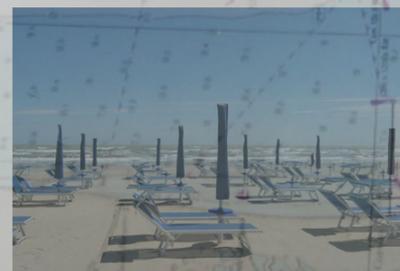
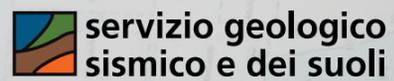


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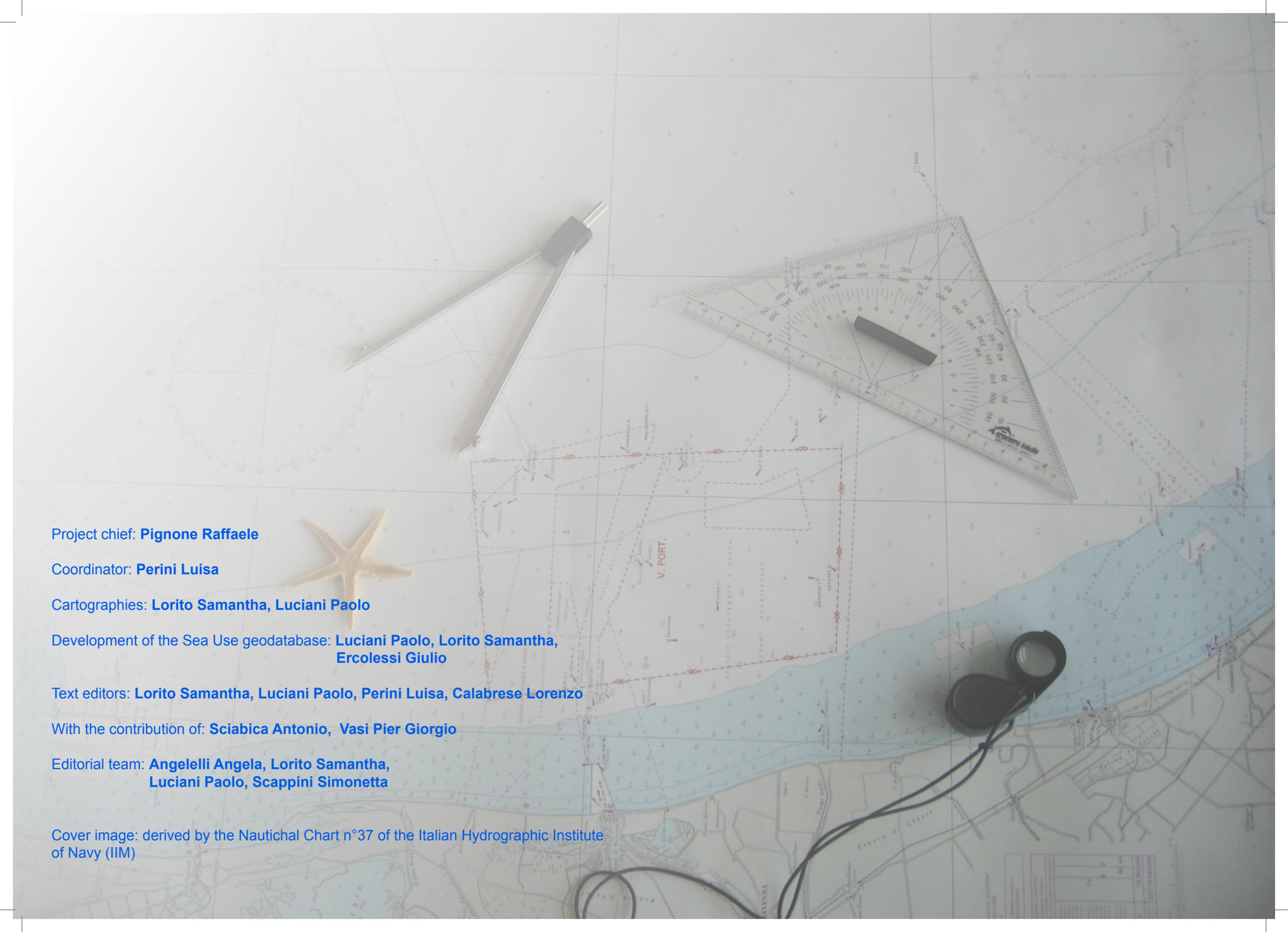
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Introduction

The sea and the coastal regions are very important areas for social well-being and for the economy of regions and European countries, even if intensive exploitation thereof together with climatic changes, have considerably increased pressures exerted on the marine environment.

Awareness that preservation of the sea areas must be faced at a global level has led the European Commission to consider the issue with an “integrated” approach, aimed at developing a sustainable *governance* system of marine and coastal areas, based on the principles of preservation of natural resources and environmental protection.

Thus, guidelines and community directives have been issued such as the Protocol on Integrated Coastal Zone Management (ICZM), the Roadmap for Maritime Spatial Planning (MSP) and the **Marine Strategy Framework Directive** (MSFD 2008/56/EC), aimed at encouraging the EU Member States to define their own national integrated maritime policies in close collaboration with the coastal regions and local authorities which should participate at a decision-making level (principle of subsidiarity). In these documents, the policies aimed at defining a clear planning framework addressed to promote investments in the maritime field, among which the development of offshore energy, shipping and maritime transport, port development, the exploitation of oil and gas Technological innovation is of great importance in this process as well as the **creation of a knowledge base** that enables to analyze the impact of human activities on marine systems and that allows the finding of suitable solutions to mitigate environmental degradation.

Hence, the **knowledge source must be comprehensive and accessible, and relate to natural factors and human activities linked to the marine environment.**

Already since 2000, the Region of Emilia-Romagna, by means of the SGSS, has developed its own **Information System of the Sea and Coast**, aimed at supporting the Integrated Coastal Zone Management process, as well as providing a complete framework of

knowledge that is effective for management of coastal risks.



Considering that coastal defence also depend on the preservation of the marine environment, and on the sustainable exploitation of fishery resources and, more generally, upon the renewable resources stored therein, the SGSS decided to extend the knowledge by including within information system data concerning the marine area between the shoreline and the limit of continental platform (which coincides with the Italy-Croatia delimitation line), situated at a distance of about 65 km from the coast. Besides the physical, bathymetric, geological, sedimentological and hydrometeorological data, further information were acquired on available resources (exploration and exploitation of the seabed) and the human activities which unfold in front of the Emilia-Romagna coast (fishing, mussel farming, navigation, etc.).

The development of the Information System was made possible thanks to the collaboration of many Institutions to share information and data. These include the Italian Hydrographic Institute of the Navy (IIM), ENI S.p.a. E&P div. and ISMAR-CNR (Institute of Marine Science).

Finally, in the last year, participation in the European project **Shape – IPA project** helped to extend the task further, facing new issues related to the human uses of the sea and the potential impacts and conflicts they generate.

Sea & Coast Information System and the applicable databases

The Sea and Coast Information System was initially developed by using as a reference the guidelines for “the implementation of local information systems for the management of coastal erosion”, issued by the Directorate General for the Environment of the European Commission within EuroSION programme (European Commission, 2004); these guidelines establish the development of nine thematic groups, some of which refer to the physical characteristics of the marine area:

- Administrative boundaries (terrestrial and maritime);
- Topography (DTM seabed, bathymetry, shorelines, etc.),
- Geology, geomorphology and sedimentology (including the marine area);
- Hydrodynamics (winds, waves and prevailing currents);
- Land use (land use classification of the coastline and land use change);
- Demography (resident population and tourist influx);
- Heritage (SIC-ZPS areas; protected marine areas);
- Economic assets (tourism, aquaculture, mussel farming and fishing infrastructures);
- Coastal defences (defence works).

This information constitutes a crucial asset for the analysis of coastal risks and represents the starting point to develop more specific **database applications**, such as:

- Monitoring
- Coastal risks
- Sea storms
- Beach nourishments

- **Management of undersea sand deposits**
- **Use of the sea** (undersea installations for the exploitation of hydrocarbons, undersea sands deposits, fishing, defence, ports & navigation restrictions)
- Subsidence

A portion of this data is already available to the public through an **interactive mapping** web interface, at the address: <http://geo.regione.emilia-romagna.it/geocatalogo/> <http://ambiente.regione.emilia-romagna.it/geologia/cartografia/webgis-banchedati/sistema-informativo-mare-costa>. The data that are still being processed, or the ‘sensitive’ ones are accessible only to the regional technicians.

The data are geo-referenced in geographic reference system adopted by the RER (UTM-ED50-Zone 32*) and in the national systems (Gauss-Boaga and UTM-ED50). In order to be aligned with the European INSPIRE Directive (2007/2/EC ratified by Legislative Decree n° 32/2010) all newly acquired data are to be produced directly in the WGS84 system (or ETRS89) and subsequently converted into the regional system. We are also providing the adjustment of the dataset to the new national geodetic reference system (Dec. P.C.M. of 10th November 2011 – Adoption of the National Geodetic Reference System, published in the Official Gazette n° 48 of 27/02/2012).

Furthermore, as established by the INSPIRE Directive, each mapping is accompanied by the relative **metadata**, which contain the information needed to describe the identity information, such as: type of data, origin, property, quality, elaboration processes, etc..

Database for the management of undersea sand deposits

Over the past 10 years the Emilia-Romagna Region has completed two large beach nourishment projects using undersea sand deposits. These projects were made possible thanks to the data acquired by ISMAR-CNR of Bologna in decades of geophysical research in the Adriatic, and the surveys conducted by ARPA Emilia-Romagna and by the Emilia-Romagna Region, that all together, have led to the identification and characterization of currently exploited sandy deposits (Correggiari et al., 2011; Preti M. (ed.) 2011). Being a non-renewable resource, it is essential that it be carefully managed, also through the use of Informative Systems to support the programming and the planning of the interventions. Through an agreement with ISMAR-CNR a dedicated geodatabase has been created, binding together all the data relevant to the characterization and management of undersea sand deposits (Correggiari et al. 2012).

The dataset consists in geometries, tables and images revealing the perimeter of the deposits, their thickness, the lithology and the usable volumes of sand. High-resolution seismic data, three-dimensional reliefs, images of core samples of seabed are also contained. Lastly, analysis tools have been prepared for updating the available sand volumes.

Database on the human use of the sea

Within the framework of a proper coastal risk management and of the exploitation of the resources, it is fundamental to have knowledge of land uses including the marine area. For these reasons, as well as to provide the useful tools for the future planning of the maritime space, the SGSS has started the project to build a **sea use** geodatabase; a technical tool that allows to highlight the critical issues in the overlapping of uses and in the exploitation of resources, as well as the direct and indirect impacts on the aquatic environment.

It is a tool, closely connected to the geodatabase for the management of undersea sand deposits,

that is under development.

The representation of coastal and marine feature and the three-dimensional nature of water column represent a challenge for traditional geographic information systems; for this reason the SGSS is trying to readapt data type to the marine application in order to represent its dynamicity (volumetric and temporal).



As a first approximation, the data are stored on the basis of sea level involved (surface, water column, bottom and substrate) and the distance from the shore (*onshore* and *offshore*).

The themes currently found in the geodatabase have been differentiated into:

- **Fishing**, fishing fleet, fishing restriction (e.g. for fishing with trawl and dredge, purse seining fishing, etc); concession areas for mussel farming and aquaculture.
- **Defence**, military areas and related temporary and absolute restriction.
- **Navigation**, traffic separation scheme, inshore traffic zone, traffic lane, precautionary area and area to be avoided. We are also trying to implement it with information relating to the traffic fluxes (routes and size of the flows).
- **Undersea infrastructures for exploitation of hydrocarbons**: wells and platforms, cables, and pipelines, and related links for fishing and navigation constraints
- **Exploitation of undersea sand deposits and sediment discharge** (link to the Management of undersea sand deposits geodatabase)
- **Ports**: categories, types of fleets and related constraints
- **Restrictions**: areas of restriction, constraints, bans and threats to the activities that take place at sea (navigation, transit, stops, anchoring, fishing, swimming).

Developments of the use of the sea geodatabase within the European Shape project

Starting from June 2011 the General Direction for Environment and for Soil and Coast protection of Emilia-Romagna Region has been coordinating the European **Shape Project** (Shaping an Holistic Approach to Protect the Adriatic Environment) funded by the European Union through the IPAAdriatic 2007-2013 Cross Border Cooperation Programme. SHAPE aims at developing a multi-level and intersectoral "governance" system of the natural resources and the prevention of risks that exceed the conflicts among the uses exercised in the coastal areas and in the Adriatic Sea.

The project activity also promotes the application of the Protocol on the Integrated Coastal Zone Management in the Mediterranean and the Roadmap on maritime spatial planning in the Adriatic .



<http://www.shape-ipaproject.eu/>

In this context, the SGSS is expanding the databases with new themes and is collaborating on the development of new verification tools to support planning choices, such as:

- the synoptic representation of maritime activities and the biological, chemical and physical status of the marine environment;
- the critical analysis of the overlapping of uses and conservation of the environment;
- the "technical maps of the sea".

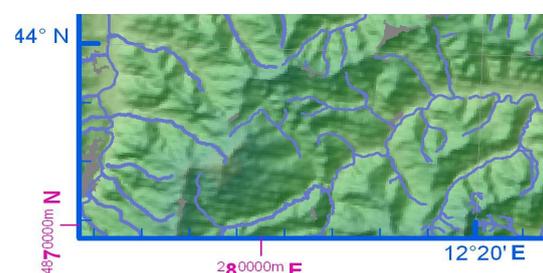
The thematic maps of human uses of the sea

Starting from the above mentioned data, four thematic **maps** were processed that illustrate the main activities that take place at sea with particular reference to the most involved marine level (surface, water column, seabed and subsoil):

- Map 1 –Exploration and exploitation of the resources – Marine subsoil
- Map 2 –Undersea infrastructures and surface resources - Seabed
- Map 3 –Mariculture and ecological-environmental protection areas –Water column
- Map 4 –Restriction areas of human activities – Sea Surface

The themes listed above are mapped within the marine region area of reference, whose indicative limits are extended to the maritime area between the coast line (∩) and the Italy-Croatia boundary line (Continental Platform Limit (∩)). The northern and southern limits are instead represented by broken lines which define the jurisdiction area of the Maritime Rescue Sub Centre (8° MRSC) of Ravenna (∩), as defined in the annex 2 of the Presidential Decree n° 662 of 28/09/1994 as amended by Presidential Decree n° 29 of 13/02/2007. The marine area so defined has an area extent of approximately 5040 Km².

The Maps are Projected in the Mercatore



Transverse system (UTM), using the 1:300.000 scale; the geographical coordinates shown on the margins are referred to the World Geodetic System WGS84, whereas in magenta there are the coordinates in the systemUTM WGS84 Zone 33 N.

Map 1

EXPLORATION AND EXPLOITATION OF THE RESOURCES

Marine subsoil

The exploration and exploitation sovereign rights of the natural resources of the continental shelf belong to the coastal State (UNCLOS 77). The principles adopted by Italy for the regulation of exploration and extraction of the hydrocarbons from its continental shelf are contained in L. 21st July, 1967, n° 613. The law regulates the conditions for issuing permits for the exploration and production of oil and gas hydrocarbons in the territorial sea and continental shelf, the latter defined on the basis of international law (IV Geneva Convention of 1958) in agreement with the neighbour states. The Map represents the exploration and exploitation of the subsoil resources in the continental shelf portion in front of the Emilia-Romagna coast and its main geological features. The themes in Map 1 are:

- Geological map of the Subsoil.
- Wells for hydrocarbons and location of the platforms.
- Mineral titles.
- Isochrones (expressed in double time), of the bottom of the post evaporite succession.

Knowledge of the general geological setting of the Adriatic subsoil are mainly due to the intensive research by ENI- E&P S.p.A. through seismic surveys and drilling for exploration and production. Many of the hydrocarbon exploration data in Italy are currently available on the website of the Ministry of Economic Development (ViDEPI Project). They are public records concerning ceased mining titles, filed as from 1957 at the UNMIG (National Mining Office for Hydrocarbons and Geothermic).

The ENI geophysical data were used to supplement those acquired by the Institute of Marine Sciences (ISMAR) of the CNR - Bologna, which processed the *Subsoil Map* showing the geological units surfacing below the Pliocene base, such as:

- the *Fusignano* formation (**FUS**) and *Argille a Colombacci* formation (**FCD**) deposited during the post-evaporitic

- Messinian period (**FUS** **FCD**);
- the *Gessoso-Solfifera* Formation (**GES**) including the Messinian evaporates;
- the Group of *Marne of Gallare* (**GMG**), undifferentiated Miocene sediments (pre-evaporitics) .

Over and above these formations, the reservoirs of hydrocarbons (mainly gas) are identified, that generally correspond to tabular sandstone bodies of turbiditic origin distributed at different stratigraphic levels ranging from *Pliocene* to *Early Pleistocene*. The traps are usually related to smooth anticlines and to thrusts associated with the main compressive structures of the foredeep. Moreover stratigraphic or mixed traps are also present.

From the Ministry website (www.sviluppoeconomico.gov.it) data were obtained for hydrocarbon wells, mining platforms and mining Titles concerning the Mining Lease areas (□), the grant Instance (□), the Exploration Permits (□) and their Instances (□).

In the marine area of reference, from the '60s to today 602 wells have been built, out of which 435 have become of production type (★), 154 are for exploration (☆), 7 are assessment wells (⊙), 4 for in-depth exploration (⊙) and 2 for injection (⊙). The production wells connected to extractive Platforms are currently 136. The Mining Leases cover an area of about 1948 km², approximately 39% of the total area; in fact this Marine Area produces almost 50% of the entire national territory's Natural Gas, with an average of about 3.4 billion m³ (Ministerial source), among which there is one of the largest and most productive fields, Angela (on the table: AC. 27.EA), Cervia (CERVIA SEA), Annamaria (A.C. 11.AG), Tea (A.C. 24.AG) and Agostino-Garibaldi (A.C. 3.AS). The last one is the biggest reservoir of them.

Map 2

UNDERSEA INFRASTRUCTURES AND SURFACE RESOURCES

The seabed in front of the Emilia-Romagna coast has numerous undersea infrastructures for the exploitation of the natural resources and sand deposits. We should point out that with the term “continental platform” we are indicating both the marine subsoil and the seabed of the coastal waters that extend also beyond the territorial waters till the Italia-Croatia limit. The coastal State exercises over the continental shelf sovereign rights for the purpose of exploring it and exploiting its natural resources. The natural resources referred to the mineral and other non-living resources of the seabed and subsoil together with living organisms belonging to sedentary species, that is to say, organisms which, at the harvestable stage, either are immobile on or under the seabed or are unable to move except in constant physical contact with the seabed or the subsoil. The rights of the coastal State over the continental shelf do not affect the legal status of the superjacent waters or of the air space above those waters (UNCLOS 78).

The rights to laying of undersea cables and pipelines is subject to the conditions imposed by the coastal State, whereas the scientific research must be expressly authorized thereby.

In Map 2 there are the surface geological characteristics of the seabed and the main human uses, in particular:

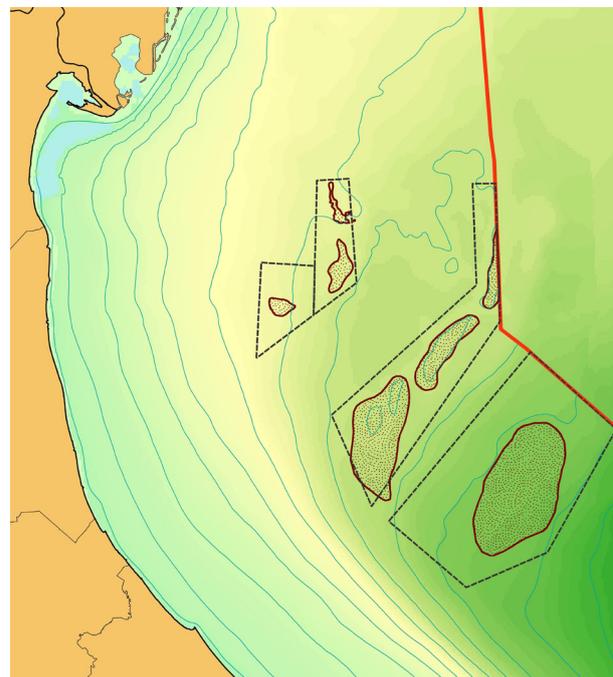
- Surface geology.
- Submarine sand deposits and the relative grant application areas
- Areas for discharge of sediment resulting from the dredging of ports
- Location of undersea cables and pipelines
- Platforms for the extraction of gas

The marine geology of this area has been extensively investigated by the ISMAR of the CNR in Bologna, which has run several geophysical survey and coring of the seabed. Thus allowed them to produce the “Surface geological map”, where the late-quaternary deposits are mapped, on the basis of the

relative depositional sequences.

In the area of interest we found: the regressive deposits of high stand system tract, represented by mud prism of prodelta (hs1), passing upward to beach sand deposits (hs2); the transgressive deposits of paralic environment mainly consisting in clay and sandy-clay (tp1) with sandy lenses (tp2) which form the stretching bodies in correspondence to the morphological steps; the deposits of fall and low stand system tract (ls) mainly consist of over-consolidated clays.

The submarine sand deposits. The research carried out by ISMAR helped to deepen the knowledge of the transgressive sand deposits (tp2) that were exploited for beaches nourishment. Information relating to these deposits are contained in the abovementioned



dedicated database.

The table gives the thickness of the sand deposits and, in dashed lines (L - I), the areas are highlighted that the Region requested in concession to the Ministries of Environment and Economic Development for the exclusive

use of these undersea sand stocks.

The exhaust areas. Another theme concerns the exhaust areas of waste coming from the dredging of ports (□), that for grain size and/or chemical and physical properties are not suitable for their use in the nourishment of the beaches.

Platforms, cables and pipelines

The exploitation of hydrocarbon resources stored in the sea subsoil requires the laying of cables and pipelines, as well as platforms, for the extraction and transport of energy or material from the production areas to the



mainland.

In the marine area of reference there are 61 active platforms, out of which 56 are for production (■), 4 to support production (■) and 1 is not yet operational because it is waiting for transfer of mining lease (■). The platforms can be single well or connected to others of the same type to forming a cluster, or larger platforms (structures of 4, 6, 8 and 12 legs) sometimes also linked amongst themselves, to which and more productive wells are connected and with permanent staff on board. All of these platforms are connected to each other, so that all of the extracted gas is conveyed to the storage systems (■), by a dense network of subsea pipelines (*sealine*) for a total length of about 586 kilometres of which 460 are currently in operation (—). Some pipes were installed thanks to a joint venture between the Italian oil company ENI and the Croatian INA, in order to connect platforms

located in the Croatian marine area.

The ducts (formed from one or more pipes with diameters ranging from 1 to 24 inches) converge to 3 collection and treatment plants located along the Regional coast: “Casalborsetti”, to which 15 platforms are connected for a total of 51 producing wells, “Ravenna Sea” with 17 connected platforms for a total of 36 wells and, lastly, “Rubicon” with 15 connected platforms for a total of 41 wells. Some platforms in front of the Region are connected to the Fano Plant. Lastly, off the Ravenna coast there are located 3 marine terminals (●) for the loading and unloading of hydrocarbons. A network of pipelines is connected to them, for a total length of about 38 km, which connect with the industrial area near Punta Marina.

Map 3

MARICULTURE AND ECOLOGICAL-ENVIRONMENTAL PROTECTION AREAS

The **water column** is the object of the main activities related to the exploitation of fishery resources and therefore it seemed appropriate to place on this level the information currently available relating to fisheries, aquaculture and mussel farming as well as the measures aimed at protecting the marine environment and preservation the biological resources.

Regarding the **fishing**, specific information are not yet available for mapping, but it should be noted that the Emilia-Romagna fishing fleet is composed of 703 boats, for a total of 9,065 GT (gross tonnage) and 69,956 kW of engine power. There is no real production specialization linked to the fleet, although the anchovies are the most fished species (12,536 tons, representing 41% of the regional total) and the fishing of clams is also relevant (*Chamelea Gallina*), as well as that of cuttlefish and cobs.

However, information concerning **shellfish farming** is available in the Map which represents the productive entry regarding national aquaculture.

The map shows in yellow () the concession boundary for the mussels farm, derived from the Nautical Chart n° 37 scale of 1:100.000 supplied in digital format by I.I.M. Those relating to Sacca di Goro instead are supplied by the Service Development of the fish and animal production of the Emilia-Romagna Region. Mariculture farms located in the Region are 79, out of which 44 deal with the breeding of clams and 35 of mussel farming. Regarding the production of clams, it's settled at 13,796 tons in 2008 and the production of mussels was around 15,000 tonnes (Second Report on the economy of the sea in Emilia-Romagna, 2008). In the lagoons and closed seas the mussels are raised in rectangular nurseries, called pergolas, generally consisting of chestnut or galvanized iron poles. The poles are joined at the water level by ropes which are tied to the ropes on which the mussels grow. Offshore farming is made up of rectangular concessions delimited by perimeter buoys within which there are several rows consist of ropes anchored on

the bottom and sealed on the surface by the buoys.

The **ecological and environmental protection areas** shown in the map refer to:

Biological Protection Zone (ZPB), called "Area Fuori Ravenna", established with Ministerial Decree 16/03/2004, edited by Ministerial Decree 27/09/2006, and then by Ministerial Decree 14/10/2009, to protect the biological resources of the sea and the preservation of fish species (). In the BPZ fishing activity is regulated, in the facilities, time and ways according to the of best protection result and increase of the resources.

SIC-Wreck of the Paguro drilling platform (). The Emilia-Romagna Region established the SIC IT4070026, the only marine site in the region recognized as a site of Community interest, coinciding with the biological protection area already identified by Ministerial Decree 21.7.95 "Establishment of the Biological Protection Zone within the maritime sector of Ravenna". It's also known as the "Wreck of Paguro drilling platform" because it was created on the wreck of a platform for the extraction of methane, that was built between 1962 and 1963, and sank during exploration operations. The submerged wreck represent an artificial reef very different from the others because it's located on muddy bottoms, thus makes the area an attraction site for flora and fauna.

Protected Marine Area (AMP) It' a protected area with submerged barriers and artificial nests (Tecnoreef) to allow recovery of native fish species. The marine protected area has been defined on the base of the Coast Guard regulation (No. 63/2006); it correspond to a circular area with a radius of 0.5 nautical miles (926 m) within which navigation, transit, stopping, anchoring and fishing are banned (). It is an artificial reef to allow the

Water column

repopulation of native fish species.

Ecological Protection Zone (EPZ). In accordance with the provisions of the United Nations Convention on the Law of the Sea (Montego Bay, 1982) to preserve and protect the marine environment outside the limits of territorial waters, until the edge of the Continental Platform limit, an Ecological Protection Zone was established with Law 8th February 8, 2006, n° 61 ().

Nursery Area. By nursery area we mean a growth area of the juvenile forms of various species of marine organisms in their first year of life; the current Italian laws establish that areas within 3 nautical miles from the coast () are classified as a nursery. Within these areas fishing is regulated in order to allow the renewal of fish stocks.

In Map 3 are also included **monitoring stations of the water column**, with particular reference to oceanographic buoys, tide gauges and meteorological stations offshore the regional coast, that are:

- The **Nausicaa wave buoy** () (Datawell Directional wave rider MkIII 70), acquired by ARPA-SIMC on behalf of the Emilia-Romagna within the project Beachmed-E and managed thanks to findings provided by European projects such as MICORE FP7. Additional information is available at (<http://www.arpa.emr.it/sim/?mare/boa>).
- The **Model M4 oceanographic buoy** () that measures meteo and physico-chemical data (CTD, Oxygen, pH, etc.) in the water column was positioned in the S1 site south of the Po Delta and in the E1 site off the coast of Rimini. The data are recorded every 5-10-15-30 minutes downloaded and deposited at a data Center of CNR-ISMAR of Bologna, respectively (http://s1.bo.ismar.cnr.it/perl/s1_home.pl).
- The **tide gauge** () at **Porto Corsini** (RA) belonging to the National tide gauge network (RMN), that also has a complete

weather station. (<http://www.mareografico.it/?session=0SESSM&syslng=ita&system=-1&sysind=-1&syssub=-1&sysfnt=0&code=STAZ&idst=15>).



- The **tide gauge** () of **Porto Garibaldi**, owned by the province of Ferrara is available, with private access to the site <http://www.corr-tek.eu/>. The station is equipped with sensors for the acquisition of meteorological data and for controlling the water quality.
- The **marine weather stations** () positioned on the gas platforms of Eni S.p.A, are also equipped **with non-directional wave buoy**. Thanks to an agreement with the Region of Emilia-Romagna, the data, are also sent to ARPA-SIMC to complement the network of regional monitoring.

Map 4

RESTRICTION AREAS OF HUMAN ACTIVITIES

The **sea surface** is the level where most of the human activities occur that have a direct and indirect influence on the other dimensions (column, seabed and subsoil). Similarly navigation, transport, anchoring, fishing and swimming may be affected by activities taking place at lower levels.

Map 4 shows a series of restrictions, that are applied to the human activities that take place starting from the sea surface, determined by the presence of activities, risks and environmental protection factors in the other sea levels, which are incompatible with the sustainable use of the marine resources.

Restrictions derived from the exploitation of the seabed resources

The *presence of drilling platforms and pipelines* for the extraction and transport of hydrocarbons constrains the possibility to perform activities of trawling or generally with nets and towed gears, as well as the ability for ships and boats to anchor in these areas so as not to compromise the operation functionality of plants. According to Italian law in force “wilful damage or breakage due to negligence or negligent, by vessels flying its flag or of persons falling under its jurisdiction, of pipelines or cables[...]”.

Furthermore, access is prohibited in the 200 m wide area (500 m for pleasure craft) surrounding the fixed and mobile methane plants. Transit and stopping are banned as well as all types of fishing within 1000 m from the marine terminals (☒).

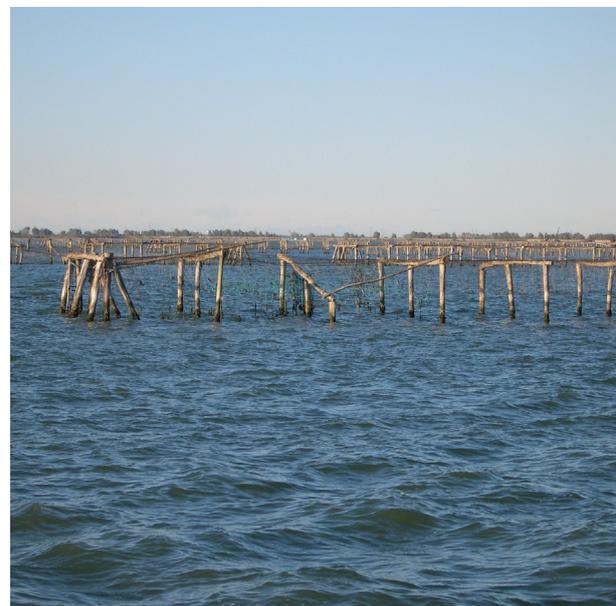
The polygonal areas (☒), off-limits to anchoring and fishing in Italian territorial waters (*onshore*), established by the Maritime Authorities Ordinance, were obtained from coast Nautical Chart scale 1:100.000 N° 37 of the IIM. The areas of respect, equal to ¼ of a nautical mile, in the remaining portions of onshore and offshore pipelines (☒) were directly prepared by SGSS starting from the legislation in force.

Restrictions derived from the presence military zones

In front of the mouth of the Reno River (☒) due to the presence of a military area, is permanently forbidden anchoring and fishing activities (Maritime District of Ravenna–Ordinance). With different (☒) symbol, areas for military exercise are indicated, for which, with specific periodic ordinance, issued by the competent office, are temporarily banned navigation, stopping, anchoring and fishing are temporarily prohibited (Echo Area 345-346).

Restrictions derived from the presence of mussel farming plants

Where there are facilities for the breeding of shellfish it is strictly forbidden to transit, navigate, anchor, fish, swim and dive for unauthorized persons and vehicles (☒). Furthermore, it is forbidden navigated at a distance of 500m from mussels farm (☒).



Restrictions derived from ecological and environmental protection needs

The areas of ecological and environmental protection, described in Map 3, have been defined in order to ensure effective protection of the environment and water resources.

Sea surface

They are restriction zones for human activities such as sailing, anchoring and fishing, in particular:

Marine Protected Area (), **SIC and ZPS** (): navigation, transit, stopping, anchoring and fishing are forbidden.



Biological Protection Zone (ZTB -) and **Nursery Area** (): in these areas it is prohibited to fish juvenile of any species and it is also banned to fish with a trawl system.

Restrictions derived from the presence of traffic regulation

Several traffic separation schemes are established in the Adriatic Sea and regard all coastal states. Some of them have been adopted by the IMO (International Maritime Organization) and others are adopted by each government. In the marine area offshore the coast of Emilia-Romagna region both types are present as shown in the IIM charts. In particular, there is an inshore traffic zone () regulated the entrance to the port of Ravenna, and an area dedicated to lightening, always near the port, inside of which anchoring, stopping and fishing are forbidden.

traffic separation scheme, inshore traffic zone, traffic lane, precautionary area and area to be avoided. We are also trying to implement it with information relating to the traffic fluxes (routes

and size of the flows).

In the offshore zone, a traffic separation scheme is present (), taken from 'IMO, which regulates the passage of ships and boats, in an area particularly frequented, in order to reduce the risk of accidents. The scheme extends northern of the parallel N 43°47'N and consists in a precautionary area from which extend two channels of traffic, one east and one west of the central area of interdiction for vessels over 200 t of sl, due to the presence of platforms for the extraction of hydrocarbons and associated pipelines (Portolano, 2008).

In the Map 4 is also reported the presence of a wrecks possibly dangerous for navigation ().

Acknowledgements

Special thanks for collaboration to the colleagues of the General Directorate for Environment, coast and soil protection and to the other Regional Directorates involved in the IPA project Shape.

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