coast's physical system.)

This study was slightly compromised by the unavailability of certain data, meaning that certain topic areas, such as saline contamination of water table aquifers, could not be analysed.

For each area of criticality analysed we identified the principle monitoring indicators (Fig 2.15) which were used in vulnerability analyses and map production, as described below.

Critical factors	Vulnerability indexes
River Flooding	Geomorphology Events frequency
Coastal erosion	Beach width Beach elevation Coastal slope Shoreline accretion/erosion rate Subsidence rate Artificial defence
Flooding due to sea-level rise &/or storms	Topography Subsidence rate Wheather condition (sea state) Sea level rise
Salt Intrusion of aquifers	Geological setting Hydraulic parameters Resistivity Aquifers exploitation

2.2 Province-level application of Integrated Coastal Zone Management guidelines – WP4 "Proposal of Spatial Plan according to ICZM principles"

The pilot project aims to strenghten to role of spatial planning in the ICZM implementation process. The Plan is still currently being designed and in particular in the phase of collecting data for the Analysing of the Stocktake.
The pilot project was used to broaden useful themes and elements of the coastal system for inclusion in Stocktake on the basis of the analysis of the sector-specific themes contained in ICZM guidelines.
It was applied a simplified assessment methodology to verify coherence between the various planning choices and the state of the territory as described in the Stocktake.
The process comprised the following stages:

- The analysis of the state in different sectors aimed at identifying and defining specific problems and criticality relating to different thematic profiles;
- The drawing up of a document (Stocktake) describing the state of environmental, territorial and infrastructure resources by "sensitive/significant topics" to the territorial planning;
- An integrated assessment of the different levels of criticality;
- Adoption of the plan's objectives;
- Evaluation of criticality in relation to these objectives in order to identify preliminary criteria, directions and conditions related to the feasibility of the plan's possible actions.

The above activities were carried out with respect to the following thematic sectors set down in the ICZM guidelines:

1. Physical coastal system, risk factors and defence strategies
2. Pollution, water resource management, monitoring
3. Ports, ship wastage, sea-transport risk
4. Habitat, biodiversity and landscape
5. Tourism
6. Fishing and aquiculture
7. Agriculture
8. Energy policies
9. Urban Settlement system and infrastructures (service and mobility).

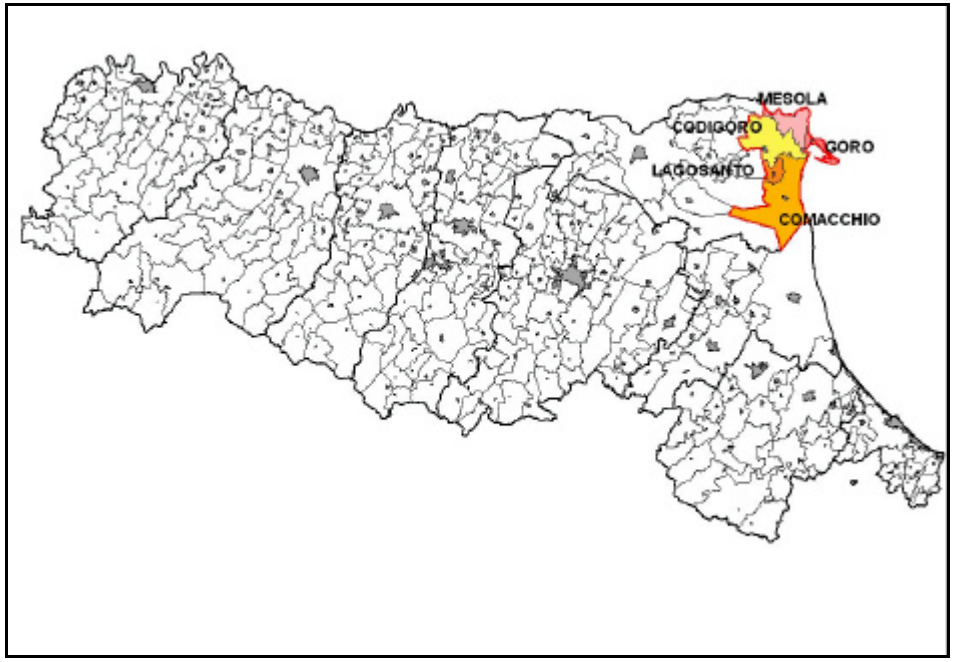
What this therefore amounts to is the drawing up of Cognitive Frame describing typical themes to coastal systems.

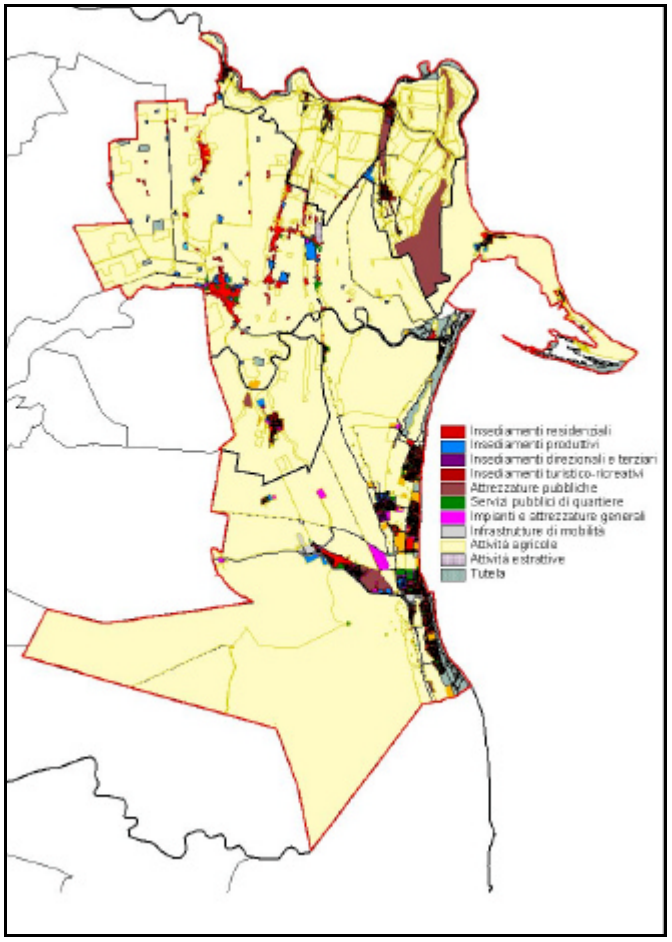
The pilot project aimed to design a Coordinated Territorial Plan (PTCP) for the province of Ferrara and, more specifically, the 5 coastal municipality of: Codigoro, Comacchio, Goro, Lagosanto and Mesola.

Description of the project area

Ferrara Province coastal system	**5 Municipalities: Codigoro, Comacchio, Goro, Lagosanto, Mesola.**
Total inhabitants (31/12/2006)	**51.354**
Project area extension	**604.152.000 Ha**
Territory	**coast**

Project Area **Urban framework and territorial asset**





Considering the preliminary phase of the Coordinated Territorial Plan of the Province, the pilot project has so far covered only a few of the above thematic fields and to differing degrees of completeness. These include:

1. Physical coastal system, risk factors and defence strategies
2. Pollution, water resource management, monitoring
4. Habitat, biodiversity and landscape
5. Tourism
9. Urban Settlement system and infrastructures (service and mobility)

For the remaining fields the project has not yet progressed beyond defining and elaborating the assessments contained in the ICZM guidelines.

Particular attention was devoted to thematic field no. 1 which relates to the physical coastal system. The methodology employed to study sectors involved in coastal vulnerability was characterised by a high degree of innovation.

Drafting of a Cognitive Frame on the state of infrastructures, territorial and environmental resources based on the territorial plan's "sensitive/significant topics" and Synthesis of existent and potential criticality

The Cognitive Frame is a constitutive element of the plan and necessary to define the objectives and plan contents and assesses environmental and territorial sustainability of the effects of its implementation.

Evaluation of the coherence on Plan choices have to consider the laws, the prescriptions coming out from regional territorial planning and the indications based on the Cognitive Frame.

The Cognitive Frame therefore represents the area within which to assess whether the plan's choices contradict the current status quo.

What this means is that any evaluation must be preceded by an overall general assessment of the state of the territory. The Cognitive Frame can therefore act as this overall general assessment and must present only the information needed to be able to evaluate planning choices.

In order to draw up this Cognitive Frame we must first determine the points of intersection between the plan's actions and areas of responsibilities, and the "sensitive/significant topics" of the environment and territory.

"Sensitive/significant topic" is an environmental element, a resource (material or immaterial), or an anthropised or natural aspect of the area, sensitive to planning and which is either modified by or contributes to the modification of the plan itself.

The Cognitive Picture of the project area has been developed through the stocktaking, data collecting and analysis of the following themes:

- land use dynamic;
- Physical coastal system (geographical and geomorphologic features, coastal environment dynamic, physical coastal vulnerability);
- Pollution and water resource management (marine water quality, water balance and supplying system, sewages and waste water treatment system);
- Habitat, biodiversity and landscape (the coastal system and the landscape units, landscape and coastal territory ecosystem);
- Urban settlement system and infrastructures (urban coastal system, urban coast, road system, port and water transport infrastructure, electromagnetic pollution).

Identification and evaluation of current and potential criticality for the various "sensitive/significant" topics

Once the Cognitive Frame had been drawn up, the provincial planning objectives and policies were accepted (see "Project idea for the Delta town") and the different areas of actual or potential criticality were identified for the different systems and themes.

We carried out a first level of general analysis of criticality present in those areas where the provincial plan will implement territorial policies and transformative actions.

The "Project idea for the Delta town" began from an analysis of the Cognitive Frame and identifies eight coastal geographical "contexts" to which provincial planning policies and actions can be applied.

The pilot project examined, in the eight territorial context the principle sensitive topics for the various ICZM profiles, assessing in each case whether those factors which interact with planning features actually increase or decrease the level of risk associated with natural or anthropic systems, population settlement patterns and infrastructures. This process is represented in some interaction matrixes, as many as the contexts.

These interaction matrix also enabled us to forge an initial global interpretation of the various levels of criticality for the areas subject to territorial policies and urban transformation projects.

It is useful to note that for each instance of criticality analysed represent the level of difficulties that provincial and municipal administrative bodies will face and solve to implement the actions of own territorial plan.

This enabled us to tentatively shape planning choice definitions in line with ICZM guidelines and to provide for their efficient and productive insertion into territorial and urban planning processes

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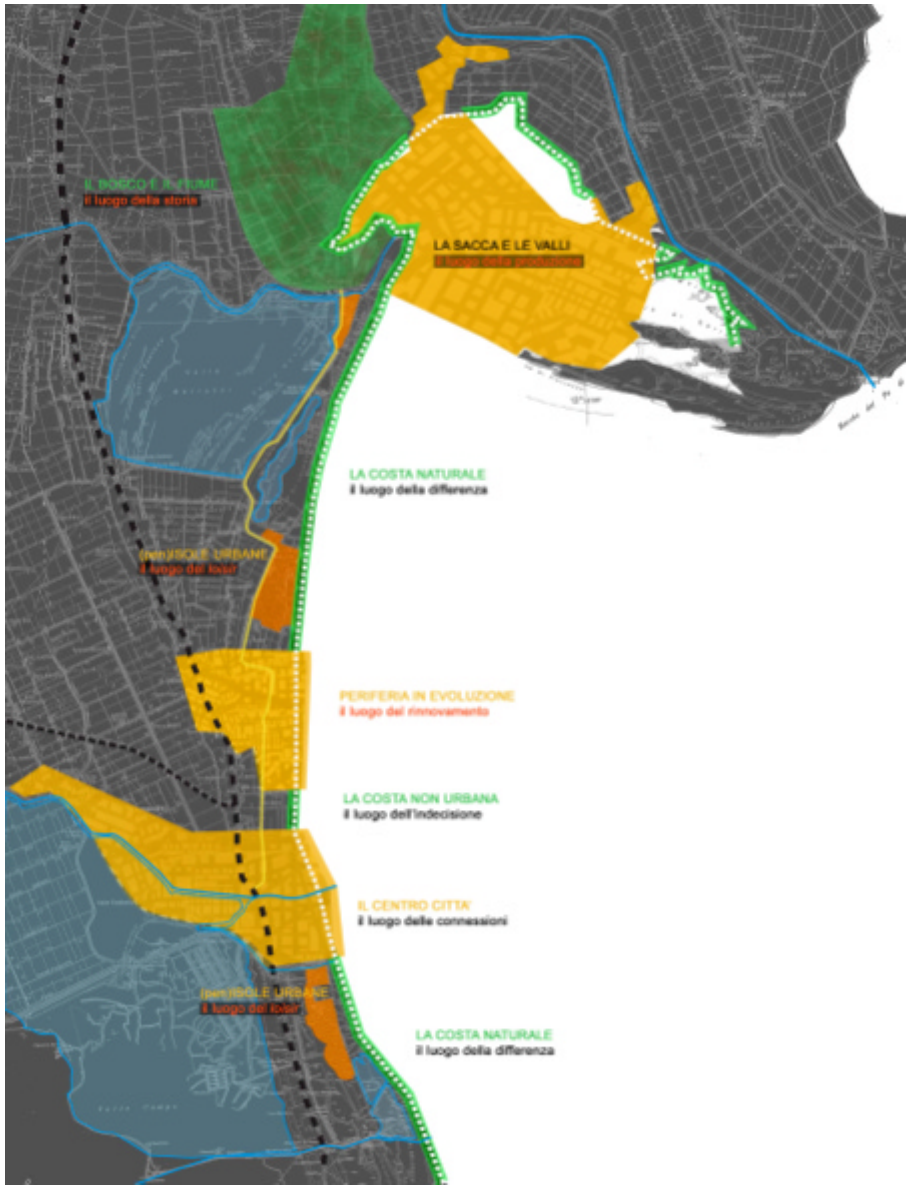


"DELTA TOWN" idea-project

This project extends what was outlined in the Information Document and aims to supply a detailed description of the province of Ferrara's coastal zone. The project is in line with the principle rules defined in the current PTCP (province-coordinated territorial plan) and the Territorial Plan for the Po Delta Park ("Stazione Centro Storico" and "Stazione Volano-Mesola-Goro"). It also acts as a potential source-document to be used in local planning activities, especially the Comacchio Structural Plan for which the town authorities, the Province and the Region have already signed a territorial agreement.

The project seeks to present a global interpretation of this complex urban organism which is composed of specific individual parts, together forming a system which we have defined as "Delta town" with the town of Comacchio at its organisational centre.

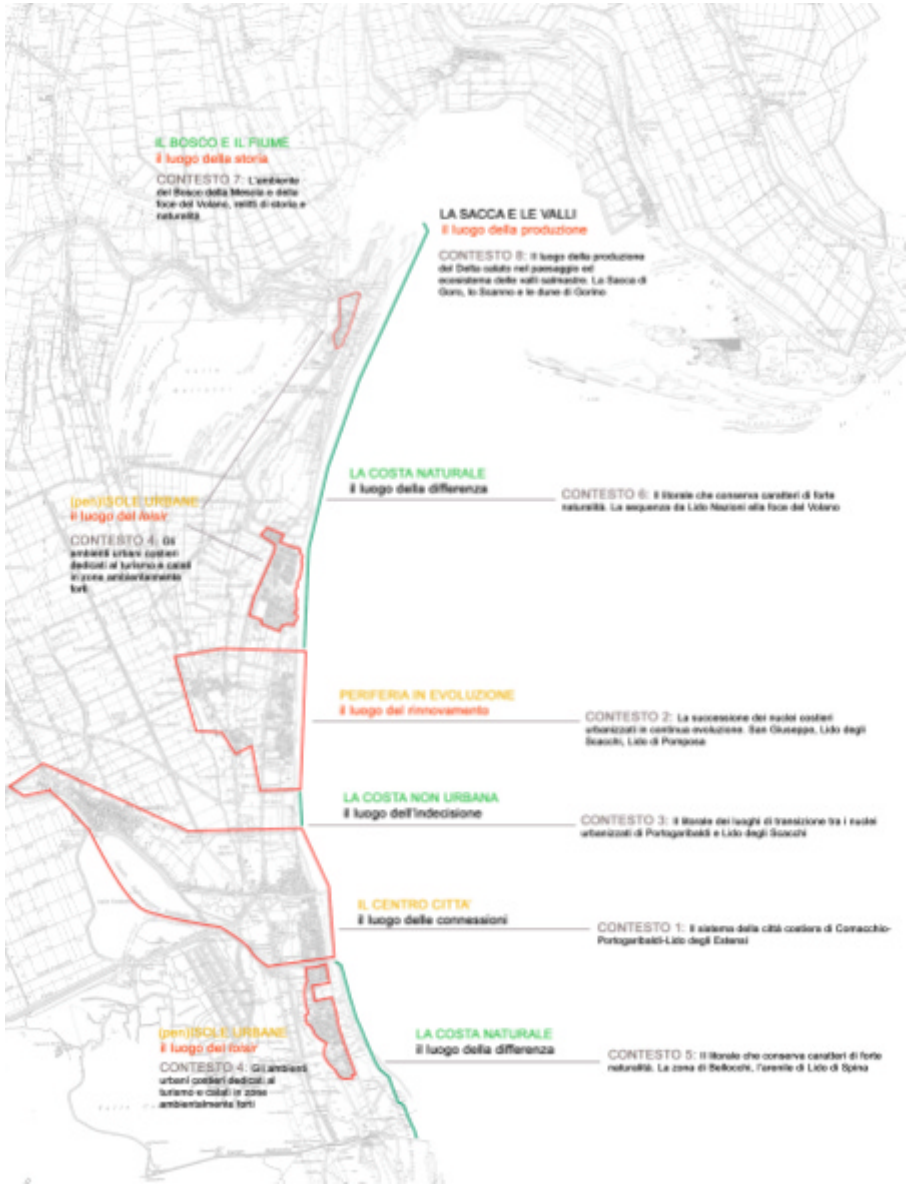
The interpretative reading to which this sample area of the northern coastline is subjected shows how this area is different from what we might call "coastal towns", a definition which might be applied more readily to the coastal zones in central and southern Emilia Romagna. The Delta area is characterised by a high degree of complexity where built-up urban areas are flanked by open countryside reserved for environmental or natural purposes. What such an approach means is that each of the seven *Lidi Comacchiesi*, or Comacchio beach stretches, which are usually analysed as one uniform unit, can now be examined individually in order to evaluate the specific features and purposes of each.

The interpretative reading model for these Delta town allows us to subdivide them into geographical "places" which can be delineated on the map. These different places correspond to different "contexts" whose perimeters can be traced in a simplified system.

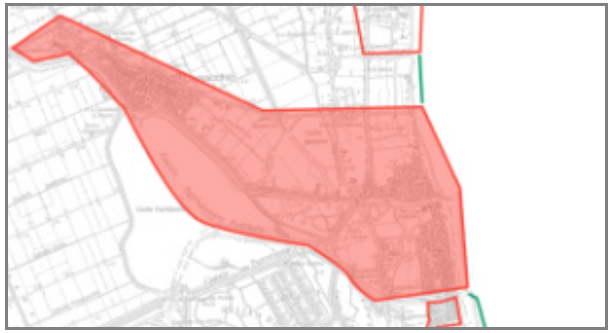
This exercise was designed using ideogrammatic summary charts highlighting the project's main concept. By subdividing the area we were able to demarcate the different stretches of beach which would undergo an in-depth evaluational analysis on the part of the Geological Services team aimed at assessing physical and natural vulnerability.

The goal of this interpretative strategy is to contribute to reducing the burden that built-up areas have on the natural environment. At present the territory's "consumption" is concentrated around those areas more specifically dedicated to urban purposes, and yet we hope to introduce a practice that promotes the protection and appreciation of environmental features pertaining to these beach areas which have managed to acquire, or which can be encouraged to acquire, a balance between controlled anthropisation and a strong natural component.

Territorial Contexts			Areas included
1	**Town centre**	*A place of connections*	Comacchio, Portogaribaldi, Lido Estensi
2	**The changing periphery**	*A place of renewal*	Scacchi, Pomposa, San Giuseppe
3	**Non-urbanised coast**	*A place of indecision*	PortoGaribaldi north – Scacchi south
4	**Urban peninsulas and islands**	*A place of leisure*	Spina, Nazioni, Volano
5, 6	**Natural coastline**	*A place of difference*	Spina, Bellocchi, Nazioni, Volano, Valle Bertuzzi…
7	**Woodland and river**	*A place of history*	Po di Volano, Po di Goro, Canal Bianco, Bosco della Mesola
8	**Inlet and flat marshland**	*A place of production*	Sacca di Goro, Scanno sandbank and the sand dunes of Gorino, Valli di Comacchio



Context 1 – Town centre – A place of connections



In the context of the "Delta town" which, unlike other coastal towns, are characterised by the co-existence of "built-up" and "empty" spaces, urbanised areas and woodland, the town centre must obviously be considered a built-up area due to the predominance of urbanisation. This area is in fact the nucleus of the coastal system and is the place where the town's urban functions and services intersect. It comprises the old town of Comacchio and extends towards the sea at Portogaribaldi and Lido degli Estensi.

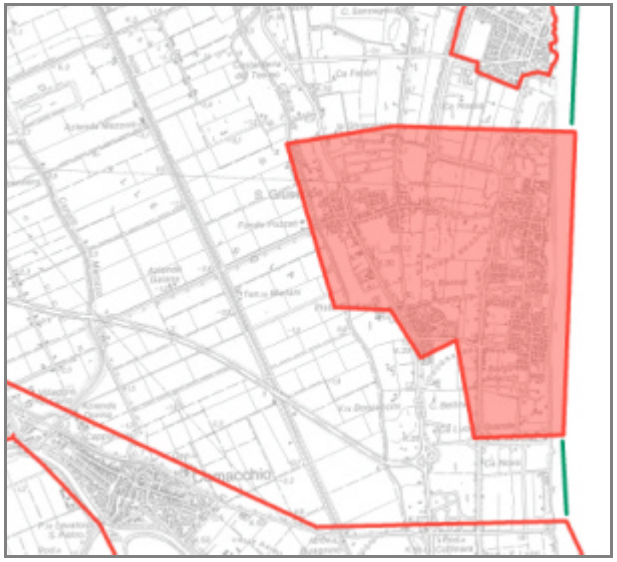
The town's services and functions experience no seasonal fluctuations. The area studied encompasses the port as well as Portogaribaldi and Lido degli Estensi, the most concentrated tourist areas of all "old towns" in the province of Ferrara.

A road network runs from east to west which leads alongside Valle Fattibello and links Comacchio to Portogaribaldi. A section of the main road S.S. Romea runs along the north-south axis; here the traffic is at its heaviest and shops and services flank the road. These two axes intersect where the S.S. Romea crosses the final stretch of the waterway linking the centre of Comacchio to the sea. This road crosses the waterway at a heavily congested bridge which is often the cause of traffic jams.

Comacchio, the "old town" part of this area, sees a high concentration of urban functions and is a town of historical importance. Portogaribaldi is the first of the coastal settlement areas in the province of Ferrara and is quite residential in character, though this is not merely the result of tourism, and includes a fishing port (all its fishing-related activities take place here). Lido degli Estensi with its shopping centre is the largest, most well-known and fashionable of the seven *Lidi*. Estensi also functions as the area's nautical hub and, being at the end of the navigable Ferrarese waterway, houses port machinary and facilities.

A place of connections	**Policies**
	Unite the Comacchio-Portogaribaldi population settlement systems
	Enhance general services and services for the public
	Identify the main congestion point of the S.S. Romea road
	Actions
	Completion of expansion work being carried out to the east of Comacchio's old town
	Concentration of production activities, large-scale commerce and territorial services to the stretch of S.S. Romea running between Collinara and the Superstrada (dual carriage way)
	Development of a single port system running from Comacchio's ex-sugar factory to the edge of the sea
	Reclaim unused land and improve remaining areas
	Investment in existing and new hotel facilities

Context 2 - The changing periphery – A place of renewal

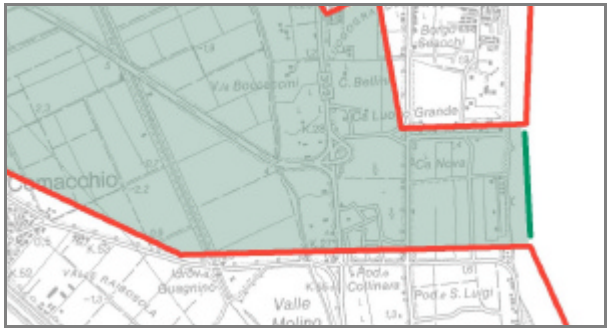


Situated north of Portogaribaldi, the two beach areas at Lido Scacchi and Lido Pomposa tend to be seen as a single unit. The main function of both is tourism-related and over time a single conurbation was formed linking these latter with the district of San Giuseppe which, being on the S.S. Romea main road, has forged for itself an individual identity with respect to the two seaside towns. The two *Lidi* attract many families as a good number of hotels, guesthouses and holiday flats are located here. Yet the tourist industry in this area suffers as a result of there being an insufficient number of hotels and residential accommodation. In fact, these two areas have suffered more than any other as a result of building development and this has turned this space into a sort of coastal suburb rather than a holiday resort. Lido di Pomposa is the worst hit and its seafront is lined with very tall buildings which cast shadows over the beach.

This area is intersected on the north-south axis by a stretch of the S.S. Romea main road, whilst its seafront zone is bordered on either side by pre-existing free open beaches with open-air tourist facilities.

A place of renewal	**Policies**
	Favour the development/refurbishment of existing buildings and urban improvement over new construction
	Favour tourist capacity by creating multi-site hotel complexes
	Actions
	Stop urban spread northwards and southwards
	Favour urban re-development projects, building refurbishments and the consolidation of volume in order to increase the number of green areas
	Alleviate anthropic pressure on the stretch of S.S. Romea main road running through San Giuseppe
	Redevelop the seafront favouring non-intensive features and green areas
	Re-incorporate fringed areas by eliminating the gaps between urban zones, agricultural zones and natural areas (Acciaioli and Romea)

Context 3 – Non-urbanised coast – A place of indecision



A place of indecision	**Policies**
	Subject this "place of indecision" to a choice: fortify its natural characteristics – stop urban sprawl spreading into this area (see contexts 2-6)
	Actions
	Fortify natural and environmental characteristics
	Alleviate the burden of tourism-related factors
	Guarantee the construction of sand dunes and passive sea defences

The short stretch of beach running between Portogaribaldi and Lido degli Scacchi is the coastal zone of an inland area presenting a low incidence of urbanisation – it is characterised by stretches of quite anonymous and fragmentary countryside and is crossed by the S.S. Romea main road and one of the slip roads leading off the Ferrara-Coast road. Nearby built-up areas tend to extend into this area.
This area is an intermediary area which we define as a "place of indecision" because it is not characterised by a precise function or specialisation and, as such, is an "in progress" site requiring decisions regarding development.
Portogaribaldi's seafront has begun to spill over into this area's free beach opposite an area equipped with an open air campsite for tourists. This then leads down to the urbanised coast where the Lido di Scacchi complex is located

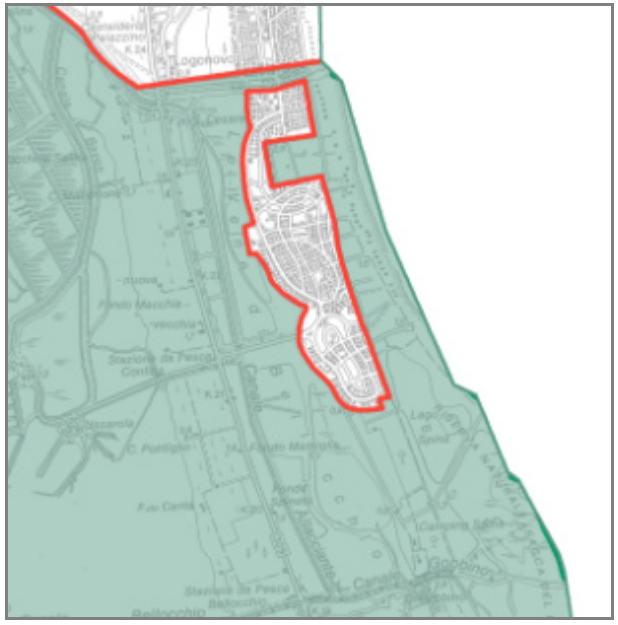
Context 4 – Urban peninsulas and islands – A place of leisure

Lido di Spina is the southern-most seaside area and is built around the old sand dunes. It is separated/linked to the Lido degli Estensi by the Logonovo canal. Tourist accommodation facilities consist mainly in small villas and bungalows used as "second homes". Characterised by the luscious green pinewood, the area has the feel of an "island" or "peninsula" and is flanked by the sea on one side and the lagoon on the other. The urban lay-out of the area has an unusual though coherent profile – it has no seafront road nor main road network running through it; rather, what we find is a system of curving lanes or trails which traverse the whole area.
The built-up areas are interrupted by green spaces (sections of pinewoods and sand dunes) and two of these areas have been equipped with open-air tourist accommodation facilities (campsites). The built-up area to the west – the furthest away from the sea – gives onto the Vene di Bellocchio marshes, though these natural areas have an indistinct character. The stretch of beach running in front of the urbanised area of Spina has been equipped with tourist accommodation facilities (see urban coastline, context 5). Lido delle Nazioni is located north of Pomposa and is the penultimate of the seven *Lidi*, situated between the Acciaioli dyke and the S.S. Romea. Its in-land areas border with the widest section of the Delta, where the Bertuzzi marshes, the Canneviè oasis, Taglio della Falce and the Volano pinewood are situated. To the north-west, we find the artificial lake which is an integral part of the natural environment and is the focus for tourist activities which are quite distinct from seaside tourist activities. Lido delle Nazione is a sort of "unfulfilled project" – it was planned as a "garden town" with expansive green spaces and recreational facilities integrated into the urban structure – though it developed into something somewhat different from this initial idea (now housing different types of small villas and tall buildings). The seaside area lacks definite character dues to its fragmentary nature.

This area's seafront houses tourist facilities and has recently undergone development resulting in the separation of the built-up area from the beach, whose natural environment is enhanced by the presence of sand dunes (see natural coastline, context 6).
Lido di Volano is near Scannone del Po and is the *Lido* with the highest concentration of natural, uncompromised features. The built-up area consists in small family villas separated from the beach by a long strip of pinewood which gives the area the feel of a natural park, and which enhances the beach as the area's focal-point.

A place of leisure	"Urban islands and peninsulas"
	Policies
	Consolidate population settlement features
	"Give the area back its tourist services"- towards their re-appropriation
	Actions
	Maintain the separation between urban systems and natural systems and limit expansion
	Promote the development of recreational tourist functions linked to the specific characteristics of this area
	Promote the development of slow roads and trails running from the seafront through the urban area and out into the surrounding countryside

Context 5 – Natural coastline – A place of difference



As is the case with the stretch of coastline running from Lido delle Nazione to Volano, the coast stretching from the Logonovo canal southwards down to the border with the province of Ravenna is characterised by a high number if natural areas.
The beaches located in front of Spina's urbanised area are equipped with tourist facilities. The width of these beaches, the stretches of free open beach with their sand dunes and the edges of the nearby pinewoods which lie behind the beach, all contribute to giving this stretch of coast the most significant natural system of the whole Delta – and this is especially true of the area around Bellocchio.
Lido di Spina, which is the seaside area furthest south of Comacchio, is built around the old sand dunes and is a peninsula flanked by the sea on one side and on the other by the lagoon, and is covered in luscious green pinewoods.
It is here that the S.S. Romea road crosses the Vene di Bellocchio marshes and as such has a strong impact on eco-systems.

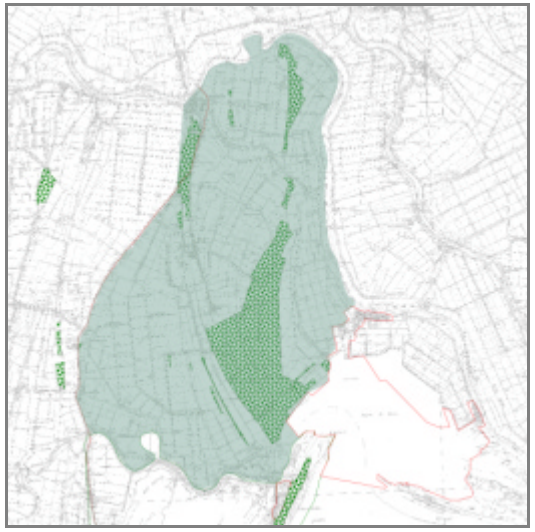
A place of difference	**Policies**
	Consolidate population settlement features
	"Give the area back its tourist services"- towards their re-appropriation
	Actions
	Consolidate natural and environmental characteristics
	Alleviate the burden of tourist accommodation along the coast
	Guarantee the construction of sand dunes as a form of passive sea defence

Context 6 – Natural coastline – A place of difference

The stretch of beach running between Lido Nazione and the Po river mouth at Volano is characterised by a high number of natural spaces. The beaches located in front of the urbanised area are equipped with tourist facilities. However, along certain stretches of the free open beach we can still find sand dunes, and as such we might consider this area as the tail-end of a broader area defined as "natural coastline". The natural environment here has a particularly strong character, mainly because it is connected to the natural spaces further inland (the Nazione lake, the Bertuzzi marshes, the river mouth at Volano).
While the coastline in front of the Nazione lake presents evidence of erosion, the remaining coastline beyond this is once again characterised by beaches equipped with tourist facilities; the beach at Volano attracts tourists, though fewer than other areas. Tourist accommodation facilities consist in temporary structures; in the summer months, the long strip of pinewood separating the sand dunes from the built-up area is equipped with tourist facilities and a car park. There are no hotels in this area.

A place of difference	**Policies**
	Consolidate natural characteristics
	Actions
	Consolidate natural and environmental characteristics
	Alleviate the burden of tourist accommodation along the coast
	Guarantee the construction of sand dunes as a form of passive sea defence
	Ban the development of further strips of beach
	Encourage the transformation of existing structures into eco-friendly seaside complexes

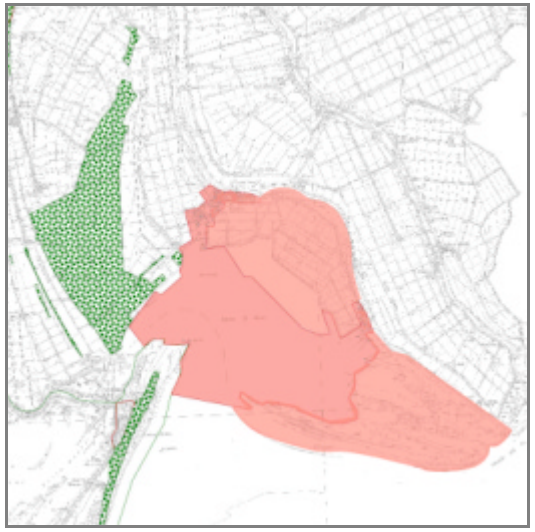
Context 7 – Woodland and the river – A place of history



The environmental features of this area are particularly significant. Nature and history exist side by side in this area of the Delta which, for a short stretch, flanks the estuary waters at Sacca di Goro. It is due to the concentration of historical sites of interest that we have decided to call this area "a place of history". This wealth of natural and historical features limits development and construction work, yet at the same time, if managed properly under a single integrated project, this area could become the community's main economic resource.
The following pinewoods and woodland areas – Gran Bosco della Mesola, Bosco di Santa Giustina, Bosco di Panfilia, Bosco Spada, Pineta della Ribaldesa, Pineta di Motte, Pineta di Fondo, Pieta del Dossone and Pineta della Celletta – spread across the whole area stretching from Po di Goro northwards towards the river mouth at Po di Volano. Near these woodland areas we find strips of dried riverbed (these are found between Mesola and the Po river mouth at Volano) as well as the residue of marshes distant from the sea, such as those found at Torre Abate and Lago di Fondo.

A place of history	**Policies**
	Put information about these natural and historical sites on the net
	Actions
	Improve the countryside (around the S.S. Romea)
	Reconstruct the historical area of Barco Estense della Mesola
	Reconstruct the historical area around Canal Bianco
	Re-establish a connection between different natural sites (Boscone and the Santa Giustina pinewoods)
	Refurbish existing buildings
	Improve and consolidate areas of historic interest (Mesola)

Context 8 – Inlets and flat marshland – A place of production



Stagnant and fresh-water marshlands are an important feature of the surface water system of the Ferrara area. Sacca di Goro, an area of inlets which cannot be strictly classed as a lagoon nor marshland, is to be found here.
The most important characteristic of this area is its multifaceted identity. This results from the co-existence of two defining features: the presence of production plants and the large areas of unspoilt countryside. The natural environment coexists harmoniously with these production plants in the marshlands which ensure the vigorous output of this territory.
Part of the Sacco di Goro area is included in the Volano-Mesola-Goro section of the Po Delta regional park Territorial Plan, though the area is also partly run by the National Nature Reserve. Planning policies currently in force in this area seek to ensure a harmonious relationship between hunting and fishing activities, production (shellfish) and environmental conservation.
The production plants of this area, especially shellfish farms, tend to introduce initiatives aimed at increasing profitability and often extend their cultivation plots close to or sometimes into natural areas of great ecological interest (parts of the Delta Park and the National Nature Reserve). At the same time, the Sacca area is threatened by other factors, including subsidence which progressively lowers river depths, increasing river pollution (which mainly originates outside the Sacca, in the Po river), the extension of the Scanno sandbank between Volano and the sea, and sailing- and tourism-related problems.

A place of production	
	Halt freshwater pollution
	Improve water circulation in the lagoon area
	Monitor the extension of the Scanno sandbank
	Consolidate the tourist port and its accommodation structures
	Rationalise and improve the fishing production chain
	Rationalise all fishing-related factors (commerce, conservation, farming pools, etc) and identify associated fields of activity (e.g., floating buoys)
	Assess the agricultural sustainability of the drained area between Goro and Gorino

Interaction matrix COASTAL LOCAL CONTEXT N. 1: TOWN CENTRE COMACCHIO, PORTO GARIBALDI AND LIDO DEGLI ESTENSI

			PLAN'S OBJECTIVES AND POLICIES				
			Completion of expansion work east of Comacchio's old town	Concentrate production, large-scale commerce and services to the stretch of the Romea road that runs between Collinara and the dual carriage way	Development of a single port system running from Comacchio's old sugar refinery to the sea front	Reclaim unused buildings and renewal existing areas	Invest resources in existing and new hotel accommodation
SENSIBLE COMPONENTS TO PLANNING SYSTEM IN COMPLIANCE WITH ICZM GUIDELINES	**FLOODS**	Low vulnerability					
	ACQUIFERS	High vulnerability for salt water intrusion	- connection to waterworks - reduce groundwater extraction				
	FLOODING FOR SEA LEVEL RISE &/OR STORMS	High vulnerability for the long period	- connection to waterworks - reduce of groundwater extraction - all building projects should favour mitigation processes (e.g., use sand from pits dug for building work for the up-keep of dunes)		- calibrated planning for marine systems and forecasting for rising sea-levels - new buildings cannot be carried out in beach areas (including sand dunes and the sandy areas behind dunes) - all building projects should favour mitigation processes (e.g., use sand from pits dug for building work for the up-keep of dunes) - connection to waterworks - reduce groundwater extraction	- building or building-related work cannot be carried out in beach areas (including sand dunes and the sandy areas behind dunes) - calibrated planning for marine systems and forecasting for rising sea-levels - tourist facilities located on the beach must be temporary removable structures - connection to waterworks
	COASTAL EROSION	Low vulnerability			- projects for harbour areas should take into account coastal sedimentary processes in order to protect surrounding areas from erosion		

Table continues on the following page

			PLAN'S OBJECTIVES AND POLICIES				
			Completion of expansion work east of Comacchio's old town	Concentrate production, large-scale commerce and services to the stretch of the Romea road that runs between Collinara and the dual carriage way	Development of a single port system running from Comacchio's old sugar refinery to the sea front	Reclaim unused properties and refurbish existing properties	Invest resources in existing and new hotel accommodation
SENSIBLE COMPONENTS TO PLANNING SYSTEM IN COMPLIANCE WITH ICZM GUIDELINES	**MARINE AND COASTAL WATER QUALITY**	Mediocre quality	- prevent refluent water and meteoric water from flowing straight into the sea		- set up fishing boat- and ship-refuse collection and management schemes - use containing systems for pollutants released as a result of accidents	- prevent refluent water and meteoric water in to the sea	
	NATURAL AND PROTECTED AREA LANDSCAPE AND CULTURAL HERITAGE	- High natural value areas - Widespread archeology historic and cultural elements - Park of Po Delta - Natura 2000	- new buildings have to be carried according natural conservation - new structures should be built in the same areas as existing structures and should seek to respect the architectural typology of a particular area with a view to safeguarding heritage - new buildings have to be carried according to Park Authority permit and Natura 2000 impact assessment	- new structures should be built in the same areas as existing structures and should seek to respect the architectural typology of a particular area with a view to safeguarding heritage - construct an "ecological corridor" along the first row of sand dunes - all building work must respect the green areas present in urban zone - adapt traffic systems to the particular features of this area and improve the urban road system (suitable signposting, green areas and use of appropriate road surface materials) - reduce the effect that manmade waterways have on the lakes in the marshland area educe the effect that manmade waterways have on the lakes in the marshland area - new buildings have to be carried according to Park Authority permit and Natura 2000 impact assessment		- new structures should be built in the same areas as existing structures and should seek to respect the architectural typology of a particular area with a view to safeguarding cultural heritage	- Refurbish existing campsites and regulate their usage, penalising projects aimed at increasing the number of waterproofed areas and favouring the insertion of campsites into the open countryside

Table continues on the following page

			PLAN'S OBJECTIVES AND POLICIES				
			Completion of expansion work east of Comacchio's old town	Concentrate production, large-scale commerce and services to the stretch of the Romea road that runs between Collinara and the dual carriage way	Development of a single port system running from Comacchio's old sugar refinery to the sea front	Reclaim unused properties and refurbish existing properties	Invest resources in existing and new hotel accommodation
SENSIBLE COMPONENTS TO PLANNING SYSTEM IN COMPLIANCE WITH ICZM GUIDELINES	**MOBILITY SYSTEM**	- Seasonal traffic congestion on Romea road and high difficult for the access of urban area - Interference with hydrographical system	Relegate new construction work in favour of projects which:: - offer multiple solutions to infrastructure problems and promote integration of infrastructures (e.g. for the canal congestion an Portogaribaldi, for regulating access to residential areas and creating alternative forms of transport) - improve access in general, increase traffic circulation and allow for different-speed circulation systems (road system adapted to the characteristics of the terrain) - creation of filter-zones linking settlement areas and the main road networks				
	SEWERS SYSTEM	Sewers and waste water treatment plant (remaining capacity of 5.000 P.E.)	- check residual capacity of waste water treatment plant and the suitability of existing sewers system - improve a separate sewers system - design on-site utilisation systems for non-polluted meteoric water suited to its proposed use in particular areas			- check residual capacity of waste water treatment plant and the suitability of existing sewers system	

Interaction matrix COAST LOCAL CONTEXT N.2: THE CHANGING PERIPHERY
LIDO DEGLI SCACCHI, LIDO DI POMPOSA

			PLAN'S OBJECTIVES AND POLICIES				
			Avoid the expansion of population settlement systems and favour urban re-development projects, building refurbishments and the consolidation of volume in order to increase the number of green areas	Alleviate anthropic pressure on the stretch of Romea main road running through San Giuseppe	Redevelop the seafront favouring non-intensive features and green areas	Re-incorporate fringed areas by eliminating the gaps between urban zones, agricultural zones and natural areas (Acciaioli and Romea)	Direct tourism accommodation towards multi-site hotel complexes
SENSIBLE COMPONENTS TO PLANNING SYSTEM IN COMPLIANCE WITH ICZM GUIDELINES	**FLOODS**	Medium/low vulnerability					
	ACQUIFERS	Very High vulnerability for salt water intrusion	- connection to waterworks				- connection to waterworks
	FLOODING FOR SEA LEVEL RISE &/OR STORMS	High vulnerability for the long period; medium/low vulnerability for the short period (storms)	- building or building-related work cannot be carried out in beach areas (including sand dunes and the sandy areas behind dunes) - re-establishment of dune		- promote projects aimed at restoring the sand dunes, creating suitable pathways and planting or up-keeping suitable vegetation; - guarantee preservation of sand dunes so as to establish sand reserves and reinforce the natural environment		- keep tourist infrastructures away from the shoreline and protect beaches, dunes and the sandy areas behind dunes - favour dune restoration projects which use the dunes as a form of protection, increasing defence of inland areas

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			PLAN'S OBJECTIVES AND POLICIES				
			Avoid the expansion of population settlement systems and favour urban re-development projects, building refurbishments and the consolidation of volume in order to increase the number of green areas	Alleviate anthropic pressure on the stretch of S.S. Romea main road running through San Giuseppe	Redevelop the seafront favouring non-intensive features and green areas	Re-incorporate fringed areas by eliminating the gaps between urban zones, agricultural zones and natural areas (Acciaioli and Romea)	Direct tourism accommodation towards multi-site hotel complexes
SENSIBLE COMPONENTS TO PLANNING SYSTEM IN COMPLIANCE WITH ICZM GUIDELINES	**COASTAL EROSION**	Medium vulnerability	- building or building-related work cannot be carried out in beach areas (including sand dunes and the sandy areas behind dunes) which must remain untouched by population settlement systems - favour dune restoration projects which conceive of the dunes as a form of sand reserve from which sand can be drawn for the natural renewal of beaches		Adapt seaside infrastructures to meet new beach management standards such as: - regulate beach cleaning procedures - favour the accumulation of sand		- when evaluating tourist accommodation issues, consider beach capacity in order to avoid overcrowding
	MARINE AND COASTAL WATER QUALITY	Mediocre quality	- prevent refluent water and meteoric water from flowing straight into the sea			- prevent refluent water and meteoric water from flowing straight into the sea	

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			PLAN'S OBJECTIVES AND POLICIES				
			Avoid the expansion of population settlement systems and favour urban re-development projects, building refurbishments and the consolidation of volume in order to increase the number of green areas	Alleviate anthropic pressure on the stretch of S.S. Romea main road running through San Giuseppe	Redevelop the seafront favouring non-intensive features and green areas	Re-incorporate fringed areas by eliminating the gaps between urban zones, agricultural zones and natural areas (Acciaioli and Romea)	Direct tourism accommodation towards multi-site hotel complexes
SENSIBLE COMPONENTS TO PLANNING SYSTEM IN COMPLIANCE WITH ICZM GUIDELINES	**NATURAL AND PROTECTED AREA LANDSCAPE AND CULTURAL HERITAGE**	- High natural value areas - Widespread archeology historic and cultural elements - Park of Po Delta - Natura 2000	- new structures should be built in the same areas as existing structures and should seek to respect the architectural typology of a particular area with a view to safeguarding heritage		- refurbish existing campsites and regulate their usage, penalising projects aimed at increasing the number of waterproofed areas and favouring the insertion of campsites into the open countryside	- promote the creation of ecological corridors and avoid pollution by waterproofed materials	- refurbish existing campsites and regulate their usage, penalising projects aimed at increasing the number of waterproofed areas and favouring the insertion of campsites into the open countryside
			- new buildings have to be carried according to Park Authority permit and Natura 2000 impact assessment				
	MOBILITY SYSTEM	- High critic to connection road network and urban access - Traffic congestion on Romea road caused by commercial areas	- improve traffic circulation by designing a road system adapted to the layout and features of our territory with protected cycle/pedestrian lanes and fully-equipped lay-by areas - use appropriate materials in the construction of road surfaces, construct green areas within the road system using appropriate vegetation and design suitable information/tourist road signs		- improve circulation by creating protected cycle/pedestrian routes and equipped lay-by areas	- improve traffic circulation by designing a road system adapted to the layout and features of our territory with protected cycle/pedestrian lanes and fully-equipped lay-by areas - use appropriate materials in the construction of road surfaces, construct green areas within the road system using appropriate vegetation and design suitable information/tourist road signs	

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			PLAN'S OBJECTIVES AND POLICIES				
			Avoid the expansion of population settlement systems and favour urban re-development projects, building refurbishments and the consolidation of volume in order to increase the number of green areas	Alleviate anthropic pressure on the stretch of S.S. Romea main road running through San Giuseppe	Redevelop the seafront favouring non-intensive features and green areas	Re-incorporate fringed areas by eliminating the gaps between urban zones, agricultural zones and natural areas (Acciaioli and Romea)	Direct tourism accommodation towards multi-site hotel complexes
SENSIBLE COMPONENTS TO PLANNING SYSTEM IN COMPLIANCE WITH ICZM GUIDELINES	**SEWERS SYSTEM**	Sewers and waste water treatment plant (remaining capacity of 5.000 P.E.)	- check residual capacity of waste water treatment plant and the suitability of existing sewers system - improve a separate sewers system - design on-site utilisation systems for non-polluted meteoric water suited to its proposed use in particular areas			- check residual capacity of waste water treatment plant and the suitability of existing sewers system - improve a separate sewers system - design on-site utilisation systems for non-polluted meteoric water suited to its proposed use in particular areas	- check residual capacity of waste water treatment plant and the suitability of existing sewers system

Interaction matrix COAST LOCAL CONTEXT N.3: NON URBANIZED COAST PORTOGARIBALDI NORD AND LIDO DEGLI SCACCHI SUD

			PLAN'S OBJECTIVES AND POLICIES		
			Fortify natural and environmental characteristics	Alleviate the burden of tourism-related factors	Guarantee the construction of sand dunes and passive sea defences
SENSIBLE COMPONENTS TO PLANNING SYSTEM IN COMPLIANCE WITH ICZM GUIDELINES	**FLOODS**	Medium/low vulnerability			
	ACQUIFERS	Very High vulnerability		- connection to waterworks of the tourist structure	favour dune restoration in compliance with: - roads liking outlaying (context 1 and 2) should be flanked by appropriate measure (barriers and pathways) - promote projects aimed at restoring the sand dunes (creating suitable)
	FLOODING FOR SEA LEVEL RISE &/OR STORMS	Medium/low vulnerability	- favour dune restoration projects resolving the fragment existing system - experiment natural system (such as aeolian sand traps)	- favour dune restoration - promote projects aimed at restoring the sand dunes (creating suitable pathways)	
	COASTAL EROSION	Medium/low vulnerability		Beaches infrastructures have to be adapt at the new beaches policies e.g.: beach clean avoiding sand loss	
	MARINE AND COASTAL WATER QUALITY	Mediocre quality			

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			PLAN'S OBJECTIVES AND POLICIES		
			Fortify natural and environmental characteristics	Alleviate the burden of tourism-related factors	Guarantee the construction of sand dunes and passive sea defences
SENSIBLE COMPONENTS TO PLANNING SYSTEM IN COMPLIANCE WITH ICZM GUIDELINES	**NATURAL AND PROTECTED AREA LANDSCAPE AND CULTURAL HERITAGE**	- High natural value areas - Widespread archeology historic and cultural elements - Park of Po Delta	- all proposals must aim to conserve soil, subsoil, lakes and river, flora and fauna employing conservation strategies and promoting the natural equilibrium between them; environmentally friendly production activities should be maintained - avoid further waterproofing of the ground or de-waterproof areas in order to favour hydro-geological processes - new buildings have to be carried according to Park Authority permit	- refurbish existing campsites and regulate their usage, penalising projects aimed at increasing the number of waterproofed areas and favouring the insertion of campsites into the open countryside - new buildings have to be carried according to Park Authority permit	- preserve open areas, ensuring that all new building work takes place within residential areas or very close by or at least at the foot of sloping land in order to facilitate drainage and keep meteoric water at a distance - ensure maximum efficiency of areas which contribute to the filling of and distribution from underground freshwater aquifers
	MOBILITY SYSTEM		- infrastructure work must be adapted to the landscape and should include fully-equipped lay-bys, access to cycle/pedestrian lanes; it should take into account surrounding agriculture and should use compatible vegetation		
	SEWERS SYSTEM				

Interaction matrix COAST LOCAL CONTEXT N.4: URBAN PENINSULAS AND ISLANDS
ZONE URBANE DI LIDO DI SPINA, LIDO DELLE NAZIONI AND LIDO DI VOLANO

			PLAN'S OBJECTIVES AND POLICIES		
			Maintain the separation between urban systems and natural systems and limit expansion	Promote the development of recreational tourist functions linked to the specific characteristics of this area	Promote the development of slow roads and trails running from the seafront through the urban area and out into the surrounding countryside
SENSIBLE COMPONENTS TO PLANNING SYSTEM IN COMPLIANCE WITH ICZM GUIDELINES	**FLOODS**	Medium vulnerability			
	ACQUIFERS	Very high vulnerability		- connection to waterworks of the tourist structures	
	FLOODING FOR SEA LEVEL RISE &/OR STORMS	Medium high vulnerability for long period; medium vulnerability for short period,	- keep tourist infrastructures away from the shoreline and preserve beaches, dunes and the sandy areas behind dunes; in the free area should be not allowed urban use	- infrastructures should be adapt to improve and renewal beaches and dunes - provide new rules for beaches maintenance avoiding sand loss and creating natural aeolian sand traps	- the road network should not interfere with beaches and sedimentary process saving beaches and dunes integrity
	COASTAL EROSION	Medium-low vulnerability causing by sinking seabed			
	MARINE AND COASTAL WATER QUALITY	Mediocre quality	- prevent refluent water and meteoric water from flowing straight into the sea		

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			PLAN'S OBJECTIVES AND POLICIES		
			Maintain the separation between urban systems and natural systems and limit expansion	Promote the development of recreational tourist functions linked to the specific characteristics of this area	Promote the development of slow roads and trails running from the seafront through the urban area and out into the surrounding countryside
SENSIBLE COMPONENTS TO PLANNING SYSTEM IN COMPLIANCE WITH ICZM GUIDELINES	**NATURAL AND PROTECTED AREA LANDSCAPE AND CULTURAL HERITAGE**	- High natural value areas - Widespread archeology historic and cultural elements - Park of Po Delta - Natura 2000	- new buildings have to be carried according natural conservation - new buildings have to be carried according to Park Authority permit and Natura 2000 impact assessment		- new structures should be built in the same areas as existing structures and should seek to respect the architectural typology of a particular area with a view to safeguarding heritage
	MOBILITY SYSTEM		- improve traffic circulation by designing a road system adapted to the layout and features of our territory with protected cycle/pedestrian lanes and fully-equipped lay-by areas - use appropriate materials in the construction of road surfaces, construct green areas within the road system using appropriate vegetation and design suitable information/tourist road signs		
	SEWERS SYSTEM	Sewers and waste water treatment plant (remaining capacity of 5.000 P.E.)	- check residual capacity of waste water treatment plant and the suitability of existing sewers system - improve a separate sewers system - design on-site utilisation systems for non-polluted meteoric water suited to its proposed use in particular areas		

Interaction matrix COAST LOCAL CONTEXT N.5: NATURAL COASTLINE ZONA LIDO DI SPINA (COSTA) AND BELLOCCHIO

			PLAN'S OBJECTIVES AND POLICIES		
			Fortify natural and environmental characteristics	Alleviate the burden of tourism-related factors	Guarantee the construction of sand dunes and passive sea defences
SENSIBLE COMPONENTS TO PLANNING SYSTEM IN COMPLIANCE WITH ICZM GUIDELINES	**FLOODS**	Medium/low vulnerability			
	ACQUIFERS	Vulnerability variable from medium and medium/high		- connection to waterworks of tourist structures	favour dune restoration in compliance with: - roads liking outlaying (context 1 and 2) should be flanked by appropriate measure (barriers and pathways) - promote projects aimed at restoring the sand dunes (creating)
	FLOODING FOR SEA LEVEL RISE &/OR STORMS	Very high vulnerability for the long period, high vulnerability for the short period where the beach is narrow	- due to the high dynamism of Bellocchio beaches, dunes and outlaying sandy areas should be reinforced	- beach structures should be adapted to the high volume of activity (use of temporary and removable structures)	
	COASTAL EROSION	Very high vulnerability in the coast in front of Bellocchio		- prescribed kind of beaches maintenance avoiding sand loss and creating natural aeolian sand traps	
	MARINE AND COASTAL WATER QUALITY	Mediocre quality		- prevent refluent water and meteoric water into the sea	

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			PLAN'S OBJECTIVES AND POLICIES		
			Fortify natural and environmental characteristics	Alleviate the burden of tourism-related factors	Guarantee the construction of sand dunes and passive sea defences
SENSIBLE COMPONENTS TO PLANNING SYSTEM IN COMPLIANCE WITH ICZM	**NATURAL AND PROTECTED AREA LANDSCAPE AND CULTURAL HERITAGE**	- High natural value areas - Widespread archeology historic and cultural elements - Park of Po Delta - Natura 2000	- all proposals must aim to conserve soil, subsoil, lakes and river, flora and fauna employing conservation strategies and promoting the natural equilibrium between them; environmentally friendly production activities should be maintained - avoid further waterproofing of the ground or de-waterproof areas in order to favour hydro-geological processes	- refurbish existing campsites and regulate their usage, penalising projects aimed at increasing the number of waterproofed areas and favouring the insertion of campsites into the open countryside	- preserve open areas, ensuring that all new building work takes place within residential areas or very close by or at least at the foot of sloping land in order to facilitate drainage and keep meteoric water at a distance - ensure maximum efficiency of areas which contribute to the filling of and distribution from underground freshwater aquifers
	MOBILITY SYSTEM		- infrastructure work must be adapted to the landscape and should include fully-equipped lay-bys, access to cycle/pedestrian lanes; it should take into account surrounding agriculture and should use compatible vegetation		
	SEWERS SYSTEM			- it must be avoid refluent water into the sea	

Interaction matrix COAST LOCAL CONTEXT N.6: NATURAL COASTLINE
LIDO DELLE NAZIONI, LAGO NAZIONI, LIDO DI VOLANO AND FOCE VOLANO

			PLAN'S OBJECTIVES AND POLICIES				
			Fortify natural and environmental characteristics	Alleviate the burden of tourism-related factors	Guarantee the construction of sand dunes as a form of passive sea defence	Ban the development of further strips of beach	Encourage the transformation of existing structures into environmentally-friendly seaside complexes
SENSIBLE COMPONENTS TO PLANNING SYSTEM IN COMPLIANCE WITH ICZM	**FLOODS**	Medium vulnerability (indefinite in Volano mouth)	- allow flooding and filling process of the low wetlands	- tourist facilities located on the beach must be temporary removable structures			
	ACQUIFERS	Very high vulnerability		- connection to waterworks of existing structures			
	FLOODING FOR SEA LEVEL RISE &/OR STORMS	In the long period vulnerability is variable from medium to high; while in the short period it's variable from medium-low to high	- improve existing embankment efficiency and re-establish dunes continuity to preserve behind natural areas	- reduce groundwater extraction - tourist facilities located on the beach must be temporary removable structures - regulate beach cleaning procedures avoiding sand loss and creating natural aeolian sand traps	- reconstruct and re-establish dunes with a quota greater then con 2.5 m. where dunes do not exist		
	COASTAL EROSION	Vulnerability is variable from low to medium-low			- regulate beaches maintenance avoiding sand loss and creating natural aeolian sand traps		
	MARINE AND COASTAL WATER QUALITY	Mediocre quality		- prevent refluent water into the sea			- prevent refluent water into the sea

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			PLAN'S OBJECTIVES AND POLICIES				
			Fortify natural and environmental characteristics	Alleviate the burden of tourism-related factors	Guarantee the construction of sand dunes as a form of passive sea defence	Ban the development of further strips of beach	Encourage the transformation of existing structures into environmentally-friendly seaside complexes
SENSIBLE COMPONENTS TO PLANNING SYSTEM IN COMPLIANCE WITH ICZM	**NATURAL AND PROTECTED AREA LANDSCAPE AND CULTURAL HERITAGE**	- High natural value areas - Widespread archeology historic and cultural elements - Park of Po Delta - Natura 2000	- all proposals must aim to conserve soil, subsoil, lakes and river, flora and fauna employing conservation strategies and promoting the natural equilibrium between them; environmentally friendly production activities should be maintained - avoid further waterproofing of the ground or de-waterproof areas in order to favour hydro-geological processes	- refurbish existing campsites and regulate their usage, penalising projects aimed at increasing the number of waterproofed areas and favouring the insertion of campsites into the open countryside	- preserve open areas, ensuring that all new building work takes place within residential areas or very close by or at least at the foot of sloping land in order to facilitate drainage and keep meteoric water at a distance - ensure maximum efficiency of areas which contribute to the filling of and distribution from underground freshwater aquifers		
	MOBILITY SYSTEM		- infrastructure work must be adapted to the landscape and should include fully-equipped lay-bys, access to cycle/pedestrian lanes; it should take into account surrounding agriculture and should use compatible vegetation				- infrastructure work must be adapted to the landscape and should include fully-equipped lay-bys, access to cycle/pedestrian lanes; it should take into account surrounding agriculture and should use compatible vegetation
	SEWERS SYSTEM			- prevent refluent water into the sea			- prevent refluent water into the sea

Interaction matrix COAST LOCAL CONTEXT N.7: WOODLAND AND RIVER BOSCO DELLA MESOLA, PO DI VOLANO, CANAL BIANCO, PO DI GORO

			PLAN'S OBJECTIVES AND POLICIES					
			Improve the state of the countryside (around the Romea road)	Reconstruct the historical area of Barco Estense in Mesola	Consolidate the historical context of the drained area around Bianco river	Re-establish connections between different natural sites (Boscone and the Santa Giustina pinewoods)	Reclaim unused buildings	Improve and consolidate areas of historic interest (Mesola)
SENSIBLE COMPONENTS TO PLANNING SYSTEM IN COMPLIANCE WITH ICZM	**FLOODS**	From medium to high vulnerability			- works have to be consider the high floods vulnerability			
	ACQUIFERS	Very high vulnerability			- connection to waterworks		- connection to waterworks	
	FLOODING FOR SEA LEVEL RISE &/OR STORMS	High and very high vulnerability			- works have to be consider the high tendency to flooding coast		- works have to be consider the high tendency to flooding coast	
	COASTAL EROSION	Low vulnerability caused by beach absence replaced by embankments						
	MARINE AND COASTAL WATER QUALITY	Mediocre quality			- improve ecological functions and auto-purification capacity of canals		- prevent refluent water into the sea	- prevent refluent water and meteoric water from flowing straight into the sea

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			PLAN'S OBJECTIVES AND POLICIES					
			Improve the state of the countryside (around the Romea road)	Reconstruct the historical area of Barco Estense in Mesola	Consolidate the historical context of the drained area around Bianco river	Re-establish connections between different natural sites (Boscone and the Santa Giustina pinewoods)	Reclaim unused buildings	Improve and consolidate areas of historic interest (Mesola)
SENSIBLE COMPONENTS TO PLANNING SYSTEM IN COMPLIANCE WITH ICZM	**NATURAL AND PROTECTED AREA LANDSCAPE AND CULTURAL HERITAGE**	- High natural value areas - Widespread archeology historic and cultural elements - Park of Po Delta - Natura 2000	- reduce fragmentation by encouraging links between natural and protected areas - ensure maximum efficiency of areas which contribute to the filling of and distribution from underground freshwater aquifers - avoid further waterproofing of the ground or de-waterproof areas in order to favour hydro-geological processes				- new structures should be built in the same areas as existing structures and should seek to respect the architectural typology of a particular area with a view to safeguarding heritage - new buildings have to be carried according to Park Authority permit and Natura 2000 impact assessment	
	MOBILITY SYSSTEM		- improve traffic circulation by designing a road system adapted to the layout and features of our territory with protected cycle/pedestrian lanes and fully-equipped lay-by areas - use appropriate materials in the construction of road surfaces, construct green areas within the road system using appropriate vegetation and design suitable information/tourist road signs					
	SEWERS SYSTEM	Sewers and waste water treatment plant (remaining capacity of 630 P.E.)						- check residual capacity of waste water treatment plant and the suitability of existing sewers system - improve a separate sewers system - design on-site utilisation systems for non-polluted meteoric water suited to its proposed use in particular areas

Interaction matrix COAST LOCAL CONTEXT N. 8: INLETS AND FLAT MARSHLAND SACCA DI GORO, SCANNO AND DUNE DI GORINO

			PLAN'S OBJECTIVES AND POLICIES					
			Halt freshwater pollution	Improve water circulation in the lagoon area	Monitor the extension of the Scanno sandbank	Consolidate the tourist port and its accommodation structures	Rationalise all fishing-related factors (commerce, farming pools) and identify associated fields of activity (e.g., floating buoys)	Assess the agricultural sustainability of the drained area between Goro and Gorino
SENSIBLE COMPONENTS TO PLANNING SYSTEM IN COMPLIANCE WITH ICZM	**FLOODS**	Indefinite vulnerability						
	ACQUIFERS	Very high vulnerability				- connection to waterworks - reduce groundwater extraction		
	FLOODING FOR SEA LEVEL RISE &/OR STORMS	Very high vulnerability		- before works it should be better to carry out deepen studies on the system reaction and on the impact which can occur in the surrounding area		- reduce groundwater extraction - adapting of embankments height		
	COASTAL EROSION	Low vulnerability – completely protected; high at Goro mouth						
	MARINE AND COASTAL WATER QUALITY	Mediocre quality	- adopt measure to python water-softener in marginal areas and in stagnant water - govern fresh water - monitor water quality			- prevent refluent water and meteoric water from flowing straight into the sea	- improve the effect that fish farms have on general water quality - monitor water quality	- limit use of nitrogenous composts, plant protection products and pesticides - adopt agricultural good practices to reduce sea pollution

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			PLAN'S OBJECTIVES AND POLICIES					
			Halt freshwater pollution	Improve water circulation in the lagoon area	Monitor the extension of the Scanno sandbank	Consolidate the tourist port and its accommodation structures	Rationalise all fishing-related factors (commerce, farming pools) and identify associated fields of activity (e.g., floating buoys)	Assess the agricultural sustainability of the drained area between Goro and Gorino
SENSIBLE COMPONENTS TO PLANNING SYSTEM IN COMPLIANCE WITH ICZM	**NATURAL AND PROTECTED AREA LANDSCAPE AND CULTURAL HERITAGE**	- High natural value areas - Widespread archeology historic and cultural elements - Park of Po Delta - Natura 2000	- undertake work to re-naturalise the canals with a view to creating links between natural and protected areas and to diminish fragmentation	- reduce fragmentation by encouraging links between natural and protected areas - projects can only be accepted if they do not harm in any way the area's hydro-geological, naturalistic or geo-morphological identity	- projects can only be accepted if they do not harm in any way the area's hydro-geological, naturalistic or geo-morphological identity	- reduce fragmentation by encouraging links between natural and protected areas - projects can only be accepted if they do not harm in any way the area's hydro-geological, naturalistic or geo-morphological identity - new buildings have to be carried according to Park Authority permit and Natura 2000 impact assessment		- new agricultural activities must be non intensive
	MOBILITY SYSTEM	Road network in not enough for traffic caused by port activities				- improve project to solve traffic congestion - offer multiple solutions to infrastructure problems and promote integration of infrastructures		
	SERWERS SYSTEM	Sewers and waste water treatment plant (remaining capacity of 2.288 P.E.)	- improve check of sewers system			- check residual capacity of waste water treatment plant and the suitability of existing sewers system - improve a separate sewers system design on-site utilisation systems for non-polluted meteoric water suited to its proposed use in particular areas		